Appendix G Lamberts North Ash Placement Project - Annual Water Quality Monitoring Report 2020– 2021

EnergyAustralia
LIGHT THE WAY

Lamberts North Ash Placement Project

Annual Water Quality Monitoring Report 2020/21

22 November 2021

Project No.: 0553983_R04_F01

The business of sustainability

ERM

Document details	
Document title	Lamberts North Ash Placement Project
Document subtitle	Annual Water Quality Monitoring Report 2020/21
Project No.	0553983_R04_F01
Date	22 November 2021
Version	Final
Author	Tenille Cook
Client Name	EnergyAustralia NSW Pty Ltd

Document history

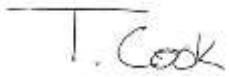
				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	00	Tenille Cook	Andrew McLellan, Gavin Powell	Tamie Weaver	29.10.21	Draft for client comment
Draft	01	Tenille Cook	Andrew McLellan, Gavin Powell	Tamie Weaver	12.11.21	Response to client comment
Final	00	Tenille Cook	Andrew McLellan, Gavin Powell	Tamie Weaver	22.11.21	Final

Signature Page

22 November 2021

Lamberts North Ash Placement Project

Annual Water Quality Monitoring Report 2020/21



Tenille Cook
Consultant

Andrew McLellan
Principal Consultant and Technical Director

Gavin Powell
Senior Consultant

Dr Tamie Weaver
Technical Fellow and Partner in Charge

Environmental Resources Management Australia Pty Ltd
Level 15 309 Kent Street
Sydney NSW 2000

CONTENTS

List of Tables

List of Figures

Acronyms and Abbreviations

Name	Description
AEMR	Annual Environmental Monitoring Report
AHD	Australian Height Datum
ANZECC	Australia and New Zealand Environment Conservation Council
ANZG	Australian and New Zealand Guidelines
ARI	Average Recurrence Interval
BCA	brine conditioned ash
C	Degrees Celsius
CEMP	Construction Environmental Management Plan
CSP	Coal Settling Pond
DO	Dissolved Oxygen
DPIE	NSW Department of Planning, Industry and Environment
EC	Electrical Conductivity
EPA	Environmental Protection Authority
EPL	Environmental Protection Licence
ERM	Environmental Resources Management
GCB	Groundwater Collection Basin
GMMP	Groundwater Management and Monitoring Plan
ha	hectare
km	Kilometres
LCC	Lithgow City Council
LDP	Licenced Discharge Point
LGA	Local government area
LMP	Licenced Monitoring Point
LNAR	Lamberts North Ash Repository
LOR	Limit of Reporting
LSAR	Lamberts South Ash Repository
m	metre
mg/L	milligrams per litre
mm	millimetre
ML	Megalitre
MPAR	Mt Piper Ash Repository
MPPS	Mt Piper Power Station
MW	Megawatt
NSW	New South Wales
OEMP	Operation Environmental Management Plan
PEA	Preliminary Environmental Assessment
REF	Review of Environmental Factors
SSD	State Significant Development
SWTP	Springvale Water Treatment Project

TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WAL	Water Access Licence
WCA	water conditioned ash
µg/L	micrograms per litre
µS/cm	microSiemens per centimetre

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by EnergyAustralia NSW Pty Limited (EnergyAustralia) to prepare an Annual Water Quality Monitoring Report (this report) for the Lamberts North Ash Repository (LNAR) at the Mt Piper Power Station facility located at 350 Boulder Road, Portland, New South Wales (MPPS, or the site). Refer to Figure 1, Appendix A for the location and setting of the site.

This report presents the results of water quality monitoring conducted in accordance with the Lamberts North Ash Placement Project Operational Environmental Management Plan (EnergyAustralia, 2019) (the OEMP) over the period of 1 September 2020 to 31 August 2021 (i.e. the reporting period). Results from the monitoring program are reported to key stakeholders including WaterNSW, NSW Environment Protection Authority (EPA), Lithgow City Council (LCC) and NSW Department of Planning, Industry and Environment (DPIE).

This report has been prepared in accordance with Conditions E15 and E16 of project approval 09_0186 granted under the Environmental Planning and Assessment Act 1979 (NSW) on 16 February 2012 (the Project Approval).

This report should be read in conjunction with the Statement of Limitations presented Section 9.

1.1 Project Background

EnergyAustralia owns and operates the MPPS. The MPPS was built between 1984 and 1993 and comprises two 700 megawatt (MW) coal-fired steam turbine generators. The MPPS is located within the Lithgow Local Government Area (LGA), approximately 110 kilometres (km) west of Sydney, 18 km north-west of Lithgow, and five km east of Portland.

The MPPS is fuelled using black coal currently sourced from the local area. Ash is produced as a result of coal combustion by the transformation of the non-combustible matter present in the coal. The ash constituents comprise bottom furnace ash and fly ash. Bottom furnace ash, which typically makes up 10% of the total ash product, is typically coarse and wet. Fly ash typically makes up 90% of the total ash product and is finer with a moisture content of 0%. Together, bottom furnace ash and fly ash is referred to as 'ash.' Ash produced by MPPS can either be reused (sold on the open market) or placed in purpose-built ash placement repositories.

EnergyAustralia has two approved and operating ash placement repositories as described below.

- The Mt Piper Ash Repository (MPAR), approved under the MPPS development consent (80-10060), as modified (the Mt Piper Consent). The majority of the ash produced at MPPS has been and still is placed within the MPAR in accordance with the conditions of the Mt Piper Consent.
- The Mt Piper Ash Placement Project consists of two ash placement repository areas, the LNAR and the Lamberts South Ash Repository (LSAR). The LSAR is currently not available as the LSAR approval area is being used by Springvale Coal Pty Ltd (Centennial) for approved coal mining and processing activities. Ash placement is currently occurring within the northern portion of the LNAR only; the southern portion of the LNAR approval area is currently leased by Centennial, with handback scheduled for 2022.

Together the LNAR and the MPAR are referred to as the Ash Repositories. This report is limited to the LNAR, as required by the Project Approval. The water quality monitoring conducted in relation to the MPAR is reported separately, in line with the separate development consents that apply to the MPAR. Refer to Figure 2, Appendix A for a plan showing relevant site features.

The wet bottom furnace ash is placed directly onto the Ash Repositories, either temporarily (i.e. recovered and reused) or permanently. Prior to the placement of fly ash within the Ash Repositories, it is conditioned to increase its moisture content. This is undertaken to achieve required compaction rates and to maintain geotechnical stability of the Ash Repositories; it also assists in dust suppression.

Fly ash is conditioned by the addition of either:

- Water, sourced in accordance with MPPS existing water licences and allocations including recycled process water and fresh (non-potable) water. Fly ash treated with water is referred to as Water Conditioned Ash (WCA); or
- Brine, a by-product from:
  - Treatment of evaporative cooling water from the cooling towers of MPPS to remove salts and impurities. Treatment occurs at the MPPS Brine Concentrators under the Mt Piper Consent; and
  - The desalination process of the nearby Springvale Water Treatment Project (SWTP), Significant Development (SSD) 7592.

  Fly ash treated with brine is referred to as Brine Conditioned Ash (BCA).

The conditioning of fly ash as WCA or BCA occurs within the power block of the MPPS, away from the Ash Repositories. The BCA or the WCA is then transported separately (via conveyor) to the repository silos located at the MPAR. From the silos, the conditioned ash is loaded into trucks and transported to approved placement areas.

To date (since 2013), only placement of WCA has occurred under the Project Approval at the LNAR. The relevant conditions of the Project Approval to operate the LNAR require:

- Implementation of the OEMP (Conditions E2 and E3) which contains a detailed environmental management framework, and practices and procedures to be adopted as part of operations at the LNAR. This includes a Groundwater Management Plan and a Surface Water Management Plan; and
- The carrying out of groundwater and surface water monitoring programs required by Conditions E15 and E16 respectively and as specified in the OEMP.

No changes to the Project Approval which affect the reporting period are noted.

1.2 Objectives

The objectives of this report are to meet the reporting requirements of the Groundwater Management and Monitoring Plan and Soil and Surface Water Management Plan as presented in the OEMP.

1.3 Scope of Works

In order to meet the objectives of this report, the following scope of works has been implemented:

- Importation of environmental monitoring data provided by EnergyAustralia to the existing environmental database for the site;
- Export of summary tables for all available water quality and weather data collected by EnergyAustralia from the monitoring conducted in accordance with the OEMP;
- Export of graphs of selected data collected by EnergyAustralia from the monitoring conducted in accordance with the OEMP;
- Review of monitoring data at the three existing surface water quality monitoring sites in Wangcol Creek[1] at LMP01, NC01 and WX22 (Appendix B);

[1] Wangcol Creek is referred to as "Neubecks Creek" in the OEMP. However, WaterNSW has clarified that the creek is properly named "Wangcol Creek". Accordingly, this report refers to the monitored creek as Wangcol Creek.

- Assessment and reporting of groundwater quality and depth of the water table at groundwater monitoring bores outlined in the OEMP (Appendix C and Appendix D, respectively);
- Comparison of surface water and groundwater data with the modelled groundwater elevation predictions in the OEMP;
- Assessment of trends in surface water and groundwater quality (comparison between reporting years), presented in Appendix E and Appendix F respectively;
- A list of occasions in the twelve month reporting period when the Environmental Goals were not achieved;
- An update on the contingency measures currently being implemented in accordance with the OEMP;
- Presenting figures of key findings of the assessment (Appendix A); and
- Preparation of this report to present the results of the surface water and groundwater quality monitoring, including interpretation and discussion of results, as required under the Project Approval and the OEMP for the reporting period.

1.4 Documentation Reviewed

The reports listed below have been reviewed as part of this report, and information within them has been relied upon:

- The Project Approval conditions (Appendix I);
- Sinclair Knight Merz, September 2009. Mt Piper Power Station Ash Placement Project, Project Description and Preliminary Environmental Assessment;
- Sinclair Knight Merz, August 2010, Mt Piper Power Station Ash Placement Project Environmental Assessment;
- Sinclair Knight Merz, March 2011, Mt Piper Power Station Ash Placement Project Submissions Report;
- CDM Smith, December 2012, Delta Electricity, Lamberts North Ash Placement Project Plan, Construction Environmental Management Plan (CEMP);
- EnergyAustralia NSW Pty Ltd (EnergyAustralia) (2019), Lamberts North Ash Placement Project – Operational Environmental Management Plan (the OEMP), Revision 5, 2 September 2019;
- ERM, March 2019. Lamberts North Ash Placement Water Quality Monitoring, Annual Water Quality Monitoring Report 2018/2019. Final Version 02, 15 March 2019; and
- ERM, November 2020. Lamberts North Ash Placement Project, Annual Water Quality Monitoring Report 2019/2020. Final Version, 09 November 2020.

In addition to the above, the information presented in this report was prepared using data and information provided by EnergyAustralia, including:

- Water quality data (Appendix B and Appendix C);
- Gauging data, presented as hydrographs, for groundwater bores as supplied by EnergyAustralia for the reporting period (Appendix D);
- Local climate data from Mt Piper Weather Station (Appendix G); and
- LNAR operations summary (Section 2 and Appendix H).

2. OPERATIONS SUMMARY

All ash placement operations for MPPS, including within the LNAR authorised by the Project Approval, are undertaken by a specialist ash placement contractor. Lend Lease Infrastructure is the current service provider for EnergyAustralia in relation to all aspects of ash placement and dust management at the MPPS.

A summary of operations at the LNAR area for the 2020/21 reporting period is presented in **Error! Reference source not found.**1. No ash was placed during the 2019/20 reporting period, whereas 157,500 tonnes of ash was placed during the 2020/21 reporting period. Figure 2 and Figure 3 provide the layout of site features and the current ash placement plan respectively.

Table 1 Lamberts North Ash Repository – Operations Summary

Activity	Previous Reporting Period (2019/20)	This Reporting Period (2020/21)
WCA delivered to site (T)	0[1]	157,500[2]
Total LNAR ash footprint (ha)	16.77	16.7
Area of LNAR capped (ha)	1.29	1.30

[1] No ash was placed at LNAR during the 2019/20 reporting period.
[2] Only WCA was placed at LNAR during the 2020/21 reporting period.

2.1 Ash Placement and Geometry

This subsection presents a summary of the intended ash placement procedure and geometry, as summarised from the OEMP, with a discussion of the ash placement activities that occurred over the reporting period.

The ash deposited at the LNAR is treated to achieve an average compaction of 95%, relative to its maximum standard compaction, through controlled water addition and mechanical compaction using of rollers and rubber-tyred vehicles. Ash placement at the LNAR generally occurs in 0.5 m to 1 m lifts. The lifts are conducted in pads, using conditioned materials to achieve design elevation contours.

The ash is deposited to produce an external batter slope with an approximate gradient of 1(V):4(H). Benches are added in the external batter every 10 m in change of height vertically. The external batters and surfaces are covered with approximately 1 m of clean fill / mine spoil to provide suitable cover for the ash and to support the rehabilitation.

Figure 3 indicates that the elevation achieved by ash placement operations in the LNAR up to 9 August 2021 was up to approximately 946 m Australian Height Datum (AHD) at the highest point. The height of WCA placement in the LNAR at that time remained below the maximum approved final landform height for the LNAR, being 966-980 m AHD. Ash placement has occurred initially in the most northerly part of the LNAR, continuing towards the eastern and southern parts of the active LNAR ash placement area.

3. ENVIRONMENTAL SETTING

Details of the environmental site setting are presented in the following sections to provide context to the surface water and groundwater assessments (Sections 5 and 6 respectively). The surface water and groundwater monitoring locations are presented in Figure 4.

3.1 Climate

Climate data was provided by EnergyAustralia and is sourced from a weather station at MPPS (Table 2). A copy of the data is provided in Appendix G.

Table 2: Local Climate Data for 2020/21

Month	Rainfall Total (mm)	Min. Temperature (°C)	Max. Temperature (°C)
September 2020	4.5	-2	22
October 2020	73.8	1	19.10
November 2020	5.0	4	23.6
December 2020	86.6	4	21.9
January 2021	101.1	7	24
February 2021	77.4	9	22.46
March 2021	165.4	4	20.39
April 2021	1.0	-1	18.1
May 2021	22.1	-4	14.0
June 2021	56.3	-3	10.37
July 2021	58	-7	10.06
August 2021	80.80	-4	12.52
TOTAL/MIN/MAX	**732.0**	**-7**	**23.6**

Data from MPPS Weather Station

The total rainfall for the reporting period was 732.0 mm. This is higher than the total reported rainfall for the 2019/20 reporting period of 500.1 mm (ERM, 2020). However it is similar to the average annual rainfall between 2012 and 2017 which was reported by Aurecon (2017) to be 756.5 mm.

The 2020/21 reporting period was characterised by higher than average rainfall, which occurred generally between December 2020 and March 2021. This high rainfall broke the period of relative drought experienced at the site, and more broadly within NSW, between 2017 and 2020.

3.2 Geology

The LNAR is located on an outcrop of the Illawarra Coal Measures. The Illawarra Coal Measures overlie the Shoalhaven Group and host the coal seams that were previously mined out in and around the LNAR. The Narrabeen Group, comprised of sandstones, overlies the Illawarra Coal Measures and forms the surrounding hillsides (NSW Government, 1992). Characteristics of the native geologic units are listed in Table 3.

Table 3: Local Geological Units

Narrabeen Group	Illawarra Coal Measures	Shoalhaven Group
■ Sandstones, shale and claystone. ■ Up to approximately 800 m thick in parts, although generally absent in the immediate vicinity of the Ash Repositories. ■ Deposition in estuarine/alluvial, fluvial, and fluvial-deltaic environments. ■ Unconformably overlies Illawarra Coal Measures (Danis et al., 2011).	■ Interbedded shale, sandstone, conglomerate, and coal. ■ Dips 1 - 2 degrees to the east. ■ Outcrops extensively just east of Portland, exposing the Lidsdale and Lithgow coal seams close to the surface with approximately 15-25 m of sandstone overburden (CDM Smith, 2012). ■ Mined coal seams at and in the vicinity of the Ash Repositories (underground and open cut mining). ■ Upper portions extensively weathered.	■ Siltstones, lithic sandstones and conglomerate. ■ Marine sediments. ■ Berry Sandstone/ Formation (earlier) & Snapper Point Formation (later). ■ Contains sulfide-bearing material and is acid-generating in places where exposed via rock cuttings (SKM, 2010).

Whilst the majority of the area underneath and around the LNAR has been mined using open cut methods, there are small areas near the western boundary of the LNAR where remnant underground bord and pillar remains.

3.3 Hydrogeology

Groundwater beneath the LNAR is present within the Illawarra Coal Measures. The natural stratigraphy of the Illawarra Coal Measures in the vicinity of the LNAR is generally as follows:

- Bunnyong Sandstone (Long Swamp Formation) – massive sandstone;
- Lidsdale Coal Seam – interbedded high ash coal and shale;
- Blackmans Flat Conglomerate – coarse sandstone and conglomerate;
- Lithgow Coal Seam; and
- Marrangaroo Conglomerate – massive sandstone and conglomerate.

Considering the former mining in the area, and the current ash placement activities, anthropogenic lithologies in the vicinity of the LNAR include ash, fill and placed overburden, and mined out workings which may be voids, or may contain fill or collapsed overlying lithologies.

Prior to 2012, a former mined out void located to the east of the MPAR was used to extract groundwater (SKM 2010). The void was referred to as the Groundwater Collection Basin (GCB) and, in 2012, it was filled in as part of the construction of the LNAR. Aurecon (2017) noted that, prior to the placement of ash in the footprint of the former GCB, the former void (Huons Void) was filled and compacted to a maximum level of 917 m AHD, with ash placed above that elevation. Historically, groundwater seepage from beneath the MPAR would have been collected in the former GCB (SKM, 2010).

Groundwater elevations, contours, and inferred flow directions for the reporting period are presented in the Figure 5 series (i.e. Figure 5A to Figure 5D). During the reporting period, the water table elevation range was approximately 907 m AHD to 914 m AHD in the vicinity of the LNAR. This, and other groundwater monitoring results indicate that, near the Ash Repositories (ERM, 2021) the water table occurs variably in the former below ground mined out areas and open cuts and, away from the Ash Repositories it occurs predominantly in the overlying Bunnyong Sandstone.

Groundwater elevation contours indicate primary groundwater flow directions from the LNAR to the east and north-east. The groundwater flow directions remained relatively consistent throughout the reporting period based on groundwater contour plans prepared for each season as presented in the Figure 5 series.

3.4 Hydrology

The LNAR is located within the former Huons Gully catchment. The former Huons Gully is a part of the Wangcol Creek catchment, which is part of the upper Coxs River Catchment. Wangcol Creek is located to the north of the LNAR and flows from the north-west towards the south-east. The creek joins the Coxs River approximately 3.2 km east of the LNAR. At its closest point, Wangcol Creek is approximately 150 m north-east of the LNAR.

Currently, the following surface water management and mitigation measures are implemented at the LNAR:

- Clean water is diverted from external areas (i.e. areas not exposed to ash placement activities) around the LNAR to avoid interaction with ash materials;
- Stormwater runoff from the west and south-west of the LNAR is captured by the existing clean water drain and is diverted into the clean water system;
- Stormwater from the south of the LNAR falls onto the existing mining operations of Centennial and is managed by Centennial through a series of ponds and drains in the vicinity of the Lamberts Gully Creek; and
- Stormwater falling on areas to the east and north of the LNAR largely drains naturally to the east into Wangcol Creek following the general lay of the land away from the LNAR.

The LNAR has been designed to contain water on site, by diverting water into the centre of the LNAR to on-site retention and sediment basins. This allows for:

- Re-use and recycling of runoff from within the LNAR (i.e. for dust suppression); and
- Cover and revegetation of completed external batters, diverting clean water to drainage systems.

4. ENVIRONMENTAL GOALS

The Environmental Goals for groundwater and surface water monitoring for the reporting period are consistent with the OEMP and are consistent with those applied to monitoring of the MPAR, as approved in the Water Management and Monitoring Plan[2]. The Environmental Goals were developed by Aurecon (2009) to account for hardness corrected guideline values as presented by CDM Smith (2013).

The Environmental Goals utilise whichever is the greater value of the 95% ecosystem protection values, stock watering, irrigation water or drinking water values based on the Australian and New Zealand Guidelines (ANZG, 2018) water quality guidelines (formerly Australia and New Zealand Environment Conservation Council, ANZECC, 2000), and the 90th percentile pre BCA placement local environmental (groundwater/surface water) data. The local guideline values incorporated into the Environmental Goals are based upon the 90th percentile pre-ash placement water quality results, as measured at surface water quality point WX22 (for surface water) or the former GCB (for groundwater).

Aurecon (2017) present a set of additional baseline values for copper and nickel which were developed based on a dataset from October 2012 to August 2013 at monitoring location WX22 (for surface water) and MPGM4/D9 (for groundwater), to capture potential changes that have occurred since the operation of the MPAR, but prior to the commencement of operation of the LNAR.

It is noted that, where the Environmental Goals for groundwater are based on the ANZG (2018) water quality guidelines, these guidelines are applicable to receiving waters and not to groundwater. However, they form an appropriate basis for undertaking a conservative initial screening assessment. Changing surface water and groundwater conditions in relation to the Environmental Goals (i.e. baseline conditions) serve as an early warning for potential surface water and groundwater impacts that may be associated with operation of the Ash Repositories.

4.1 Surface Water Environmental Goals

In order to assess for potential effects on surface water quality in the receiving environment adjacent to the LNAR, Environmental Goals for surface water have been set out in the OEMP. The Environmental Goals have been applied to the following surface water monitoring sites (blue squares in Figure 4):

- Licenced Discharge Point (LDP12[3]) – LDP under Environment Protection Licence (EPL) 13007, is used to monitor discharge from the Coal Settling Pond (CSP), and the data from this location is not representative of instream surface water conditions. Data from the LDP is not regulated by the Environmental Goals and is provided in this report for comparison only.
- Licenced Monitoring Point (LMP01[3]) - located on Wangcol Creek, downstream of the Final Holding Pond (FHP). Discharge from LMP01 enters the Western Drain, which is part of the upstream Wangcol Creek catchment, before flowing into the FHP. The FHP holds storm water from the clean water diversions from around the MPPS, and can be closed in the event of an environmental incident to limit the likelihood of adverse impacts to the downstream surface water environment. The FHP was constructed within Wangcol Creek and it operates as the final pollution control structure before water reaches the “off premises” portion of Wangcol Creek. LMP01 is the sampling location downstream of the FHP, and is representative of instream conditions in the upper reaches of Wangcol Creek, upstream of the Ash Repositories.
- Neubecks Creek (NC01): Located midstream in the monitored area of Wangcol Creek, upstream to the Ash Repositories; and

[2] Approved for the Mt Piper Brine Conditioned Fly Ash Co-Placement Project in accordance with development consent DA80/10060 (as modified) and dated 28 February 2020.
[3] LMP01 was historically referred to as LDP01 within the OEMP (2019) and prior versions of the OEMP (CDM Smith, 2013).

- Neubecks Creek (WX22): Located in Wangcol Creek at a stream gauge to the east/down-stream of the Ash Repositories. Also WaterNSW monitoring point 212055.

The Surface Water Environmental Goals adopted for this assessment are presented alongside the surface water data in Appendix B.

4.2 Groundwater Environmental Goals

The Environmental Goals for groundwater have been applied to the groundwater monitoring locations located cross-gradient/south of the LNAR (D15, D16, D17, D18), up-gradient/adjacent the LNAR (D10 and D11 - down-gradient of the MPAR), down-gradient/adjacent to the LNAR and adjacent to Wangcol Creek (D1, D9, D8 and D19). The objective of the groundwater monitoring locations is to identify where impacts above the Groundwater Environmental Goals exist.

The Groundwater Environmental Goals are presented alongside the groundwater data in Appendix C.

4.3 Early Warning Assessment

In addition to comparing results with the Environmental Goals for surface water and groundwater, EnergyAustralia conduct an early warning assessment of the groundwater and surface water monitoring data. The early warning assessment includes evaluation of concentration trends through time at each groundwater monitoring location. Data (50th percentile) from the current reporting period are compared against the 90th percentile pre-placement data.

4.4 Operational Environmental Management Plan

The OEMP outlines the framework to manage environmental aspects associated with the operation of the LNAR. With respect to the management of surface water and groundwater at the site, the OEMP outlines the following sub-plans:

- Section 6.4 (of OEMP): Groundwater Management and Monitoring Plan (GMMP), to address Conditions D3 (b and j), B2, E15 and E17 of the Project Approval; and
- Section 6.5 (of OEMP): Soil and Surface Water Management Plan to address Conditions D3 (c) and E16 of the Project Approval.

The OEMP (EnergyAustralia, 2019) is applicable to the 2020/21 reporting period.

4.5 Groundwater Model Predictions

Groundwater modelling prepared by CDM Smith (2012) presented the following conclusions:

- Ash placement was considered highly unlikely to adversely affect the two aquifers underlying the LNAR. The project design was modified to reduce the likelihood of groundwater contamination resulting from the LNAR, including provision of a sufficient separation distance between maximum groundwater level and the base of ash placement (CDM Smith, 2013);
- Groundwater modelling demonstrated that the water present in the former GCB and Huon Gully is largely groundwater from the intersection of Huon Void with the water table (CDM Smith, 2013);
- The maximum modelled groundwater level in the southern end of the LNAR was identified as 912.5 m AHD, 2.5 m above the RL 910 m AHD (CDM Smith, 2012);
- The model results indicated that groundwater levels across the site were at maximum levels during wet weather patterns. Accordingly the model results indicated that groundwater levels would remain at least 4 m below the base of the LNAR under a 1 in 100 year Average Recurrence Interval (ARI) event and steady state normal conditions (CDM Smith, 2012);
- The model indicated that LNAR operations were not expected to impact on background groundwater and surface water quality parameters (CDM Smith, 2012); and

- Preliminary predictions based on sulfate and total dissolved solids (TDS) concentrations indicated that impacts from the LNAR associated with compounds such as boron, manganese, nickel, zinc, molybdenum, copper, arsenic and barium on the surrounding environment were unlikely (CDM Smith, 2012).

4.6 Independent Investigation

A separate and broader independent investigation of groundwater and surface water conditions in the vicinity of the Ash Repositories, including the MPAR and in close proximity to the LNAR, is nearing completion (the independent investigation). Measures to manage potential impacts to groundwater and surface water are currently being evaluated as part of the independent investigation.

5. Surface Water Assessment

5.1 Objective

The objective of the surface water monitoring program is to monitor the impacts of ash placement activities on the surface water quality in Wangcol Creek.

5.2 Surface Water Monitoring Locations and Frequency

The surface water monitoring locations allow comparison of the condition of the surface water downstream of the LNAR with upstream surface water quality conditions to assess for potential changes in water quality. A summary of the surface water monitoring site locations is presented in Table 4 and Figure 4.

Table 4 Surface Water Monitoring Site Network and Frequency

Site ID	Location Description	Frequency[1]	No. of Samples in 2020/21
LDP12	Monitors the storm water in the CSP and discharge from the CSP. Sampling of the CSP is conducted routinely at times when discharge is not occurring. These samples are differentiated as LDP12_CSP (not discharging) and LDP12 (when discharge is occurring).	As required by EPL 13007 during discharge	3 (LDP12)[1] 13 (LDP12_CSP)[1]
LMP01	This monitoring point is located north-west of the MPAR. It is located in an upstream position relative to the Ash Repositories and is the location where flow from the headwaters of Wangcol Creek leaves the MPPS operational area, downstream of LDP12 and the FHP.	Quarterly	5[1]
NC01	Located midstream in the monitored area of Wangcol Creek, upstream to the Ash Repositories.	Quarterly	12
WX22	Located in Wangcol Creek at a stream gauge to the east and down-stream of the Ash Repositories and east / north-east of all groundwater monitoring locations contained in the OEMP. Also WaterNSW stream gauge monitoring station 212055.	Quarterly	13

[1] *Selected field parameters monitored more regularly. Some additional samples were also analysed for specific analytes.*

The number of samples in Table 4 indicates the number of occasions where a complete, or near complete suite of analysis was conducted. Monitoring location LDP12 was not sampled in September 2020 despite at least one sampling event per month for the reporting period.

Monitoring at LDP12_CSP included an additional 38 samples analysed for fluoride, chloride, sulfate and field parameters, and a total of 68 samples for the reporting period (most being a set of field measurements of TDS and Total Suspended Solids (TSS) only).

The sample from monitoring location LMP01 taken in July 2021 was not analysed for the full laboratory analyte suite. Field parameters and major anions, fluoride, chloride and sulfate (as SO_4), were analysed in the July 2021 event.

5.3 Surface Water Monitoring Methodology

Surface water quality monitoring was undertaken by Nalco Water – Ecolab (Nalco) on behalf of EnergyAustralia. Details regarding the Nalco sampling method and quality assurance and quality control (QA/QC) program are presented in Appendix J, and these are understood to be in accordance with the sampling methodology outlined in the OEMP.

5.4 Surface Water Quality Dataset

Samples were obtained by Nalco for either field or laboratory analysis in accordance with the following monitoring and analysis schedule:

- pH - laboratory measurement (LMP01 only) and field measurement;
- Electrical Conductivity (EC) - field measurement (WX22, LMP01 and NC01) and laboratory measurement at LMP01;
- Dissolved Oxygen (DO) - field measurement;
- Temperature (ºC) - field measurement (WX22 only);
- TDS - laboratory analysis;
- TSS - laboratory analysis (LMP01 only);
- Major and minor anions including chloride, sulfate (as SO_4), alkalinity and fluoride;
- Major and minor cations including calcium, magnesium, sodium and potassium – laboratory analysis;
- Nutrients including nitrate, nitrite, nitrogen and phosphorus (and on occasion ammonia for LDP12) – laboratory analysis; and
- Metals (including Al, As, Ba, Be, B, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, Sr, V and Zn) – laboratory analysis on filtered and unfiltered samples
- Only filtered samples were analysed for antimony, beryllium, cobalt, mercury, phosphorous, silver and strontium

Evidence of the collection of field QC samples (i.e. rinsate, trip blanks or trip spikes) during the field based programs was not provided. Results of laboratory QC measures including laboratory duplicate, triplicate, method blanks or spike data were not presented for review and are not considered in this report.

5.5 Surface Water Results

A summary of the surface water analytical results obtained for the 2020/21 reporting period against the Environmental Goals for surface water is presented in Table 5 with ranges presented for each analyte.

Tabulated results along with summary statistics for each monitoring point (minimum, maximum, 50th percentile and 90th percentile) are presented in Appendix B and Figure 6A.

Table 5 Surface Water Monitoring Results – 2020/21

Analyte/Location	Surface Water Concentration Range			Screening Criteria	
	WX22	**LMP01**	**NC01**	**Wangcol Creek at WX22 Pre-placement 90th Percentile**	**Surface Water Environmental Goal**
pH (field)	6.77 – 7.54	7.17 – 8.5	6.75 – 7.82	6.7-7.8	6.5 – 8.0[k]
pH (laboratory)	NA	NA	NA	6.7-7.8	6.5 – 8.0[k]
EC (µS/cm)	213 - 930	184 - 568	139 - 307	894	2,200[c]
TDS, Major and Minor Ions (mg/L)					
TDS	139 - 560	150 - 390	92 - 188	580	1,500[d]
Sulfate (as SO_4)	37 - 279	31.6 - 224	15.2 – 62.8	332	1,000[e]
Chloride	12 - 79	3.0 - 29	5.0 - 14	22	350[f]
Fluoride	0.052 – 0.179	0.103 – 0.198	0.043 – 0.21	0.338	1.5[g]
Trace Metals (µg/L)					
Arsenic	<1	1	<1	<1	24[b]
Barium	8 - 29	21 - 27	16 - 33	29	700[g]
Beryllium	<1	<1	<1	<1	100[i]
Boron	<50 - 120	50	<50 - 60	90	370[b]
Cadmium	<0.1	0.1 – 0.2	<0.1	<1	0.85[h]
Chromium (total)	<0.1	1	<1 - 1	<1	2 [h]
Copper	<1 - 2	4 - 6	<1 - 3	<1	3.5 h / 5 [m]
Iron (filtered)	<50 - 270	20 - 210	80 - 250	281	300[f]
Iron	122 - **1450**	200 - **1340**	246 - **1520**	281	300[f]
Mercury	<0.04	<0.04	<0.04 – 0.06	-	0.06[b]
Manganese (filtered)[l]	41 - 752	15 - 56	<1 - 196	720	1,900[b]
Manganese	43 – 782	71 – 168	32 – 314	720	1,900[b]
Molybdenum	<1 - 2	8 - 12	<1 - 4	<1	10[i]
Nickel	7 - **47**	6 - 10	1 - 4	5	17[b] / 15[m]
Lead	<1	<1 - 2	<1 - 1	<1	5[b]

Analyte/Location	Surface Water Concentration Range			Screening Criteria	
	WX22	**LMP01**	**NC01**	**Wangcol Creek at WX22 Pre-placement 90th Percentile**	**Surface Water Environmental Goal**
Selenium	<0.2 – 0.4	0.4 – 1.4	<0.2 – 1.6 (<10 also recorded)	<1	5[b]
Silver	<1	<1	<1	-	0.05[b]
Zinc	<5 - 11	13 - 35	<5 - 13	116	116[j]

Notes:
NA Not Available
All metals concentrations presented are from unfiltered samples, as per the OEMP
Shaded cell indicates value is equal to or exceeds the Environmental Goal
***Bold** indicates result is 1 - <10 times the Environmental Goal*
***Bold** and **shaded** indicates result is >10 times the Environmental Goal*
a. Values adopted from OEMP
b. ANZECC 2000 for Freshwater Slightly-Moderately disturbed aquatic ecosystems (B 90th, Pb 90th, Ni 80th, Se 90th, Ag 90th)
c. ANZECC 2000 – EC range for lowland rivers in slightly disturbed ecosystems in south-east Australia is 125-2200 µS/cm
d. 1,500 mg/L based on a conversion factor of 0.68 and an EC of 2200 µS/cm lowland river conductivity for slightly disturbed ecosystems
e. ANZECC (2000) Livestock
f. ANZECC (2000) Irrigation for moderately tolerant crops
g. ANZECC (2000) Drinking water guidelines
h. Concentrations of cadmium, chromium and copper modified due to consideration of water hardness. Cd from 0.001 mg/L to 0.00085 mg/L; Cr from 0.001 mg/L to 0.002 mg/L and Cu from 0.0025 mg/L to 0.0035 mg/L
i. ANZECC (2000) Irrigation LTV
j. Local guideline based on 90th percentile pre-brine placement
k. ANZECC (2000) pH values presented are for groundwater systems and based on aesthetic considerations such as corrosion and fouling of pumping, irrigation and stock watering systems) for primary industries
l. Concentrations of iron and manganese are filtered
m. Lamberts North pre-placement 90th percentile baseline data from October 2012 to August, 2013 and Wangcol Creek at WX22 as presented in Aurecon (2017).

5.6 Discussion

The surface water data from the reporting period is presented in Appendix B, where the results are compared to the surface water Environmental Goals. Figure 6A and Figure 6B in Appendix A summarise the surface water data from the reporting period.

For some specific analytes, concentrations at downstream monitoring location WX22 were generally higher than those reported at upstream monitoring locations LMP01 and NC01. Concentrations of EC, TDS, chloride, sulfate and nickel in surface water from WX22 were generally higher than in samples from the upstream monitoring locations. However, these results are not considered to be due to ash placement activities occurring at the LNAR. As reported in the Annual Environmental Monitoring Report – Water Management and Monitoring for the Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project (ERM, 2020) which focusses on the MPAR, the results are considered to be primarily related to BCA placement activities at the MPAR (refer to Section 6.6 for further details), with some contributions from conditions related to historical mining.

Higher concentrations for a range of analytes including TDS, EC, chloride, sulfate, filtered boron, copper and nickel were reported in the sample collected during the December 2020 sampling event at WX22 relative to the other results from the reporting period. However, the concentrations reported were an order of magnitude lower than previously reported highs, which typically peak in the summer period (i.e. December to February). Previous summer peaks observed in surface water at WX22 were considered to be related to greater contribution of groundwater during lower rainfall periods. However higher summer rainfall during this reporting period has likely resulted in less relative groundwater contribution to the surface water receiving environment. This, combined with higher surface water flows, is considered to be a driving factor behind lower summer peak concentrations recorded during the current reporting period.

Elevated concentrations of copper, barium, boron and iron in surface water from Wangcol Creek (WX22) during the 2020/21 reporting period are considered to be comparable to background surface water quality in the area, based on the surface water results from LMP01 and NC01 which are located upstream of the Ash Repositories.

5.7 Early Warning Assessment

A summary of the surface water analytical results (50th percentile) for the 2020/21 reporting period compared with the pre-placement 90th percentile in Wangcol Creek is presented in Table 6 and Figure 6B in Appendix A. This early warning assessment serves to provide an early indication of changes in surface water quality as part of contingency planning outlined in the OEMP.

Table 6 Surface Water Concentrations (50th Percentile) – 2020/21

Analyte/Location	Surface Water Concentrations (50th percentile) 2020/21			Wangcol Creek at WX22 Pre-placement 90th Percentile[a]
	WX22	NC01	LMP01	
pH	7.2	7.09	7.81	6.7-7.8
Conductivity (µS/cm)	484	225.5	373	894
TDS and Major Ions				
TDS (mg/L)	308	116.5	234	580
Sulfate (as SO_4) (mg/L)	99.3	39.7	78.3	332
Chloride (mg/L)	32	12	10	22
Fluoride (mg/L)	0.104	0.086	0.16	0.338
Trace Metals				
Arsenic (µg/L)	-	-	1	<1
Barium (µg/L)	12	27.5	23	29
Beryllium (µg/L)	-	-	-	<1
Boron (µg/L)	60	60	50	90
Cadmium (µg/L)	-	-	-	<1
Chromium (total) (µg/L)	-	**1**	-	<1
Copper (µg/L)	2	2	5	<1
Iron (µg/L)[b]	221	621	395	281
Iron (µg/L)[c]	110	160	54	281
Manganese (µg/L)[b]	131	130	86	720
Manganese (µg/L)[c]	126	116	43	720
Molybdenum (µg/L)	1	2	8	<1
Nickel (µg/L)	18	2.5	7	5
Lead (µg/L)	-	1	2	<1
Silver (µg/L)	-	-	-	-
Selenium (µg/L)	0.25	0.3	-	<1
Zinc (µg/L)	7	7	31	116

Notes

[a] Wangcol Creek at WX22 Pre-placement 90th percentile values for analytes (OEMP)

[b] Unfiltered concentration used for iron and manganese

[c] Filtered concentration used for iron and manganese

All metals concentrations presented are from unfiltered samples unless otherwise noted

Shaded cell indicates value is equal to or exceeds the adopted criterion (Wangcol Creek at WX22 Pre-placement 90th percentile)

***Bold** indicates result is 1 - <10 times the adopted criterion*

***Bold and italicised** indicates result is >10 times the adopted criterion*

For the 2020/21 reporting period, the 50th percentile concentrations of arsenic, copper, iron (unfiltered), molybdenum, nickel and lead at LMP01 were at or above the 90th percentile pre-placement levels. At upstream monitoring location NC01 the 50th percentile concentrations of chromium, copper, iron (unfiltered), molybdenum and lead were at or above the 90th percentile levels. At downstream monitoring location WX22, the 50th percentile concentrations for chloride, copper, molybdenum and nickel were above the 90th percentile pre-placement levels.

Elevated concentrations (above the 50th percentile for the 2020/21 period) of copper and molybdenum identified at WX22 were comparable to the concentrations at the upstream site, indicating that these exceedances are potentially due to upstream/background conditions, as noted in Section 6.6.

Concentrations of TDS, sulfate, chloride, manganese and nickel were higher in surface water from WX22 than from LMP01 and NC01 (Table 6).

Comparison of the 50th percentile results indicate a potential change in the surface water quality downstream of the Ash Repositories. This is the "early warning trigger"; however, these concentrations are considered to be unrelated to operations at the LNAR. As outlined in Section 4.6, the independent investigation is currently being undertaken in accordance with contingency measures outlined in the OEMP due to changes in water quality identified in relation to the MPAR (ERM, 2020).

5.7.1 Trend Analysis

A review of concentration trends in surface water with respect to key indicators including chloride, TDS, sulfate, selenium, molybdenum and nickel is presented below. These constituents were selected as they are considered to be indicators of potential changing conditions resulting from operations at the Ash Repositories, based on historic exceedances of Environmental Goals for surface water and/or trend analysis presented in previous annual monitoring reports. Surface water trend graphs for the period 2010 to the end of the current reporting period are presented in Appendix E.

5.7.1.1 Chloride

Chloride concentrations for all surface water monitoring locations were consistently below the Environmental Goal of 350 mg/L throughout the period 2010-2020. The pattern of chloride concentrations in surface water from WX22 during the 2020/21 reporting period appeared to be comparable with previous years, with the highest concentrations reported during the summer months. The higher concentrations are likely associated with lower stream flows, and increased influence of groundwater seepage during the summer months.

The highest concentration of chloride reported during this reporting period was in December 2020 (79 mg/L). Prior to that, the highest chloride concentrations recorded were in January 2020 (212 mg/L), February 2018 (164 mg/L) and February 2014 (130 mg/L).

Chloride concentrations at both LMP01 and NC01, upstream of the Ash Repositories and upstream of WX22, have remained relatively stable and low since 2010.

5.7.1.2 Nickel

Nickel concentrations at LMP01 and NC01 have been generally stable since monitoring commenced in 2012. These upstream monitoring locations have reported concentrations of nickel equal to the Environmental Goal for surface water in March 2014 (NC01 – 17 µg/L) and February 2020 (LMP01 - 17 µg/L); other concentrations at these locations were below the Environmental Goal. No concentration trend apparent in the data.

A maximum nickel concentration of 195 µg/L was reported in surface water at WX22 in January 2020. The highest nickel concentrations reported during this reporting period were lower than in several previous periods; however, the maximum concentration (47 µg/L in December, 2020) exceeded the Environmental Goal. Similar to chloride, the highest nickel concentrations at WX22 typically occurred during the summer, likely associated with periods of lower surface water flows. Nickel concentrations in surface water from WX22 exceeded the pre-placement trigger level (see Table 5) on numerous occasions during the 12 months of the current reporting period.

5.7.1.3 Sulfate

Sulfate concentrations at LMP01 and NC01 have remained relatively stable since 2010, consistently below the Environmental Goal for surface water.

The sulfate concentrations at WX22, downstream of the LNAR, were generally stable between 2010 and 2012, with fluctuations in sulfate concentrations occurring more frequently after this time.

Post 2012, sulfate concentrations at WX22 were equal to or above the Environmental Goal during the summer period in February 2014, February 2018, November 2019 and January 2020.

During this reporting period, the peak concentration was reported during the summer months (279 mg/L reported in December 2020), however the concentrations remained below the Environmental Goal (see Table 5), and were lower than the summer peaks recorded in previous reporting periods.

5.7.1.4 TDS

TDS concentrations in surface water at LMP01 and NC01 have remained relatively stable since 2010, consistently below the Environmental Goal.

At WX22, downstream of the LNAR, the TDS concentrations were generally stable between 2010 and 2012, with sporadic increases in TDS levels above the pre-placement levels observed after this time. Post 2012, the TDS concentrations at WX22 have reported above the Environmental Goal during the summer period in February 2014, February 2018, November 2019 and January 2020, consistent with the sulfate concentrations.

During this reporting period, TDS concentrations at WX22 were consistently below the Environmental Goal (see Table 5), and were lower than the summer peaks recorded in previous reporting periods.

5.7.1.5 Selenium

Since monitoring began at LMP01 selenium has been detected, with concentrations gradually increasing. A peak concentration of 1.4 µg/L was reported in November 2020; since that time selenium concentrations at LMP01 have declined to the lower values of the previously reported detectable range.

Sampling began in 2012 at NC01, and from July 2015 to December 2016, selenium concentrations were above the limit of reporting (LOR). The highest concentration recorded at NC01 (1.6 µg/L) occurred in March of this reporting period, exceeding the Wangcol creek WX22 pre-placement levels (see Table 5).

Concentrations of selenium were generally non-detectable in surface water between 2010 (with the exception of two detections in February 2010 and April 2011) at downstream location WX22. They were also consistently below the selenium concentrations in the upstream samples NC01 and LMP01. Detections of selenium were reported in samples from downstream location WX22 intermittently between July 2015 and April 2017 and then again from January 2020 until the end of this reporting period. Concentrations of selenium have remained in the lower end of the previously reported detectable range throughout the available dataset.

5.7.1.6 Molybdenum

Concentrations of molybdenum have remained below the Environmental Goal at surface water monitoring locations NC01 and WX22 since monitoring began. Molybdenum concentrations were generally higher at monitoring location LMP01 when compared to NC01 and WX22.. Concentrations of molybdenum at LMP01 were trending upwards since March 2019 until a peak was reached in July 2020 with a concentration of 23 µg/L. Since July 2020 concentrations of molybdenum at monitoring location LMP01 have been trending downwards.

A similar trend was observed at monitoring location NC01 with an increasing trend observed at this location from June 2019, until a peak was reached in February 2020 before concentrations began to decline. However, molybdenum concentrations at NC01 have remained consistently below the Environmental Goal at NCO1 since 2013.

Concentrations of molybdenum at downstream location WX22 have remained consistently below the Environmental Goal since March 2013 (see Table 5).

6. GROUNDWATER

6.1 Objectives

The objective of the groundwater monitoring program is to monitor the impacts of ash placement activities at the LNAR on local groundwater conditions.

6.2 Groundwater Monitoring Locations and Frequency

A summary of the groundwater monitoring site locations is presented in Table 7 and Figure 4.

Table 7 Groundwater Monitoring Network and Frequency

Bore ID	Location Description	Screened Material [1]	Frequency[2]	No. of Samples
MPGM4/D1	North and cross-hydraulic gradient from the LNAR approval area.	Mudstone, sandstone and coal	Quarterly	4
MPGM4/D8	Downgradient of LNAR approval area, north of and adjacent to Wangcol Creek.	Alluvial deposits	Quarterly	4
MPGM4/D9	Downgradient of LNAR approval area, south of and adjacent to Wangcol Creek.	Alluvial deposits	Quarterly	4
MPGM4/D10	Inside of LNAR approval area, south of the currently active ash placement area and east of LN Pond 2.	Fill beneath the ash	Quarterly	4
MPGM4/D11	Inside of LNAR approval area, adjacent to and downgradient from the MPAR and within the currently active LNAR ash placement area.	Fill beneath the ash	Quarterly	2
MPGM4/D15	Inside of LNAR approval area, south and cross-hydraulic gradient of the currently active LNAR ash placement area and south of multipurpose storage ponds Pond BWA – Pond BWC.	Sandstone and/or shale	Quarterly	3
MPGM4/D16	Within Centennial leased portion of the LNAR approval area, south and cross-hydraulic gradient of the currently active LNAR ash placement area, north of the Centennial coal reject emplacement areas.	Sandstone and/or shale	Quarterly	4
MPGM4/D17	Within Centennial leased portion of the LNAR approval area, south and cross-hydraulic gradient of the currently active LNAR ash placement area, north of the Centennial coal reject emplacement areas.	Sandstone and/or shale	Quarterly	4
MPGM4/D18	Inside of LNAR approval area, south and cross-hydraulic gradient of the currently active LNAR ash placement area.	Sandstone and/or shale	Quarterly	4
MPGM4/D19	Downgradient of LNAR approval area, adjacent DML Dam.	Fill (mine spoil)	Quarterly	4

1. ERM 2020

2. Frequency specified in the OEMP

Information provided by EnergyAustralia (email 10 September 2021) provided the following clarifications as to why some bores were not sampled as frequently as specified in the OEMP:

- Bore MPGM4/D15 was sampled three times instead of quarterly due to excavation works blocking access to the bore; and
- Bore MPGM4/D11 was only sampled twice before the bore was buried by ash and the November sampling event was not able to be carried out. The bore was not sampled in April 2021 as the top of the extended bore casing was too high to collect a sample at that time.

6.3 Groundwater Monitoring Methodology

Groundwater quality monitoring was undertaken by Nalco Water – Ecolab (Nalco) on behalf of EnergyAustralia. Details regarding the Nalco sampling method and QA/QC program are presented in Appendix J, and these are understood to be in accordance with the sampling methodology outlined in the OEMP.

6.4 Groundwater Quality Dataset

Groundwater samples were obtained for analysis in accordance with the following:

- pH - field measurement;
- EC - field measurement;
- TDS - laboratory analysis;
- Major and minor anions including chloride, sulfate (as SO_4), alkalinity and fluoride – laboratory analysis;
- Major and minor cations including calcium, magnesium, sodium and potassium - laboratory analysis; and
- Metals including Al, As, Ba, B, Cd, Cr (total), Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, V and Zn – laboratory analysis.

The trace metals in groundwater samples were measured on unfiltered samples, except for aluminium, arsenic, boron, copper, iron, manganese, nickel, vanadium and zinc where results from both filtered and unfiltered samples were obtained.

Evidence of the collection of field QC samples (i.e. rinsate, trip blanks or trip spikes) during the field based programs was not provided. Results of laboratory QC measures including laboratory duplicate, triplicate, internal duplicates, method blanks or spike data were not presented for review and are not considered in this report.

6.5 Groundwater Results

6.5.1 Groundwater Levels and Inferred Flow Direction

Water levels in each of the groundwater monitoring bores were relatively stable during the reporting period with the exception of groundwater levels reported at D11. Hydrographs of each of the groundwater monitoring bores are provided in Appendix D.

Based on the data provided by EnergyAustralia, depth to groundwater at bore D11 appeared to have increased by approximately 7 m during the reporting period. This would equate to a decreasing groundwater elevation of 913.4 m AHD in September 2020 to 906.3 m AHD in June 2021, which would not be expected. However, in November 2020, the bore was buried by ash and, in April 2021, the top of casing had been extended and was too high to collect a sample from the bore. The increase in depth to groundwater in this bore is therefore considered to be a result of the extended casing (which will need to be re-surveyed) rather than an actual decline in water level. Consequently, the June 2021 groundwater elevation reported for bore D11 is not considered further in this report.

The lowest groundwater elevations during the reporting period typically occurred in June 2021 (excluding bore D11), with less rainfall occurring in the months leading up to this than in the summer months. Groundwater levels in the monitored bores adjacent to and upgradient of the LNAR (i.e. D10 and D11) remained below the base of ash placement in the LNAR (917m AHD).

As discussed in Section 3.3 and presented Appendix A (Figures 5A to 5D), groundwater elevation contours indicate a groundwater flow direction towards the east and north-east. The groundwater elevations and flow directions have remained relatively consistent throughout the period based on groundwater contour plans prepared for each season, and are consistent with previous reporting years.

6.5.2 Groundwater Analytical Results Summary

A summary of the groundwater analytical results obtained for the 2020/21 reporting period is presented in Table 8. Tabulated results along with summary statistics for each monitoring point (minimum, maximum, 50th percentile and 90th percentile) are presented in Appendix C and results are shown on Figures 7A to Figure 7D in Appendix A.

Table 8 Summary of Groundwater Concentrations - 2020/21 Reporting Period

Analyte/Location	Groundwater Concentration Range				Screening Criteria	
	South/ Cross-Gradient[1]	Up-gradient /Adjacent to MPAR[2]	At boundary of LNAR[3]	Down-gradient /Adjacent to Wangcol Creek[4]	Groundwater Collection Basin Pre-Ash Placement 90th Percentile[a]	Groundwater Environmental Goal[a b,c,e]
pH	**5 –** 6.74	**5.98 – 6.32**	**5.84 – 6.08**	**5.49 – 6.15**	-	6.5 – 8.0[a]
Conductivity (µS/cm)	670 – **3,520**	**4,000 – 9,860**	**3,930 – 9,920**	211 – **10,330**	1,576	2,600[a]
TDS (mg/L)	378 – **2,870**	**2,970 – 8,620**	**3080 – 9,360**	194 – **9,410**	1,306	1,500[a]
Sulfate (as SO_4) (mg/L)	7.42 – **1,680**	673 **– 1,780**	997 **– 4,790**	94.3 – **5,140**	824	1,000[a]
Chloride (mg/L)	7.53 - 228	230 - **929**	132 – **1,120**	4.73 – **1,390**	31.5	350[a]
Arsenic (µg/L)	**<1 - 14**	**2 - 8**	**<1 - 7**	**<1 - 8**	1	24[b]
Silver (µg/L)	**<1**	**<1**	**<1**	**<1**	<1	0.05[b]
Barium (µg/L)	8 - 670	16 - 94	11 - 37	27 - 52	37	700[f]
Boron (µg/L)	50 - 210	**1,020 – 2,990**	**1,530 – 2,750**	<50 – **1,710**	244	370[b]
Cadmium (µg/L)	0.2 – 0.5	<0.1 – 0.9	<0.1 – 0.1	<0.1 – 0.2	2	2[d,e]
Chromium (total) (µg/L)	<1 - **126**	**<10**	<1 - **32**	<1 - 1	1	5[d]
Copper (µg/L)	1 - **11**	<1 - 1	<1 - **5**	<1 - **8**	1	5[a]
Fluoride (mg/L)	0.063 – 3.04	0.435 – 0.643	0.453 – 0.75	<0.02 – 3.24	0.435	1.5[d]
Iron (µg/L)	200 – **27,700**	**12,000 – 102,000**	**10,900 – 48,700**	219 – **67,700**	664	664[e]
Mercury (µg/L)	<0.04 – **0.06**	<0.04	<0.04	<0.04-**0.74**	<0.1	0.06[c]
Manganese (µg/L)	48 - 2650	2940 – **14,200**	5010 **– 23,800**	87 – **18,900**	5,704	5,704[e]
Molybdenum (µg/L)	<1 - 7	2 - 17	<1 - 1	<1 - 2	1	10[a]

Analyte/Location	Groundwater Concentration Range				Screening Criteria	
	South/ Cross-Gradient[1]	**Up-gradient /Adjacent to MPAR[2]**	**At boundary of LNAR[3]**	**Down-gradient /Adjacent to Wangcol Creek[4]**	**Groundwater Collection Basin Pre-Ash Placement 90th Percentile[a]**	**Groundwater Environmental Goal[a b,c,e]**
Nickel (µg/L)	3 - **802**	367 - **879**	424 – **2,040**	28 – **1,740**	550.9	550.9[e]
Lead (µg/L)	<1 - **6**	<1 - **32**	<1 - **10**	<1 - **10**	1	5[f]
Selenium (µg/L)	<0.2 - 1	0.3 – 0.8	<0.2 – 0.7	<0.2 – 0.7	2	5[c]
Zinc (µg/L)	<5 – **1,300**	23 - 621	159 - 260	36 - 589	908	908[e]

Notes:

1. Monitoring bores south and cross-gradient of ash repository: MPGM4/D15, MPGM4/D16, MPGM4/D17, MPGM4/D18
2. Monitoring bores adjacent to the MPAR and up-gradient of the LNAR: MPGM4/D10 and MPGM4/D11.
3. Monitoring bores at boundary of the LNAR MPGM4/D1 and MPGM4/D19.
4. Monitoring bores adjacent to Wangcol Creek MPGM4/D8 (north of Wangcol Creek) and MPGM4/D9 (south of Wangcol Creek).

Shaded and bold cells indicate values are equal to or exceed the Groundwater Environmental Goals.
a Criteria from OEMP.
b OEMP Criteria - ANZECC (2000) 95% Level of species protection for freshwater aquatic ecosystems.
c OEMP Criteria - ANZECC (2000) 99% Level of species protection for freshwater aquatic ecosystems.
d OEMP Criteria - NHMRC (2011) Australian Drinking Water Guidelines.
e OEMP Criteria - adopted from Groundwater Collection Basin Pre-Ash Placement 90th Percentile.
f OEMP Criteria - NHMRC (2008) Guidelines for Managing Risks in Recreational Waters.
g Lamberts North pre-placement 90th Percentile baseline data from October 2012 to August, 2013 and Neubecks Creek (now referred to as Wangcol Creek) at WX22 (Aurecon, 2017).

6.6 Discussion

The following subsections provide a discussion of the groundwater results in each of the monitored areas. Results are presented in Table 7, Appendix C and Appendix A.

6.6.1 Bores South/Cross Gradient of the LNAR

Groundwater from bores D15, D16, and D17 in the southern portion of the LNAR approval area recorded pH values that were more acidic than the Environmental Goal. Sulfate, EC and TDS concentrations in groundwater from bores D15 and D16 also exceeded the Environmental Goals. Concentrations of some metals (chromium, copper, iron, lead, nickel, and zinc) in groundwater from bore D15, located to the south-west of the LNAR exceeded the Environmental Goals on occasion during the reporting period. Intermittent exceedances of the Environmental Goals for fluoride, chromium, iron and mercury were also reported in groundwater from bore D18, and for chromium and iron from bore D16 and D17.

Concentrations of analytes including sulfate, chloride and metals were typically lower in groundwater from D18 when compared to D15, D16 and D17. Groundwater elevations in bore D18 were also more variable than in nearby bores, with more rapid responses to rainfall. Due to rapid response to rainfall and variable and low concentrations of analytes, it is possible the integrity of bore D18 may have been compromised, allowing fresh water to enter the borehole from the surface or may be directly connected through an underlying mine void or fill to infiltrating surface water. Consequently, water quality in bore D18 is not considered to be representative of groundwater quality in the area.

The Environmental Goal exceedances in this area are considered unlikely to be a result of activities at the LNAR based on the inferred direction of groundwater flow (Appendix A, Figure 5A to Figure 5D).

6.6.2 Bores Upgradient / Adjacent to LNAR

Bores D10 and D11 are located upgradient of the LNAR, and immediately downgradient of the MPAR. Concentrations of EC and TDS in groundwater from these bores were above the Environmental Goals throughout the reporting period. Similarly, concentrations of anions including chloride, sulfate, and metals including boron, iron, lead, nickel, and manganese in groundwater from at least one of these bores were at or above the Environmental Goals during the reporting period.

Concentrations of nickel, zinc, iron, TDS and sulfate in groundwater from bores D10 and D11 were above the Environmental Goals. Based on the location of the bores and groundwater flow directions, they are not considered to be related to ash placement activities at the LNAR.

Exceedances of the Environmental Goals for chloride, boron, manganese, nickel and lead are considered to be unrelated to either background groundwater conditions in the region or to potential impacts resulting from activities at the LNAR, due to their position being upgradient. These groundwater conditions are currently subject to review and management as part of the independent investigation. Further discussion related to the early warning assessment are discussed in Section 6.7.

In general the pH of groundwater in bores D10 and D11 is more acidic than the Environmental Goals. This is typical of the monitoring bores in the area and is considered to represent background groundwater conditions.

6.6.3 Bores Downgradient / Adjacent to the LNAR

Concentrations of boron, iron, sulfate (except for one sample from bore D1 collected in November 2020) and levels of EC and TDS (D1 and D19) and chloride (except for one sample collected from bore D1 in November 2020), manganese, and nickel (bore D1) consistently exceeded the Environmental Goals in groundwater from bores located to the north-east and east of the LNAR.

Chromium, copper and lead intermittently exceeded the groundwater Environmental Goals in groundwater collected from bore D19.

The elevated detections of these constituents are also elevated relative to concentrations in bores to the south/across gradient of the LNAR, and are considered to be reflective of the same groundwater conditions reported at D10 and D11 (i.e. upgradient relative to groundwater flow direction). It is therefore considered that these elevated concentrations are not a result of activities at LNAR, rather they are likely to be related to the groundwater conditions observed upgradient of the LNAR. These groundwater conditions are currently subject to review and management as part of the independent investigation. Further discussion related to the early warning assessment are discussed in Section 6.7.

6.6.4 Bores Adjacent to Wangcol Creek

During the reporting period, EC and TDS values, sulfate, chloride, boron, iron, manganese, and nickel concentrations in groundwater from bore D9, and low pH values in groundwater from bores D8 and D9 exceeded the Environmental Goals. Concentrations of fluoride, copper and lead at D9 and iron at D8 intermittently exceeded the Environmental Goals during the reporting period. Of these, low pH levels, iron and manganese concentrations are considered to be associated with background conditions.

EC and TDS values from D9 reported the highest concentrations compared to historical records during this reporting period.

Elevated concentrations of EC, TDS, sulfate, chloride, boron, manganese, and nickel that exceeded Environmental Goals were identified in groundwater from D9 (south side of Wangcol Creek). The same analytes did not exceed Environment Goals in groundwater from D8, to the north of Wangcol Creek.

Elevated EC, TDS and sulfate, chloride, boron, iron, manganese, and nickel concentrations were identified in groundwater from D9 in several sampling events, these are considered to be unrelated to groundwater quality from the LNAR. They are subject to review and management as part of an independent investigation. Further discussion related to the early warning assessment are discussed in Section 6.7.

6.7 Early Warning Assessment

A summary of the groundwater analytical results (50th percentile) for the 2020/21 reporting period compared with the adopted GCB Pre-Ash Placement 90th Percentile is presented in Table 9, Figure 7 series in Appendix A, and in Appendix C. This assessment serves to provide an early indication of changes in groundwater quality.

Table 9 Groundwater Concentrations (50th Percentile) - 2020/21

Analyte/Location	Groundwater Concentration (mg/L) - 50th percentile (2020 – 2021)										Groundwater Collection Basin Pre-Ash Placement 90th Percentile (mg/L)[a]
	South/Cross Gradient				Up-gradient/Adjacent to Ash Repository		Adjacent to Repository		Down-gradient		
	D15	D16	D17	D18	D10	D11	D1	D19	D8	D9	
pH	5.11	6.3	6.10	6.7	6.05	6.29	5.90	6.04	5.56	6.09	-
Conductivity (µS/cm)	**3,220**	**2,100**	**3,265**	670	**4,690**	**9,575**	**9,550**	**4,130**	416	**9,260**	1,576
TDS (mg/L)	**2,660**	**1,755**	**2,760**	391	**3,575**	**8,410**	**8,665**	**3,165**	304.5	**8,585**	1,306
Sulfate (as SO_4) (mg/L)	460	**866.5**	**1,465**	10.6	**1,985**	**4,295**	**4,510**	**1,795**	146	**4,435**	824
Chloride (mg/L)	**145**	**107**	**188**	8.39	***321***	***923***	***1,090***	**259**	18.85	***1,170***	31.5
Fluoride (mg/L)	-	0.15	0.37	**0.48**	**0.55**	**0.44**	**0.80**	**0.45**	0.04	**1.64**	0.44
Arsenic (µg/L)	**7**	**-**	**1**	**4**	**3**	**4.5**	**6.0**	**3**	**-**	**3.5**	1
Barium (µg/L)	19	9.5	12	**630**	19	**75**	27.5	15.5	**37.5**	33	37
Boron (µg/L)	190	60	115	80	**1,215**	***2,625***	***2,625***	**1,635**	90	**1,635**	244
Cadmium (µg/L)	0.4	-	-	0.2	0.1	-	-	0.1	-	0.15	2
Chromium (total) (µg/L)	**2**	**6**	**-**	**-**	**8**	**-**	**-**	**6**	**-**	**1**	1
Copper (µg/L)	**6**	**-**	**-**	**1.5**	**1**	**-**	**1.0**	**3**	**3**	**7.5**	1
Iron (µg/L)	***23,700***	**3,360**	***24,800***	299	***15,600***	***102,000***	***5,2300***	***17,200***	420	***65,300***	664
Mercury (µg/L)	-	-	-	**0.06**	**-**	**-**	**-**	**-**	**-**	**0.7**	<0.1
Manganese (µg/L)	1,675	71	2,580	78	3,040	**14,200**	**23,000**	5,050	299	**18,100**	5,704
Molybdenum (µg/L)	**5**	**-**	**-**	**5.5**	**4**	**9**	**-**	**1**	**2**	-	1
Nickel (µg/L)	**712**	20	65.5	4.5	**409.5**	**859**	**1,915**	**440**	43	**1,450**	356

Analyte/Location	Groundwater Concentration (mg/L) - 50th percentile (2020 – 2021)										Groundwater Collection Basin Pre-Ash Placement 90th Percentile (mg/L)[a]
	South/Cross Gradient				Up-gradient/Adjacent to Ash Repository		Adjacent to Repository		Down-gradient		
Lead (µg/L)	**6**	**-**	**-**	**-**	**7.5**	**-**	**-**	**8**	**-**	**8**	1
Selenium (µg/L)	0.7	-	-	0.5	0.5	0.4	0.4	0.35	-	0.55	2
Silver (µg/L)	-	-	-	-	-	-	-	-	-	-	1
Zinc (µg/L)	**1,210**	9	72	27.5	345	25.5	175.5	231	56	169.5	908

a Groundwater Collection Basin Pre-Ash Placement 90th Percentile from Aurecon (2017)
b Filtered iron results reported
Shaded cells value equals or exceeds the trigger level
Bold indicates result equals exceeds the Pre-Ash Placement 90th Percentile level by 1 to 10 times.
Bold, italicised and shaded indicates result exceeds the Pre-Ash Placement 90th Percentile level by > 10 times.

Groundwater from bores D15, D16 and D17 to the south and cross-hydraulic gradient of the LNAR, reported 50th percentile levels of EC and TDS and concentrations of sulfate, chloride, arsenic, chromium (total), copper, iron, molybdenum, nickel, lead and zinc from the 2020/21 reporting period that exceeded the pre-placement trigger levels. Groundwater from bore D15 reported higher 50th percentile concentrations than those reported at D16 and D17. Based on the locations of these bores relative to the LNAR, the concentrations of these analytes in groundwater are not considered to be related to the LNAR.

Bores (D10, D11) located up gradient and adjacent to the LNAR show a clear difference in the groundwater quality relative to groundwater monitoring bores located to the south/cross gradient of the LNAR. These monitoring bores are located down gradient of the MPAR, and between the Ash Repositories. Groundwater from bores in this area showed elevations in the 50th percentile concentrations for EC, TDS, sulfate, chloride, fluoride (minor changes noted), barium (minor changes noted in D11 only), boron, iron (in D11 only), manganese (in D11 only), molybdenum (minor change in D11 only), nickel (however concentrations were comparable to bore D15), and lead relative to the south/cross gradient bores. These increased concentrations indicate a change in groundwater quality has occurred in groundwater bores monitoring areas downgradient of the MPAR. Based on the location of these bores up gradient of the LNAR, and on the analytes that exceeded the 50th percentile levels, the concentrations of these analytes in groundwater are not considered to be related to the LNAR.

Bores D15, D16 and D17 to the south and cross-hydraulic gradient of the LNAR, reported 50th percentile levels of EC and TDS and concentrations of sulfate, chloride, arsenic, chromium (total), copper, iron, molybdenum, nickel, lead and zinc from the 2012/21 reporting period that exceeded the pre-placement trigger levels. Bore D15 reported higher 50th percentile concentrations than those reported at D16 and D17. Based on the location of these bores relative to the LNAR, the concentrations of these analytes in groundwater are not considered to be related to the LNAR. Bores D1 and D19, located adjacent to the LNAR recorded 50th percentile concentrations for EC, TDS, sulfate, chloride, fluoride, arsenic, boron, iron, manganese (D1 only) and nickel that exceeded the 90th percentile pre-placement levels. D1 is located to the north of the LNAR while D19 is located to the east of the LNAR. The concentrations of these analytes are not considered to be related primarily to the LNAR, since they were comparable to the concentrations of these analytes in groundwater from bores D10 and D11, which are upgradient of the LNAR.

50th percentile results for the 2020/21 reporting period for EC, TDS, sulfate, chloride, fluoride, arsenic, boron, chromium, copper, iron, mercury, manganese, nickel and lead in groundwater from bore D9 (and in some instances, D8) and barium and molybdenum in groundwater from bore D8 only exceeded the 90th percentile pre-placement levels. Elevated levels of EC, TDS and concentrations of sulfate, chloride, arsenic, boron, iron, manganese, nickel and lead in groundwater from these bores are considered to be associated with groundwater quality upgradient and cross gradient to the LNAR. As in other areas where groundwater concentrations exceeded the trigger levels and the exceedances are not considered to be related to background concentrations, the concentrations of these analytes in groundwater are not considered to be related primarily to the LNAR. Groundwater conditions in this area (adjacent to Wangcol Creek) are being evaluated as part of the independent investigation.

6.7.1 Trend Analysis

A review of concentration trends in groundwater with respect to key indicators including EC, TDS, sulfate, chloride, boron, iron, nickel and manganese is presented below. These indicators were selected based on their exceedances of Environmental Goals, the potential increase in concentration observed downgradient of the LNAR and/or trend analysis presented in previous annual monitoring reports. Graphs are provided for select bores from the areas south/cross gradient of the ash repository (D15), adjacent to Mt Piper and up-gradient of LNAR (D11), and south of Wangcol Creek (D9). Graphs are presented in Appendix F.

6.7.1.1 Electrical Conductivity

EC levels in D11, to the east and up gradient of the LNAR, increased between September 2013 and November 2018, although they have generally been stable since that time. They remained above the Environmental Goal during the 2020/21 reporting period.

To the south of the LNAR, EC in groundwater from bore D15 has varied over time and remains above the Environmental Goal. It is noted that, in September 2017, EC values in groundwater from D15 reached a maximum; they have since marginally declined, continuing this trend during the 2020/21 reporting period. EC concentrations in groundwater from this bore remained above the Environmental Goals.

An increasing trend in EC in groundwater from bore D9, located north of LNAR, was noted in November 2017 and has continued an upward trend since. There was some fluctuation in concentrations during this reporting period; however, EC concentrations in groundwater from this bore exceeded the historical high and remained above the Environmental Goal throughout this reporting period.

6.7.1.2 TDS

A generally increasing trend in TDS concentrations was noted in groundwater from bore D11 since September 2013. TDS concentrations have generally been more variable, not increasing, in groundwater from D11 since March 2016.

TDS concentrations in groundwater from D15 and D9 increased slightly until July 2018. Beyond July 2018 concentrations in groundwater from bore D15 have remained stable whereas those in groundwater from bore D9 have increased, reaching the highest reported concentration in February 2020. TDS concentrations at D9 have since fluctuated, but did not exceed the February 2020 peak. TDS concentrations in groundwater from bore D15 began to decline in January 2020, whilst remaining within historical range.

A peak in TDS concentrations at bore D15 occurred in August 2019. This peak appears anomalous although it was comparable with peaks identified for boron, chloride, sulfate and manganese from the same monitoring event. Since August 2019, the overall trend for TDS in groundwater from bore D15 appears to be generally stable, and concentrations have been consistent with the historical dataset.

6.7.1.3 Sulfate

An increase in sulfate concentrations was noted in groundwater from D11 in November 2013, with an increasing trend continuing until June 2017. Since then concentrations have fluctuated but have remained relatively stable; however, they continue to exceed Environmental Goals.

Consistent with the EC and TDS trends, sulfate concentration trends have been increasing in bore D9 since July 2018. This trend has continued through the current reporting period with the highest reported concentration recorded in June 2021.

An increasing sulfate trend was apparent at bore D15 throughout 2017; however concentrations have stabilised since that time. A peak in sulfate concentrations at bore D15 occurred in August 2019. This peak appears anomalous although it was comparable with peaks identified for boron, chloride, TDS and manganese from the same monitoring event. Since August 2019, the overall trend for sulfate at D15 has been stable or potentially decreasing. However, concentrations have remained consistent with the historical dataset.

6.7.1.4 Chloride

There is a generally increasing trend in chloride concentrations in groundwater from bore D11, particularly from the end of October 2013, when they increased above the Environmental Goals. Concentrations of chloride in groundwater from this bore appear to have stabilised since 2018 and this has continued during the 2020/21 reporting period.

To the south of the LNAR, chloride concentrations in groundwater from bore D15 increased in 2017, but have subsequently declined. A peak in chloride concentrations at bore D15 occurred in August 2019; however, this peak appears anomalous and is comparable with peaks identified for boron, sulfate, TDS and manganese from the same monitoring event. Since August 2019, the overall trend for chloride at D15 is generally stable and concentrations remained consistent with the historical dataset. With the exception of the August 2019 value, chloride concentrations in groundwater from D15 have remained below the Environmental Goals.

Chloride concentrations in groundwater from bore D9 were generally stable from November 2013 to May 2018. However, since then, chloride concentrations have generally increased, reaching a maximum in June 2021. As such, chloride concentrations in groundwater from this bore continue to show an upward trend and have been above the Environmental Goal for groundwater since December 2018.

6.7.1.5 Boron

Increasing boron concentrations were noted in groundwater from bore D11 from November 2013 to December 2015. Since 2015 boron concentrations have fluctuated within a generally stable range, with a decline in concentrations from the June 2021 monitoring event. Concentrations have remained above the Environmental Goal.

Boron concentrations are lower in groundwater from D9 than in D11; however concentrations of boron at D9 have increased since December 2016 until January 2019 where they appear to have stabilised. Concentrations of boron in groundwater from D9 remain above the Environmental Goal.

To the south of the LNAR, boron concentrations in groundwater from bore D15 have been variable over time, with concentrations at times being reported above the pre-placement trigger value and, less frequently, above the Environmental Goal. Concentrations of boron at D15 have generally declined since the end of 2017; however, a peak occurred in August 2019. This peak appears anomalous although it was comparable with peaks identified for chloride, sulfate, TDS and manganese from the same monitoring event. Concentrations of boron in groundwater from bore D15 (with the exception of August 2019) have been below the Environmental Goal since November 2017.

6.7.1.6 Iron

An increasing trend in iron concentrations in groundwater from bore D11 was noted from November 2013 to mid-2015. Since then, concentrations have been highly variable, although they appear to have stabilised.

Concentrations of iron in groundwater from bores D9 and D15 were variable, although increasing trends were present from 2013 to approximately 2015/16. Iron concentrations in groundwater from bore D15 increased from August 2017 to December 2018 and have since remained stable or declined slightly to the end of the reporting period. Iron concentrations in groundwater from bore D9 rose steadily from August 2017 to mid-2019 and have been fluctuating across a wide range of concentrations since then.

6.7.1.7 Manganese

Manganese concentrations in groundwater from bores D11 and D9 have been generally increasing from at least 2010 to the start of this reporting period. The rate of increase in manganese concentrations at D11 stabilised after approximately January 2015, and concentrations decreased during the current reporting period. Manganese concentrations in groundwater from bore D9 increased, reaching a peak in May 2019. Since then concentrations have been variable but have generally followed a downward trend to the end of this reporting period. Manganese concentrations in groundwater from both D9 and D11 exceeded the Environmental Goal.

Manganese concentrations in groundwater from D15 have remained generally stable and below the Environmental Goal. An anomalous manganese concentration was reported in bore D15 during August 2019, and this reported peak was comparable with those identified for boron, chloride, TDS and sulfate. During the 2020/21 reporting period a decreasing trend is apparent but concentrations have remained within historical limits.

6.7.1.8 Nickel

Nickel concentrations in groundwater from bore D15 have fluctuated above and, at times below, the Environmental Goal since monitoring commenced in 2012. However, since October 2017 nickel concentrations have remained above the Environmental Goal. During the 2020/21 reporting period concentrations remained within historical ranges however a decreasing trend is evident with the lowest concentration recorded in June 2021 since September 2017.

Nickel concentrations in D9 increased from 2010 to the beginning of 2014. Nickel concentrations were generally stable from 2014 to mid-2017, after which concentrations have overall increased and, in the 2020/21 reporting period, remained in the high end of the previously reported concentration range.

Nickel concentrations in groundwater from bore D11 increased from late 2012 to the end of 2017. Concentrations have stabilised since 2018.

7. CONCLUSION

Based on the review of the surface water and groundwater quality data at the LNAR for the 2020/21 reporting period, the following conclusions can be made:

- Several exceedances of the adopted Environmental Goals (as set out in the OEMP) for surface water and groundwater were recorded during the reporting period. Given historical reporting and trend analysis these exceedances are unlikely to be related to ash placement activities at LNAR.
- In surface water samples collected at locations described in the OEMP, sporadic exceedances of the Environmental Goals for surface water were identified at LMP01 and NC01, which are located upstream of the Ash Repositories. Based on the position of the LNAR relative to these surface water monitoring locations, activities at the LNAR are not considered to have contributed to exceedances at these locations;

  Surface water monitoring location WX22 more consistently reported concentrations of select target analytes above the Environmental Goals for surface water, and generally the concentrations of analytes reported were higher in samples collected from this sampling location compared to those from surface water sampling locations located further upstream. The reported water quality results are unlikely to be related to the LNAR, and are being assessed as part of the independent investigation;
- Concentrations of several analytes in groundwater from multiple bores, including bore D9 located towards Wangcol Creek, exceeded Environmental Goals for groundwater. Groundwater from bore D9 in particular was characterised by increasing concentrations of chloride and sulfate during the reporting period. These concentrations are unlikely to be related to the LNAR based on reported groundwater conditions across the monitoring network; and
- It is noted that the reported groundwater levels have generally remained below the maximum predicted groundwater level (912.0 m AHD) from CDM Smith (2013) with the exception of D10 and D15, and all bores have remained below the base of LNAR ash placement (917 m AHD) at the LNAR.

While the exceedances of the Environmental Goals noted in this report are considered to be predominately unrelated to the LNAR, in accordance with the contingency planning measures outlined in the OEMP, a separate and broader independent investigation into surface and groundwater impacts in the vicinity of the Ash Repositories is well progressed.

The OEMP and the associated monitoring and reporting requirements will be revised following completion of the independent investigation to reflect the key findings and further contingency measures if recommended. A summary of the Project Approval and OEMP requirements pertaining to water quality monitoring and reporting, and how each item is addressed is provided in Appendix I.

8. REFERENCES

Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) National Water Quality Management Strategy. Paper No. 4. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1: The Guidelines (Chapter 1-7).

Aurecon, 2009. Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Water Management Plan – Water Quality Monitoring Update Report 2008 to January 2009, revision 2, Final, 10 July 2009.

Aurecon, 2017. Lamberts North Water Conditioned Fly Ash Placement Water Quality Monitoring, Annual Update Report 2016/17, Revision 3, 21 November 2017.

CDM Smith, 2012, Delta Electricity, Lamberts North Ash Placement Project Plan, Construction Environmental Management Plan (CEMP), 10 December 2012.

EnergyAustralia NSW Pty Ltd (EnergyAustralia) (2019), Lamberts North Ash Placement Project – Operational Environmental Management Plan (the LNAR OEMP), Revision 5, 2 September 2019.

ERM, 2019. Lamberts North Ash Placement Water Quality Monitoring, Annual Water Quality Monitoring Report 2018/2019. Final Version 01 November 2019.

ERM, 2020. Lamberts North Ash Placement Water Quality Monitoring, Annual Water Quality Monitoring Report 2019/2020. Final Version 09 November 2020.

ERM, 2021. Mt Piper Brine Conditioned Fly Ash Co-placement Project, Annual Environmental Monitoring Report 2020/21 (the AEMR), EnergyAustralia NSW Pty Ltd, Final September 2020.

National Health and Medical Research Council (NHMRC) (2008). Guidelines for Managing Risks in Recreational Waters (ADWG).

National Health and Medical Research Council (NHMRC) (2011). Australian Drinking Water Guidelines 6 (ADWG), revised August 2018.

NSW Department of Planning, 2012. Project Approval S09/0186.

NSW Department of Primary Industries, Office of Water, Statement of Conditions, Water Access Licence (WAL) No. 27428, Reference Number 10AL116411. Statement of Conditions (as at 28 February 2018).

NSW Department of Primary Industries, Office of Water, Statement of Approval, Approval Number. 10CA11220 (as at 28 February 2018).

SKM, 2009. Mt Piper Power Station Ash Placement Project, Project Application and Preliminary Environmental Assessment, September 2009.

SKM, 2010. Mt Piper Power Station, Ash Placement Project, Appendix D, Hydrology and Water Quality. August 2010.

SKM, 2010, Mt Piper Power Station Ash Placement Project Environmental Assessment, August 2010.

SKM, 2011, Mt Piper Power Station Ash Placement Project Submissions Report, March 2011.

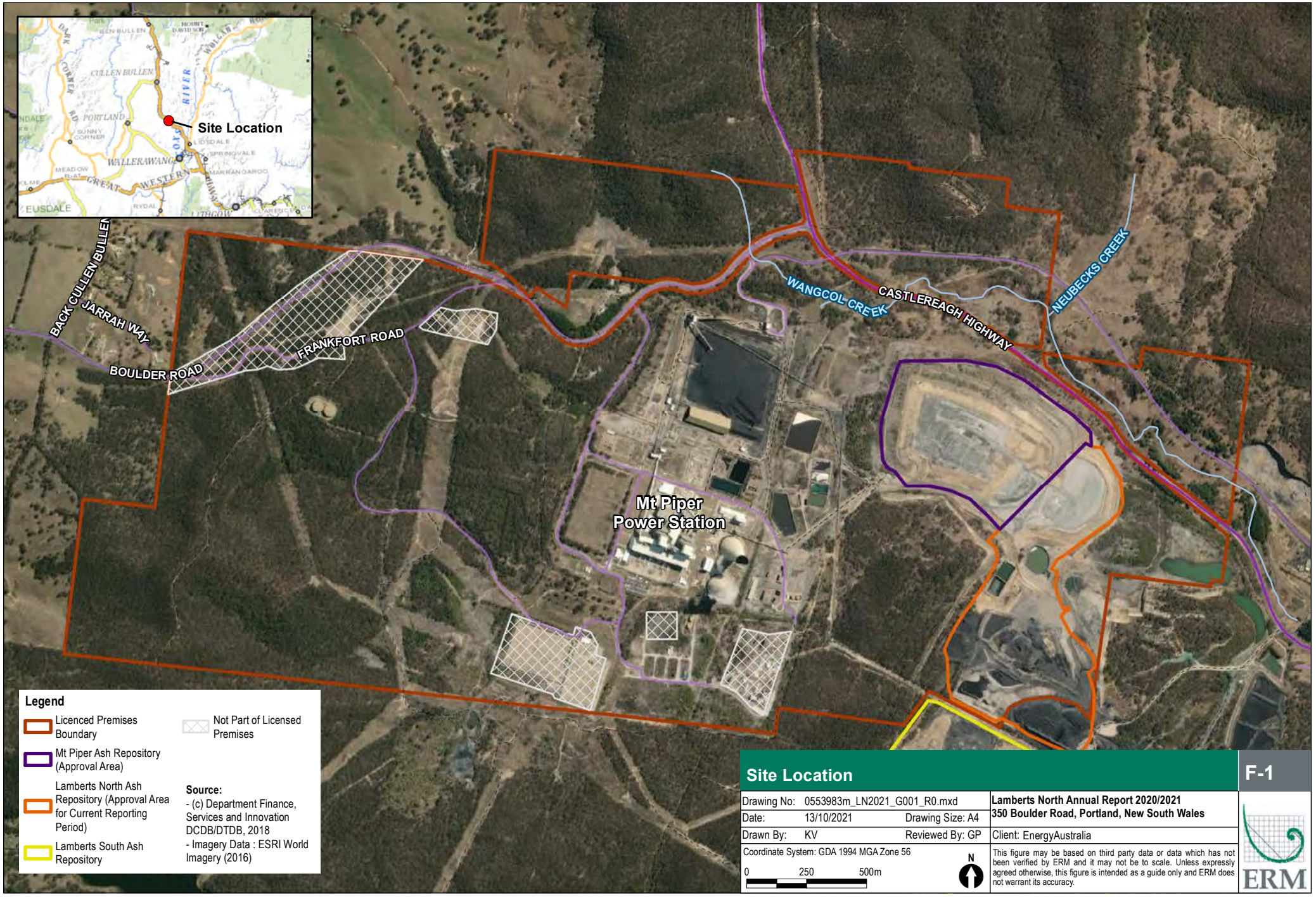
WaterNSW, 2020. Warragamba Catchment, https://www.waternsw.com.au/water-quality/catchment/sub-catchment/warragamba. Accessed last 15 October 2020.

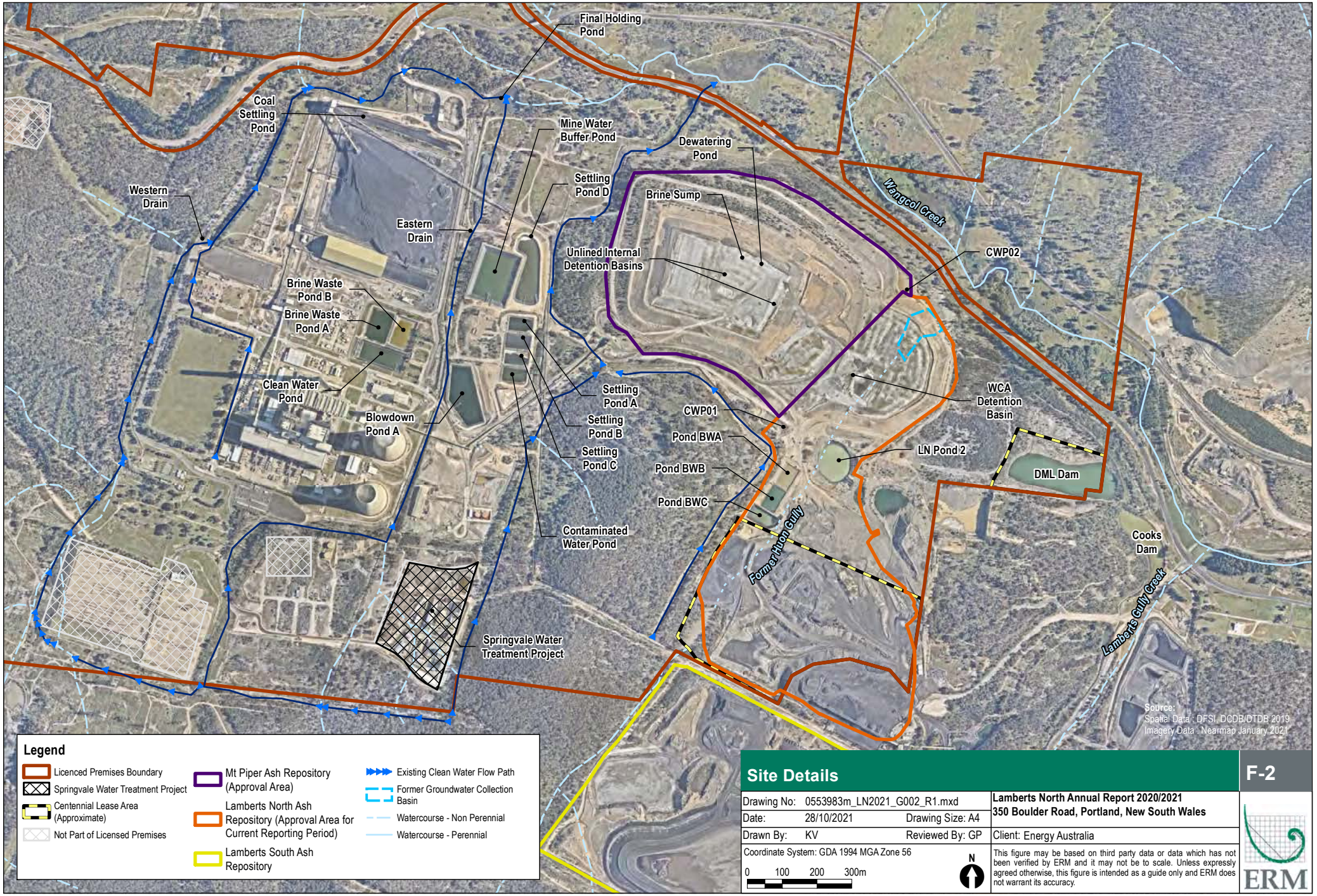
9. STATEMENT OF LIMITATIONS

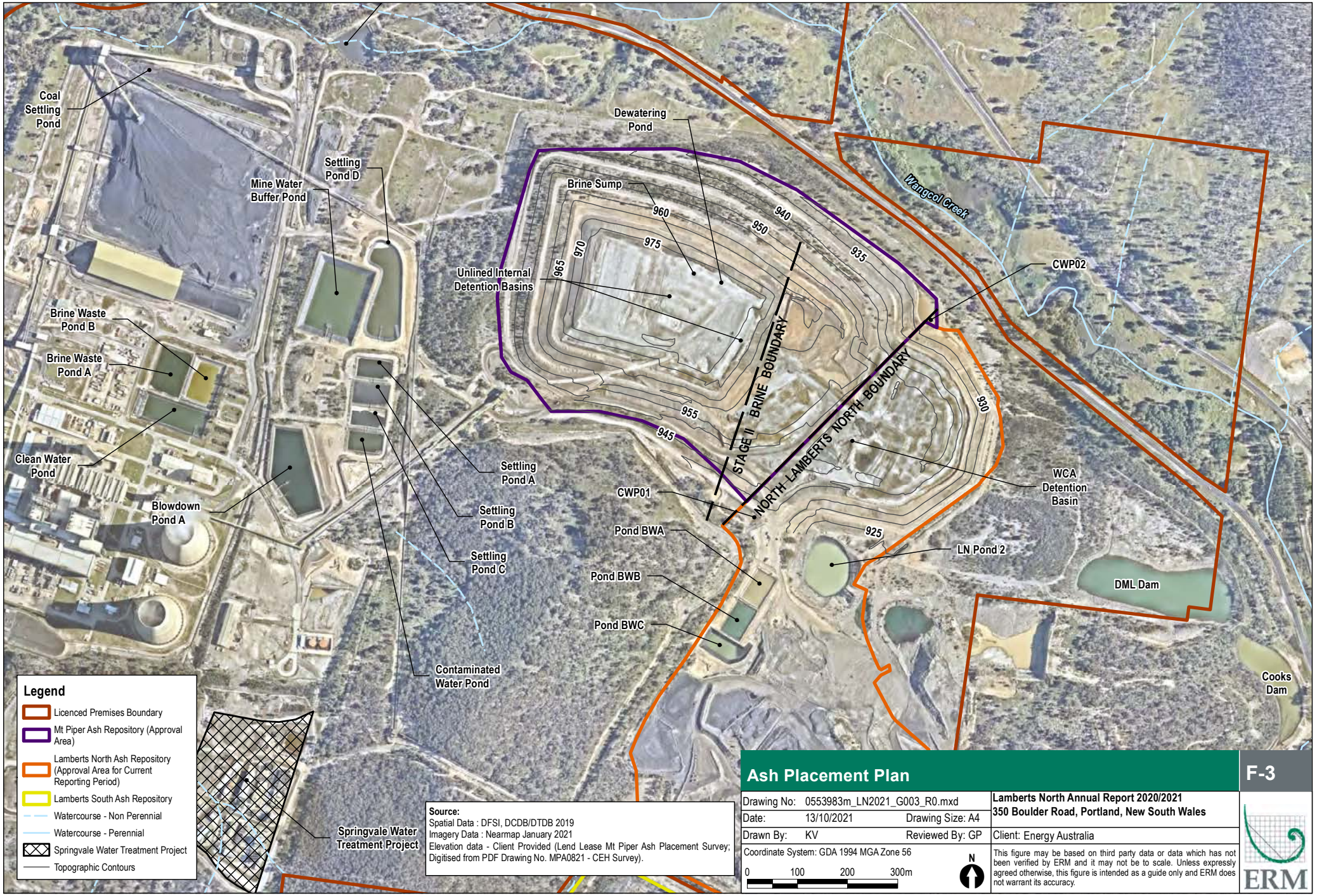
1. This report is based solely on the scope of work described in our proposal P0533074 dated 20/3/20 and confirmed via email on 24/4/20 (Scope of Work) and performed by Environmental Resources Management Australia Pty Ltd (ERM) for EnergyAustralia NSW Pty Ltd (the Client). The Scope of Work was governed by a contract between ERM and the Client (Contract).
2. No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.
3. The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.
4. This report was prepared between 2 August 2021 and 22 November 2021 is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.
5. Unless this report expressly states to the contrary, ERM's Scope of Work was limited strictly to identifying typical environmental conditions associated with the subject site(s) and does not evaluate the condition of any structure on the subject site nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials or any identified impacted soil or groundwater on the site(s) should not be interpreted as a guarantee that such materials or impacts do not exist.
6. This report is based on one or more site inspections conducted by ERM personnel, the sampling and analyses described in the report, and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:
    a. did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;
    b. assumes no responsibility or liability for errors in data obtained from,
    c. the Client, any third parties or external sources (including regulatory agencies).
7. Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.
8. Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:
    a. the suitability of the site(s) for any purpose or the permissibility of any use;
    b. the presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or
    c. the presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).

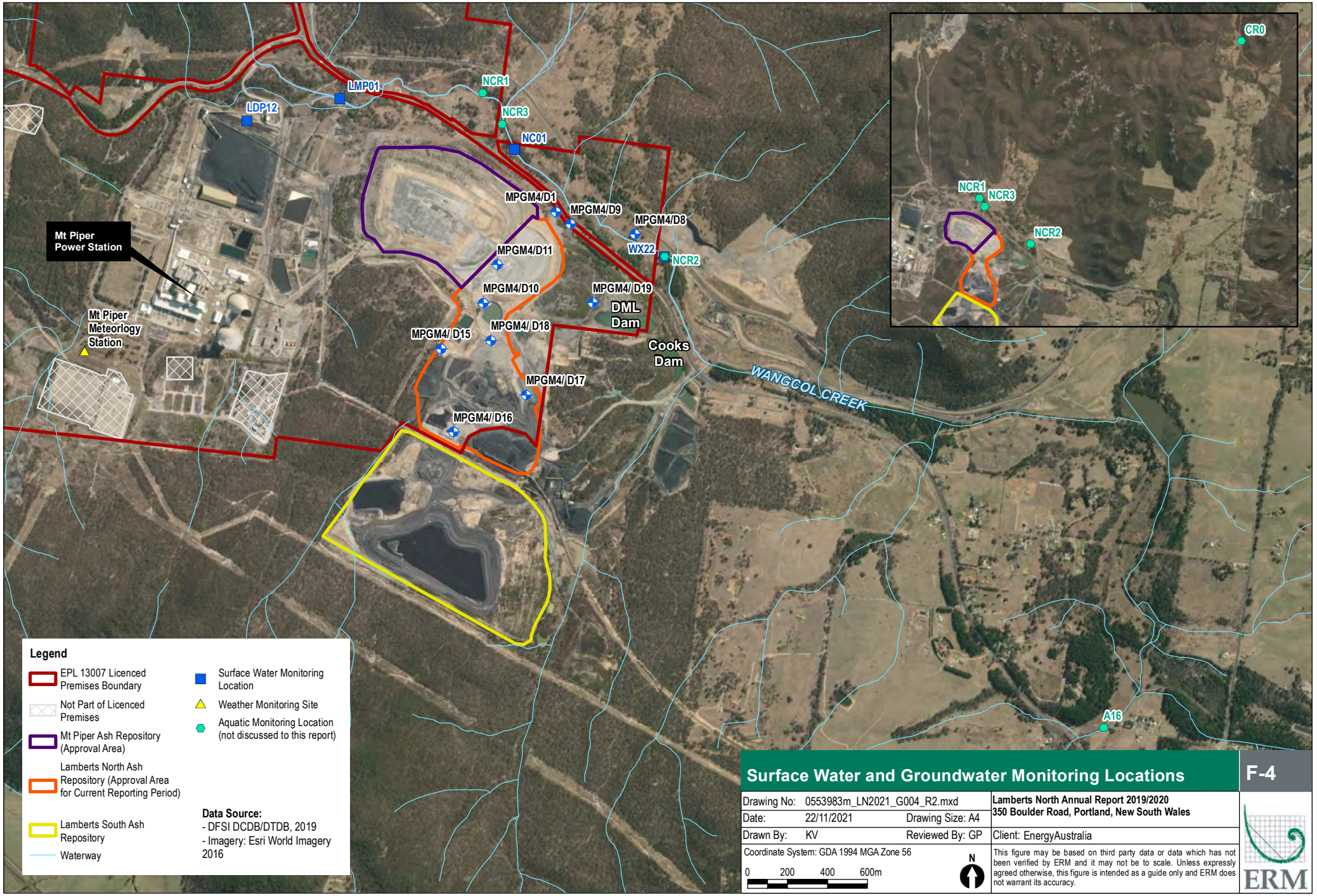
9. Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.
10. The ongoing use of the site or use of the site for a different purpose may require the management of or remediation of site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.
11. This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.
12. Except to the extent that ERM has agreed otherwise with the Client in the Scope of Work or the Contract, this report:
    a. has been prepared and is intended only for the exclusive use of the Client;
    b. must not to be relied upon or used by any other party;
    c. has not been prepared nor is intended for the purpose of advertising, sales, promoting or endorsing any Client interests including raising investment capital, recommending investment decisions, or other publicity purposes;
    d. does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and
    e. does not purport to provide, nor should be construed as, legal advice.

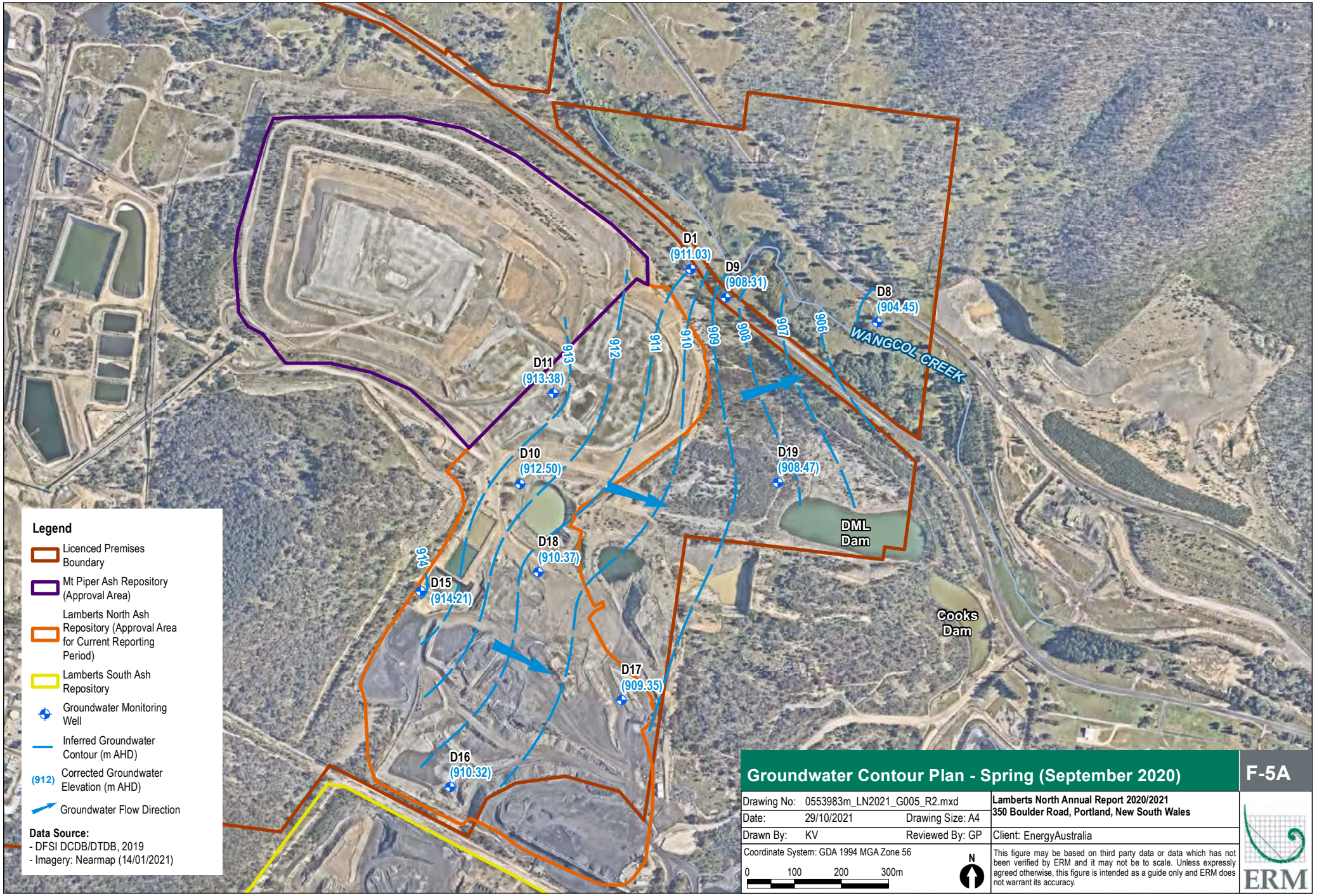
APPENDIX A FIGURES

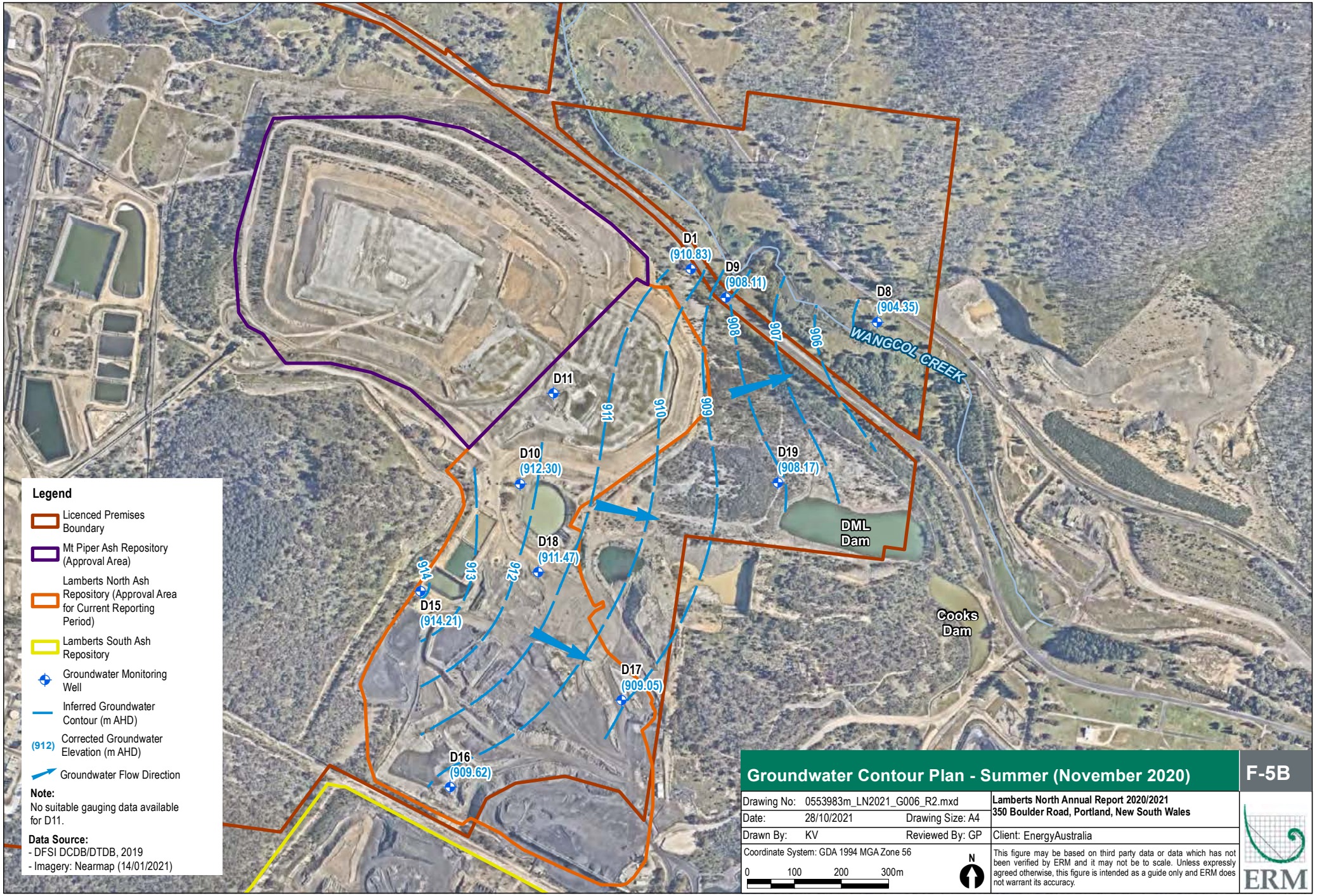

Site Location
BACK CULLEN BULLEN
JARRAH WAY
BOULDER ROAD
FRANKFORT ROAD
WANGCOL CREEK
CASTLEREAGH HIGHWAY
NEUBECKS CREEK
Mt Piper
Power Station
Legend
Licenced Premises Boundary
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Not Part of Licensed Premises
Source:
- (c) Department Finance, Services and Innovation DCDB/DTDB, 2018
- Imagery Data : ESRI World Imagery (2016)
Site Location
F-1
Drawing No: 0553983m_LN2021_G001_R0.mxd
Date: 13/10/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

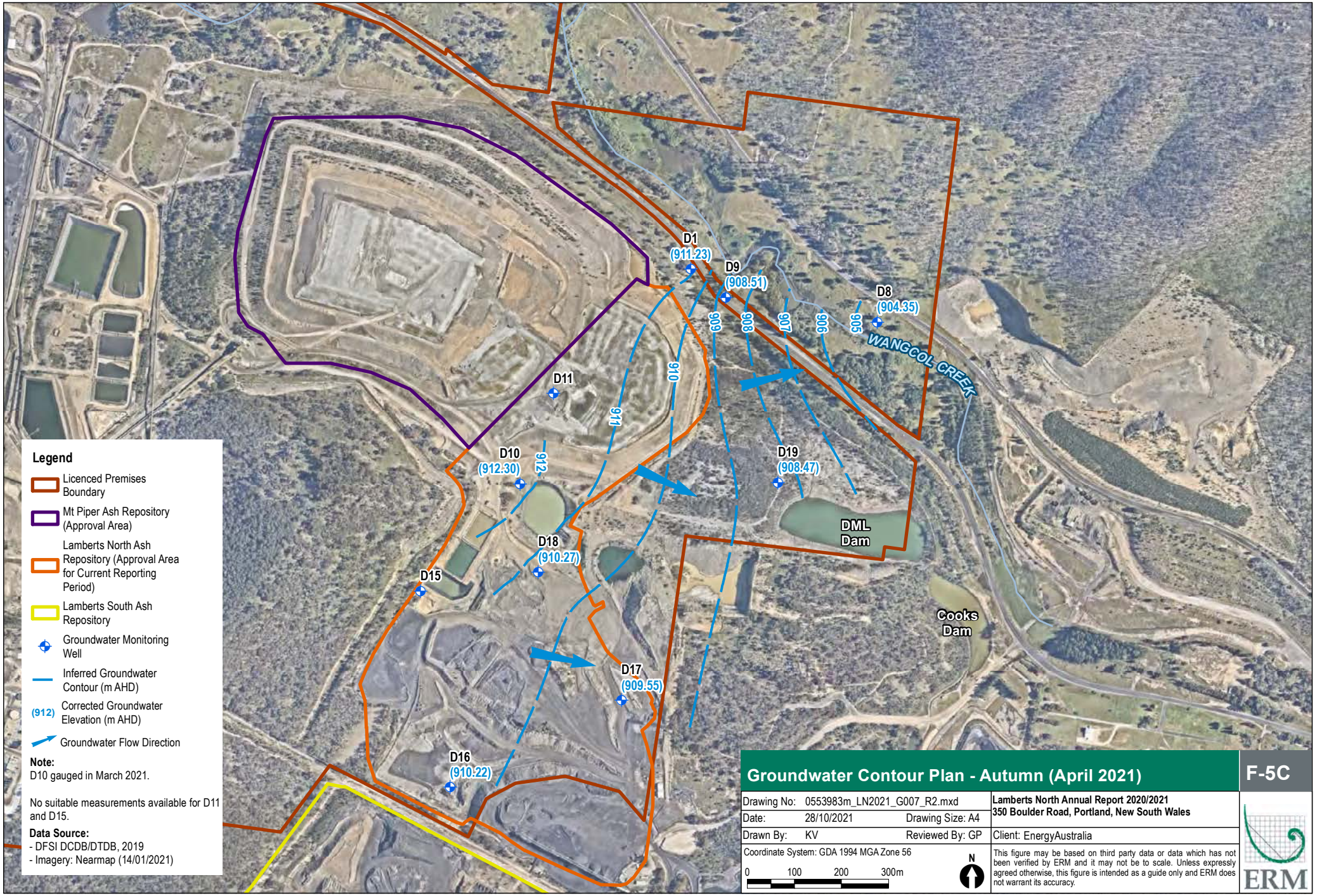

Final Holding Pond
Coal Settling Pond
Mine Water Buffer Pond
Dewatering Pond
Western Drain
Settling Pond D
Brine Sump
Eastern Drain
Wangcol Creek
Unlined Internal Detention Basins
CWP02
Brine Waste Pond B
Brine Waste Pond A
Clean Water Pond
Settling Pond A
WCA Detention Basin
Blowdown Pond A
Settling Pond B
CWP01
Pond BWA
LN Pond 2
Settling Pond C
Pond BWB
DML Dam
Pond BWC
Contaminated Water Pond
Former Iron Gully
Cooks Dam
Springvale Water Treatment Project
Lamberts Gully Creek
Source:
Spatial Data : DFSI, DCDB/DTDB 2019
Imagery Data : Nearmap January 2021
Legend
Licenced Premises Boundary
Springvale Water Treatment Project
Centennial Lease Area (Approximate)
Not Part of Licensed Premises
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Existing Clean Water Flow Path
Former Groundwater Collection Basin
Watercourse - Non Perennial
Watercourse - Perennial
Site Details
F-2
Drawing No: 0553983m_LN2021_G002_R1.mxd
Date: 28/10/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
N
Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: Energy Australia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

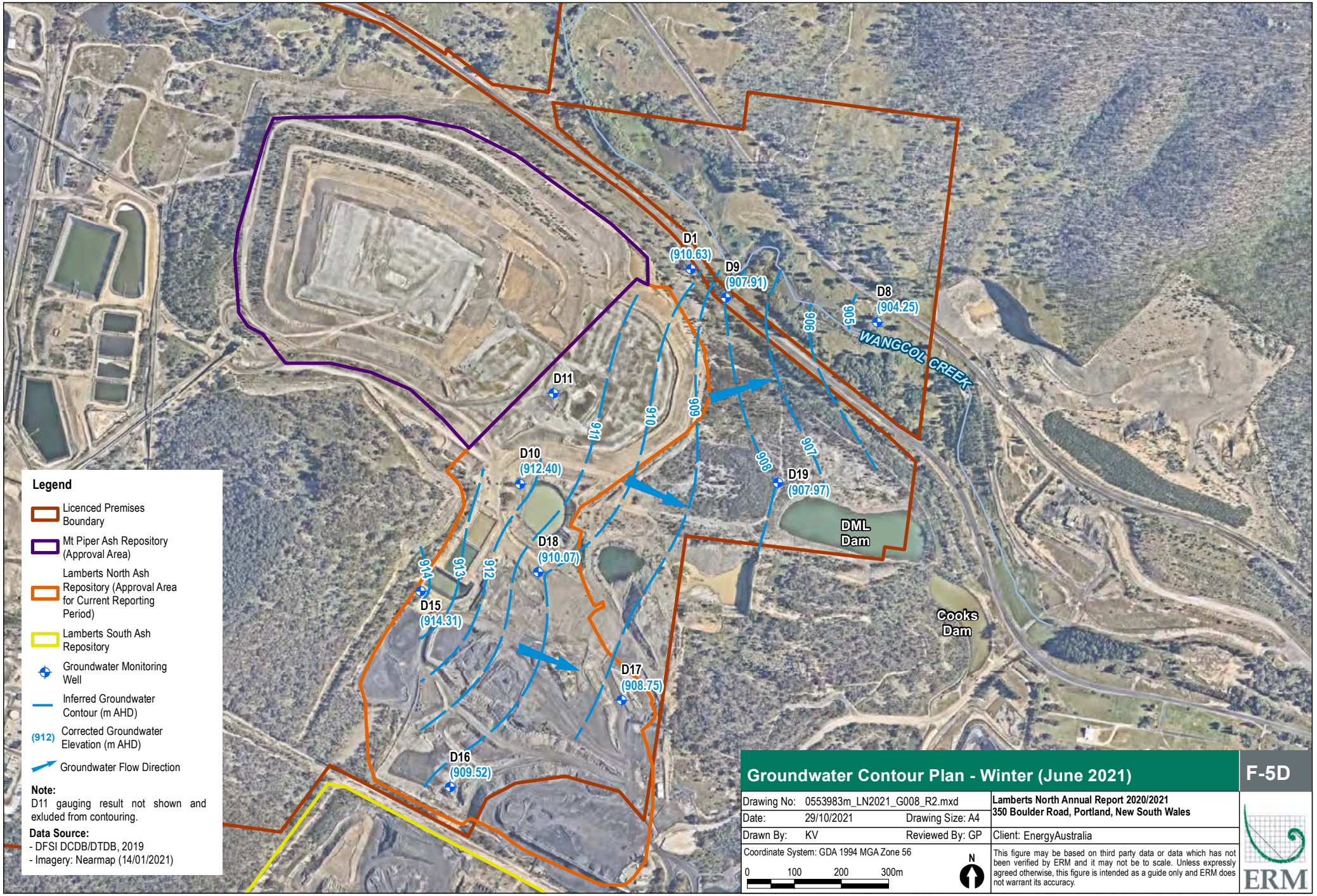

Coal Settling Pond
Settling Pond D
Mine Water Buffer Pond
Dewatering Pond
Brine Sump
Wangool Creek
Unlined Internal Detention Basins
CWP02
Brine Waste Pond B
Brine Waste Pond A
Clean Water Pond
Blowdown Pond A
Settling Pond A
Settling Pond B
Settling Pond C
Contaminated Water Pond
CWP01
Pond BWA
Pond BWB
Pond BWC
STAGE II BRINE BOUNDARY
NORTH LAMBERTS NORTH BOUNDARY
WCA Detention Basin
LN Pond 2
DML Dam
Cooks Dam
Springvale Water Treatment Project
940
950
960
970
975
965
935
955
945
930
925
Legend
Licenced Premises Boundary
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Watercourse - Non Perennial
Watercourse - Perennial
Springvale Water Treatment Project
Topographic Contours
Source:
Spatial Data : DFSI, DCDB/DTDB 2019
Imagery Data : Nearmap January 2021
Elevation data - Client Provided (Lend Lease Mt Piper Ash Placement Survey; Digitised from PDF Drawing No. MPA0821 - CEH Survey).
Ash Placement Plan
F-3
Drawing No: 0553983m_LN2021_G003_R0.mxd
Date: 13/10/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
N
Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: Energy Australia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

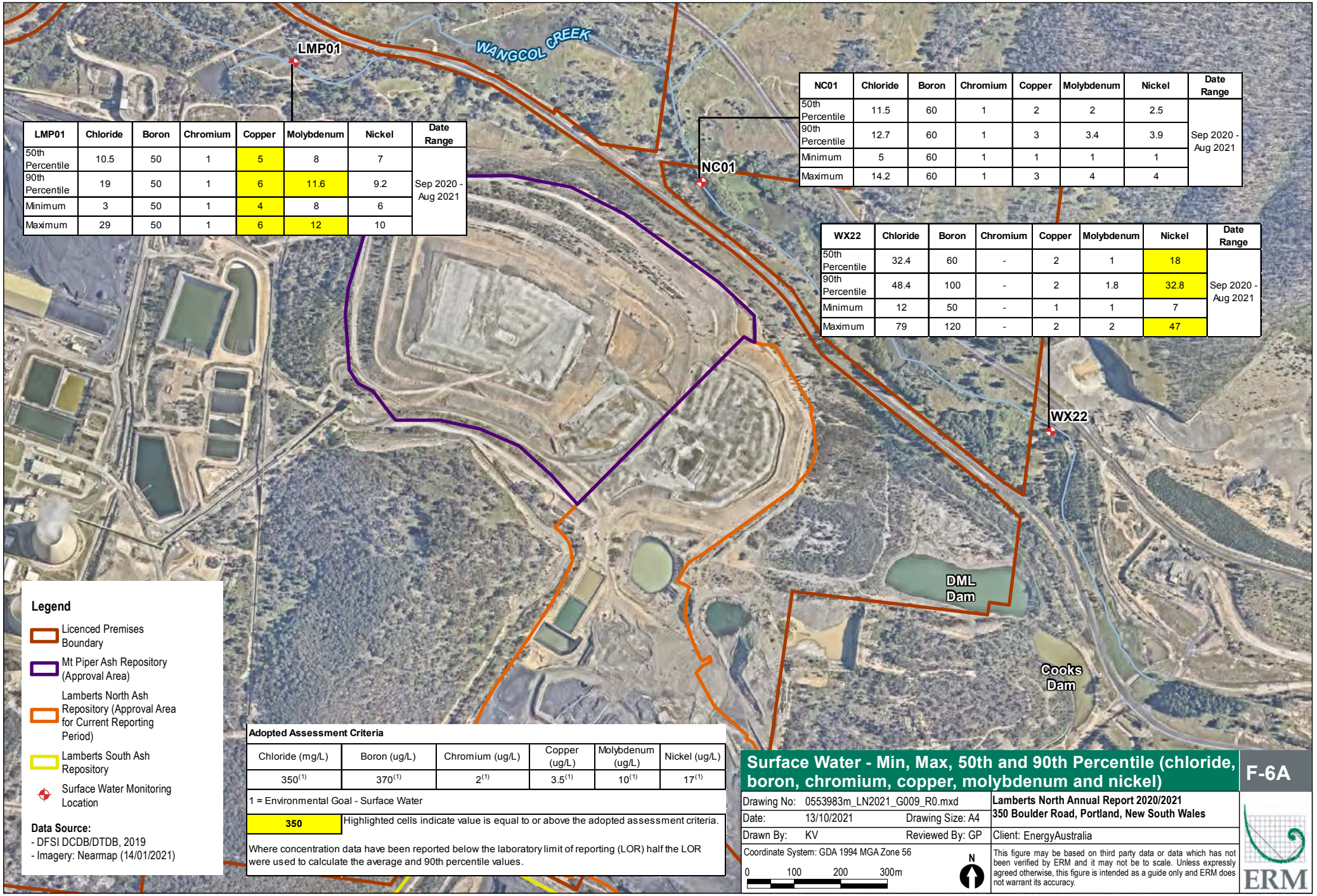

LMP01
LDP12
NCR1
NCR3
NC01
MPGM4/D1
MPGM4/D9
MPGM4/D8
WX22
NCR2
MPGM4/D11
MPGM4/D10
MPGM4/ D19
DML Dam
MPGM4/ D18
MPGM4/ D15
Cooks Dam
MPGM4/ D17
MPGM4/ D16
WANGCOL CREEK
Mt Piper Power Station
Mt Piper Meteorlogy Station
CR0
NCR1
NCR3
NCR2
A16
Legend
EPL 13007 Licenced Premises Boundary
Not Part of Licenced Premises
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Waterway
Surface Water Monitoring Location
Weather Monitoring Site
Aquatic Monitoring Location (not discussed to this report)
Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Esri World Imagery 2016
Surface Water and Groundwater Monitoring Locations
F-4
Drawing No: 0553983m_LN2021_G004_R2.mxd
Date: 22/11/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 200 400 600m
N
Lamberts North Annual Report 2019/2020
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


D1
(911.03)
D9
(908.31)
D8
(904.45)
WANGCOL CREEK
D11
(913.38)
D10
(912.50)
D19
(908.47)
DML
Dam
D18
(910.37)
D15
(914.21)
Cooks
Dam
D17
(909.35)
D16
(910.32)
913
912
911
910
909
908
907
906
914
Legend
Licenced Premises Boundary
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Groundwater Monitoring Well
Inferred Groundwater Contour (m AHD)
(912) Corrected Groundwater Elevation (m AHD)
Groundwater Flow Direction
Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)
Groundwater Contour Plan - Spring (September 2020)
F-5A
Drawing No: 0553983m_LN2021_G005_R2.mxd
Date: 29/10/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
N
Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


D1
(910.83)
D9
(908.11)
D8
(904.35)
WANGCOL CREEK
D11
D10
(912.30)
D19
(908.17)
DML
Dam
D18
(911.47)
D15
(914.21)
Cooks
Dam
D17
(909.05)
D16
(909.62)
914
913
912
911
910
909
908
907
906
Legend
Licenced Premises Boundary
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Groundwater Monitoring Well
Inferred Groundwater Contour (m AHD)
(912) Corrected Groundwater Elevation (m AHD)
Groundwater Flow Direction
Note:
No suitable gauging data available for D11.
Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)
Groundwater Contour Plan - Summer (November 2020)
F-5B
Drawing No: 0553983m_LN2021_G006_R2.mxd
Date: 28/10/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
N
Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


D1
(911.23)
D9
(908.51)
D8
(904.35)
D11
D10
(912.30)
D19
(908.47)
D18
(910.27)
D15
D17
(909.55)
D16
(910.22)
905
906
907
908
909
910
911
912
WANGCOL CREEK
DML
Dam
Cooks
Dam
Legend
Licenced Premises Boundary
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Groundwater Monitoring Well
Inferred Groundwater Contour (m AHD)
(912) Corrected Groundwater Elevation (m AHD)
Groundwater Flow Direction
Note:
D10 gauged in March 2021.
No suitable measurements available for D11 and D15.
Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)
Groundwater Contour Plan - Autumn (April 2021)
F-5C
Drawing No: 0553983m_LN2021_G007_R2.mxd
Date: 28/10/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
N
Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


D1
(910.63)
D9
(907.91)
D8
(904.25)
WANGCOL CREEK
D11
D10
(912.40)
D18
(910.07)
D19
(907.97)
DML
Dam
Cooks
Dam
D15
(914.31)
D17
(908.75)
D16
(909.52)
905
906
907
908
909
910
911
912
913
914
Legend
Licenced Premises Boundary
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Groundwater Monitoring Well
Inferred Groundwater Contour (m AHD)
(912) Corrected Groundwater Elevation (m AHD)
Groundwater Flow Direction
Note:
D11 gauging result not shown and exluded from contouring.
Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)
Groundwater Contour Plan - Winter (June 2021)
F-5D
Drawing No: 0553983m_LN2021_G008_R2.mxd
Date: 29/10/2021
Drawing Size: A4
Drawn By: KV
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
N
Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



LMP01	Chloride	Boron	Chromium	Copper	Molybdenum	Nickel	Date Range
50th Percentile	10.5	50	1	5	8	7	Sep 2020 - Aug 2021
90th Percentile	19	50	1	6	11.6	9.2	
Minimum	3	50	1	4	8	6	
Maximum	29	50	1	6	12	10	

NC01	Chloride	Boron	Chromium	Copper	Molybdenum	Nickel	Date Range
50th Percentile	11.5	60	1	2	2	2.5	Sep 2020 - Aug 2021
90th Percentile	12.7	60	1	3	3.4	3.9	
Minimum	5	60	1	1	1	1	
Maximum	14.2	60	1	3	4	4	

WX22	Chloride	Boron	Chromium	Copper	Molybdenum	Nickel	Date Range
50th Percentile	32.4	60	-	2	1	18	Sep 2020 - Aug 2021
90th Percentile	48.4	100	-	2	1.8	32.8	
Minimum	12	50	-	1	1	7	
Maximum	79	120	-	2	2	47	

Legend

- Licenced Premises Boundary
- Mt Piper Ash Repository (Approval Area)
- Lamberts North Ash Repository (Approval Area for Current Reporting Period)
- Lamberts South Ash Repository
- Surface Water Monitoring Location

Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)

Adopted Assessment Criteria

Chloride (mg/L)	Boron (ug/L)	Chromium (ug/L)	Copper (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)
350(1)	370(1)	2(1)	3.5(1)	10(1)	17(1)

1 = Environmental Goal - Surface Water

350 Highlighted cells indicate value is equal to or above the adopted assessment criteria.

Where concentration data have been reported below the laboratory limit of reporting (LOR) half the LOR were used to calculate the average and 90th percentile values.

Surface Water - Min, Max, 50th and 90th Percentile (chloride, boron, chromium, copper, molybdenum and nickel)

F-6A

Drawing No: 0553983m_LN2021_G009_R0.mxd
Date: 13/10/2021 Drawing Size: A4
Drawn By: KV Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

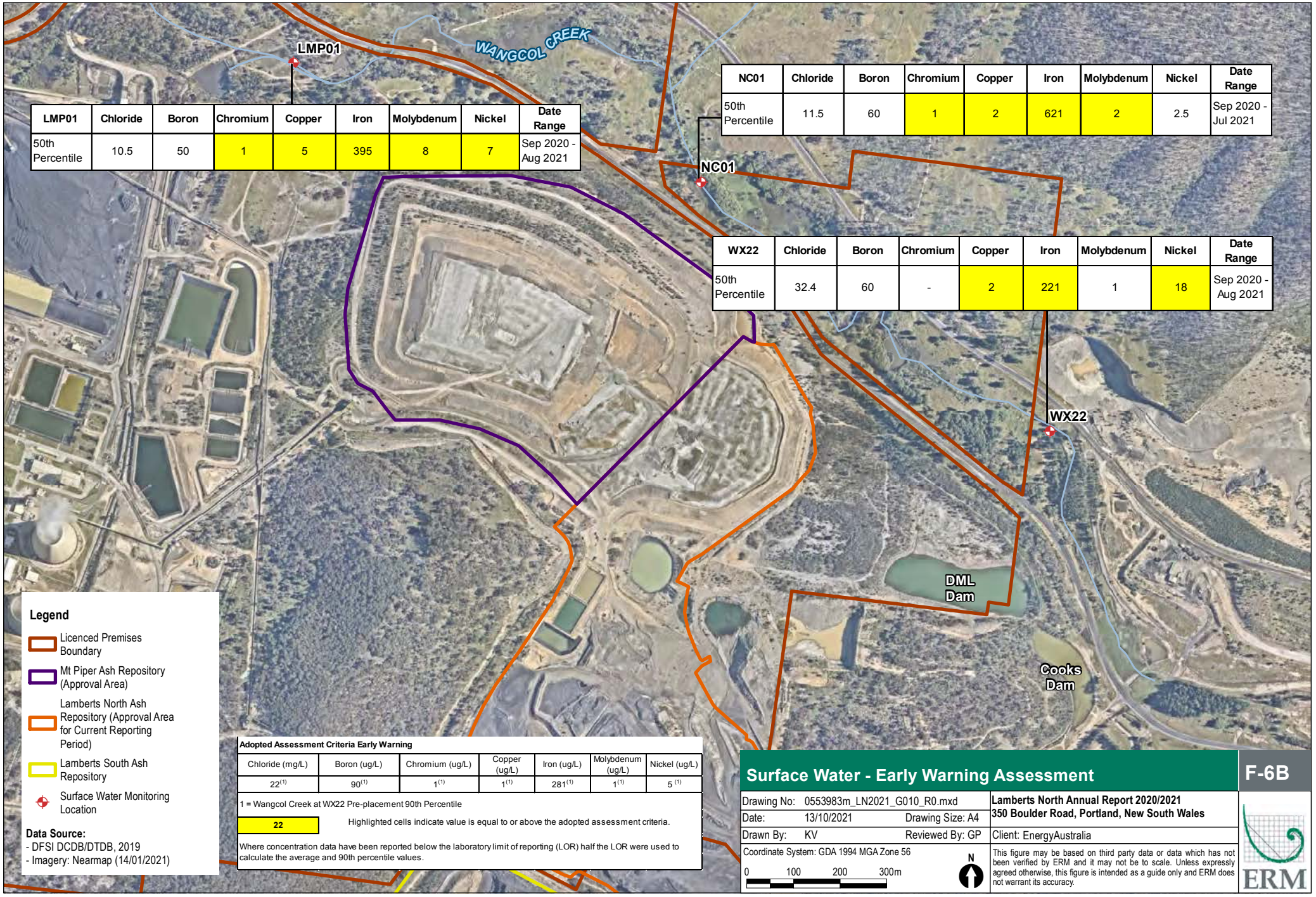
0 100 200 300m

N

Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

ERM



LMP01	Chloride	Boron	Chromium	Copper	Iron	Molybdenum	Nickel	Date Range
50th Percentile	10.5	50	1	5	395	8	7	Sep 2020 - Aug 2021

NC01	Chloride	Boron	Chromium	Copper	Iron	Molybdenum	Nickel	Date Range
50th Percentile	11.5	60	1	2	621	2	2.5	Sep 2020 - Jul 2021

WX22	Chloride	Boron	Chromium	Copper	Iron	Molybdenum	Nickel	Date Range
50th Percentile	32.4	60	-	2	221	1	18	Sep 2020 - Aug 2021

Legend

- Licenced Premises Boundary
- Mt Piper Ash Repository (Approval Area)
- Lamberts North Ash Repository (Approval Area for Current Reporting Period)
- Lamberts South Ash Repository
- Surface Water Monitoring Location

Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)

Adopted Assessment Criteria Early Warning

Chloride (mg/L)	Boron (ug/L)	Chromium (ug/L)	Copper (ug/L)	Iron (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)
22(1)	90(1)	1(1)	1(1)	281(1)	1(1)	5(1)

1 = Wangcol Creek at WX22 Pre-placement 90th Percentile

22 Highlighted cells indicate value is equal to or above the adopted assessment criteria.

Where concentration data have been reported below the laboratory limit of reporting (LOR) half the LOR were used to calculate the average and 90th percentile values.

Surface Water - Early Warning Assessment

F-6B

Drawing No: 0553983m_LN2021_G010_R0.mxd
Date: 13/10/2021 Drawing Size: A4
Drawn By: KV Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

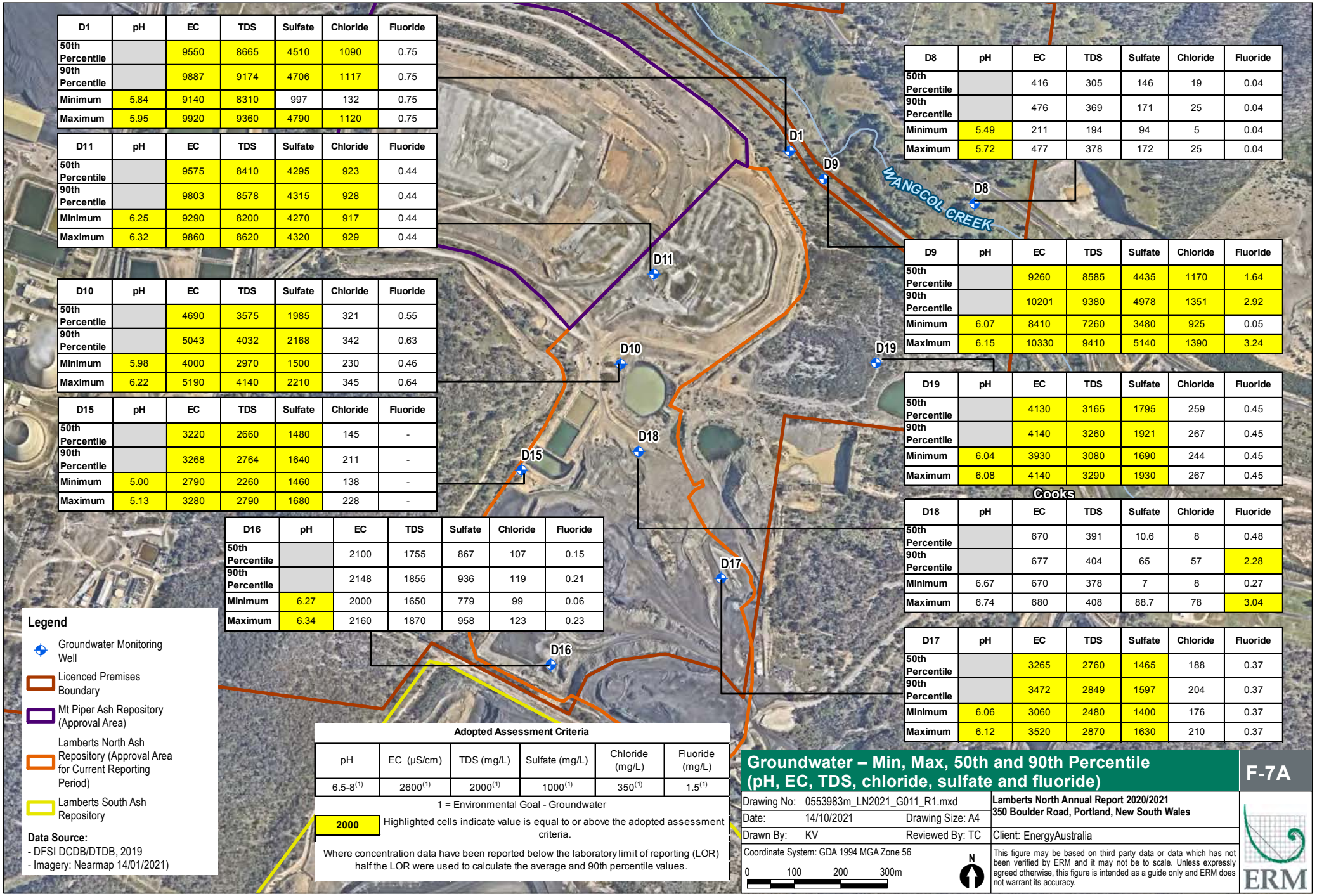
0 100 200 300m

N

Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

ERM



D1	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		9550	8665	4510	1090	0.75
90th Percentile		9887	9174	4706	1117	0.75
Minimum	5.84	9140	8310	997	132	0.75
Maximum	5.95	9920	9360	4790	1120	0.75

D11	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		9575	8410	4295	923	0.44
90th Percentile		9803	8578	4315	928	0.44
Minimum	6.25	9290	8200	4270	917	0.44
Maximum	6.32	9860	8620	4320	929	0.44

D10	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		4690	3575	1985	321	0.55
90th Percentile		5043	4032	2168	342	0.63
Minimum	5.98	4000	2970	1500	230	0.46
Maximum	6.22	5190	4140	2210	345	0.64

D15	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		3220	2660	1480	145	-
90th Percentile		3268	2764	1640	211	-
Minimum	5.00	2790	2260	1460	138	-
Maximum	5.13	3280	2790	1680	228	-

D16	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		2100	1755	867	107	0.15
90th Percentile		2148	1855	936	119	0.21
Minimum	6.27	2000	1650	779	99	0.06
Maximum	6.34	2160	1870	958	123	0.23

D8	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		416	305	146	19	0.04
90th Percentile		476	369	171	25	0.04
Minimum	5.49	211	194	94	5	0.04
Maximum	5.72	477	378	172	25	0.04

D9	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		9260	8585	4435	1170	1.64
90th Percentile		10201	9380	4978	1351	2.92
Minimum	6.07	8410	7260	3480	925	0.05
Maximum	6.15	10330	9410	5140	1390	3.24

D19	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		4130	3165	1795	259	0.45
90th Percentile		4140	3260	1921	267	0.45
Minimum	6.04	3930	3080	1690	244	0.45
Maximum	6.08	4140	3290	1930	267	0.45

D18	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		670	391	10.6	8	0.48
90th Percentile		677	404	65	57	2.28
Minimum	6.67	670	378	7	8	0.27
Maximum	6.74	680	408	88.7	78	3.04

D17	pH	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile		3265	2760	1465	188	0.37
90th Percentile		3472	2849	1597	204	0.37
Minimum	6.06	3060	2480	1400	176	0.37
Maximum	6.12	3520	2870	1630	210	0.37

Legend

- Groundwater Monitoring Well
- Licenced Premises Boundary
- Mt Piper Ash Repository (Approval Area)
- Lamberts North Ash Repository (Approval Area for Current Reporting Period)
- Lamberts South Ash Repository

Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap 14/01/2021)

Adopted Assessment Criteria

pH	EC (µS/cm)	TDS (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)
6.5-8[1]	2600[1]	2000[1]	1000[1]	350[1]	1.5[1]

1 = Environmental Goal - Groundwater

2000 Highlighted cells indicate value is equal to or above the adopted assessment criteria.

Where concentration data have been reported below the laboratory limit of reporting (LOR) half the LOR were used to calculate the average and 90th percentile values.

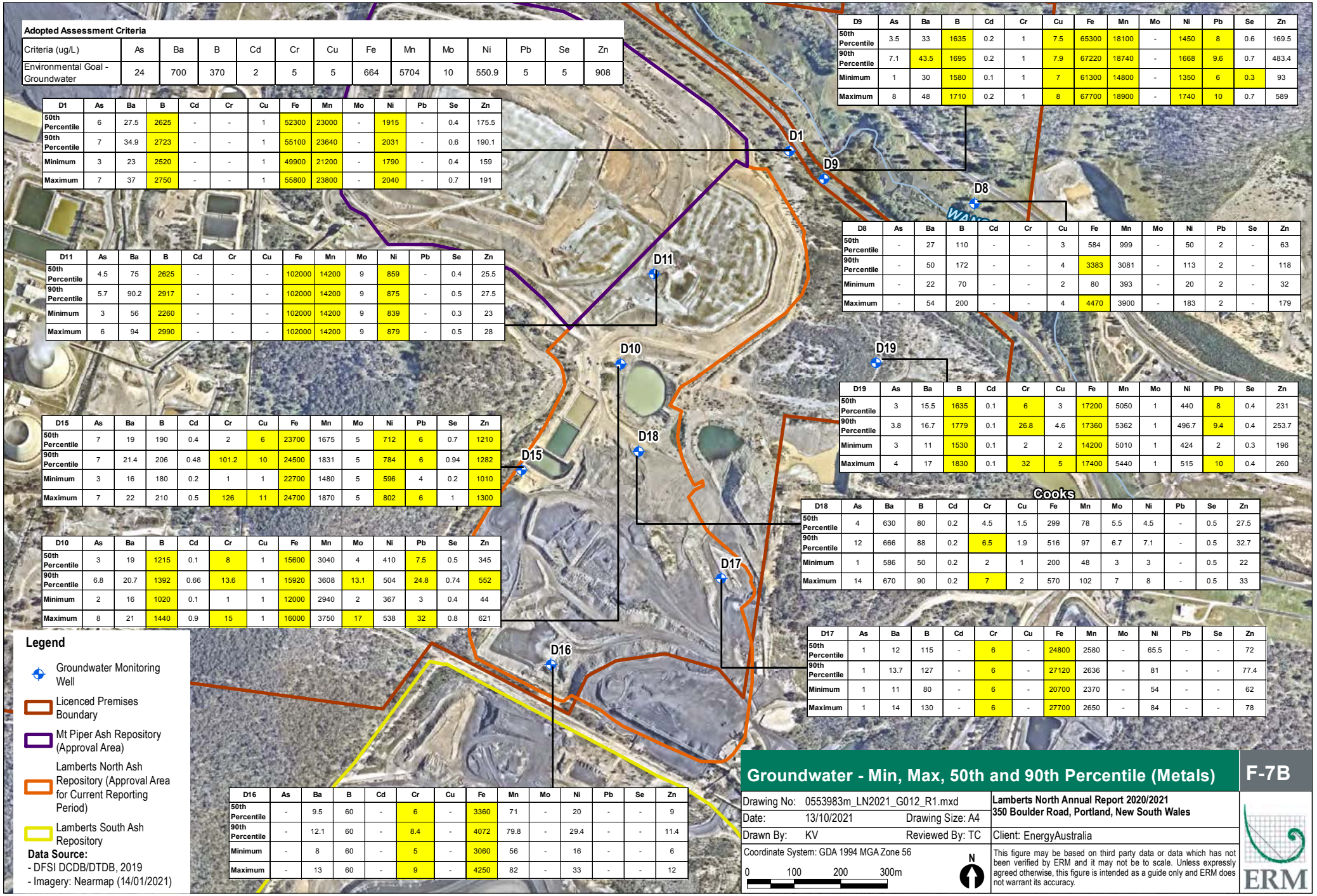
Groundwater – Min, Max, 50th and 90th Percentile (pH, EC, TDS, chloride, sulfate and fluoride)

F-7A

Drawing No: 0553983m_LN2021_G011_R1.mxd
Date: 14/10/2021 Drawing Size: A4
Drawn By: KV Reviewed By: TC
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
N

Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia

ERM



Adopted Assessment Criteria

Criteria (ug/L)	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
Environmental Goal - Groundwater	24	700	370	2	5	5	664	5704	10	550.9	5	5	908

D1	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	6	27.5	2625	-	-	1	52300	23000	-	1915	-	0.4	175.5
90th Percentile	7	34.9	2723	-	-	1	55100	23640	-	2031	-	0.6	190.1
Minimum	3	23	2520	-	-	1	49900	21200	-	1790	-	0.4	159
Maximum	7	37	2750	-	-	1	55800	23800	-	2040	-	0.7	191

D9	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	3.5	33	1635	0.2	1	7.5	65300	18100	-	1450	8	0.6	169.5
90th Percentile	7.1	43.5	1695	0.2	1	7.9	67220	18740	-	1668	9.6	0.7	483.4
Minimum	1	30	1580	0.1	1	7	61300	14800	-	1350	6	0.3	93
Maximum	8	48	1710	0.2	1	8	67700	18900	-	1740	10	0.7	589

D8	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	-	27	110	-	-	3	584	999	-	50	2	-	63
90th Percentile	-	50	172	-	-	4	3383	3081	-	113	2	-	118
Minimum	-	22	70	-	-	2	80	393	-	20	2	-	32
Maximum	-	54	200	-	-	4	4470	3900	-	183	2	-	179

D11	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	4.5	75	2625	-	-	-	102000	14200	9	859	-	0.4	25.5
90th Percentile	5.7	90.2	2917	-	-	-	102000	14200	9	875	-	0.5	27.5
Minimum	3	56	2260	-	-	-	102000	14200	9	839	-	0.3	23
Maximum	6	94	2990	-	-	-	102000	14200	9	879	-	0.5	28

D19	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	3	15.5	1635	0.1	6	3	17200	5050	1	440	8	0.4	231
90th Percentile	3.8	16.7	1779	0.1	26.8	4.6	17360	5362	1	496.7	9.4	0.4	253.7
Minimum	3	11	1530	0.1	2	2	14200	5010	1	424	2	0.3	196
Maximum	4	17	1830	0.1	32	5	17400	5440	1	515	10	0.4	260

D15	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	7	19	190	0.4	2	6	23700	1675	5	712	6	0.7	1210
90th Percentile	7	21.4	206	0.48	101.2	10	24500	1831	5	784	6	0.94	1282
Minimum	3	16	180	0.2	1	1	22700	1480	5	596	4	0.2	1010
Maximum	7	22	210	0.5	126	11	24700	1870	5	802	6	1	1300

D18	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	4	630	80	0.2	4.5	1.5	299	78	5.5	4.5	-	0.5	27.5
90th Percentile	12	666	88	0.2	6.5	1.9	516	97	6.7	7.1	-	0.5	32.7
Minimum	1	586	50	0.2	2	1	200	48	3	3	-	0.5	22
Maximum	14	670	90	0.2	7	2	570	102	7	8	-	0.5	33

D10	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	3	19	1215	0.1	8	1	15600	3040	4	410	7.5	0.5	345
90th Percentile	6.8	20.7	1392	0.66	13.6	1	15920	3608	13.1	504	24.8	0.74	552
Minimum	2	16	1020	0.1	1	1	12000	2940	2	367	3	0.4	44
Maximum	8	21	1440	0.9	15	1	16000	3750	17	538	32	0.8	621

D17	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	1	12	115	-	6	-	24800	2580	-	65.5	-	-	72
90th Percentile	1	13.7	127	-	6	-	27120	2636	-	81	-	-	77.4
Minimum	1	11	80	-	6	-	20700	2370	-	54	-	-	62
Maximum	1	14	130	-	6	-	27700	2650	-	84	-	-	78

D16	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	-	9.5	60	-	6	-	3360	71	-	20	-	-	9
90th Percentile	-	12.1	60	-	8.4	-	4072	79.8	-	29.4	-	-	11.4
Minimum	-	8	60	-	5	-	3060	56	-	16	-	-	6
Maximum	-	13	60	-	9	-	4250	82	-	33	-	-	12

Legend

- Groundwater Monitoring Well
- Licenced Premises Boundary
- Mt Piper Ash Repository (Approval Area)
- Lamberts North Ash Repository (Approval Area for Current Reporting Period)
- Lamberts South Ash Repository

Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)

Groundwater - Min, Max, 50th and 90th Percentile (Metals)

F-7B

Drawing No: 0553983m_LN2021_G012_R1.mxd
Date: 13/10/2021 Drawing Size: A4
Drawn By: KV Reviewed By: TC
Coordinate System: GDA 1994 MGA Zone 56

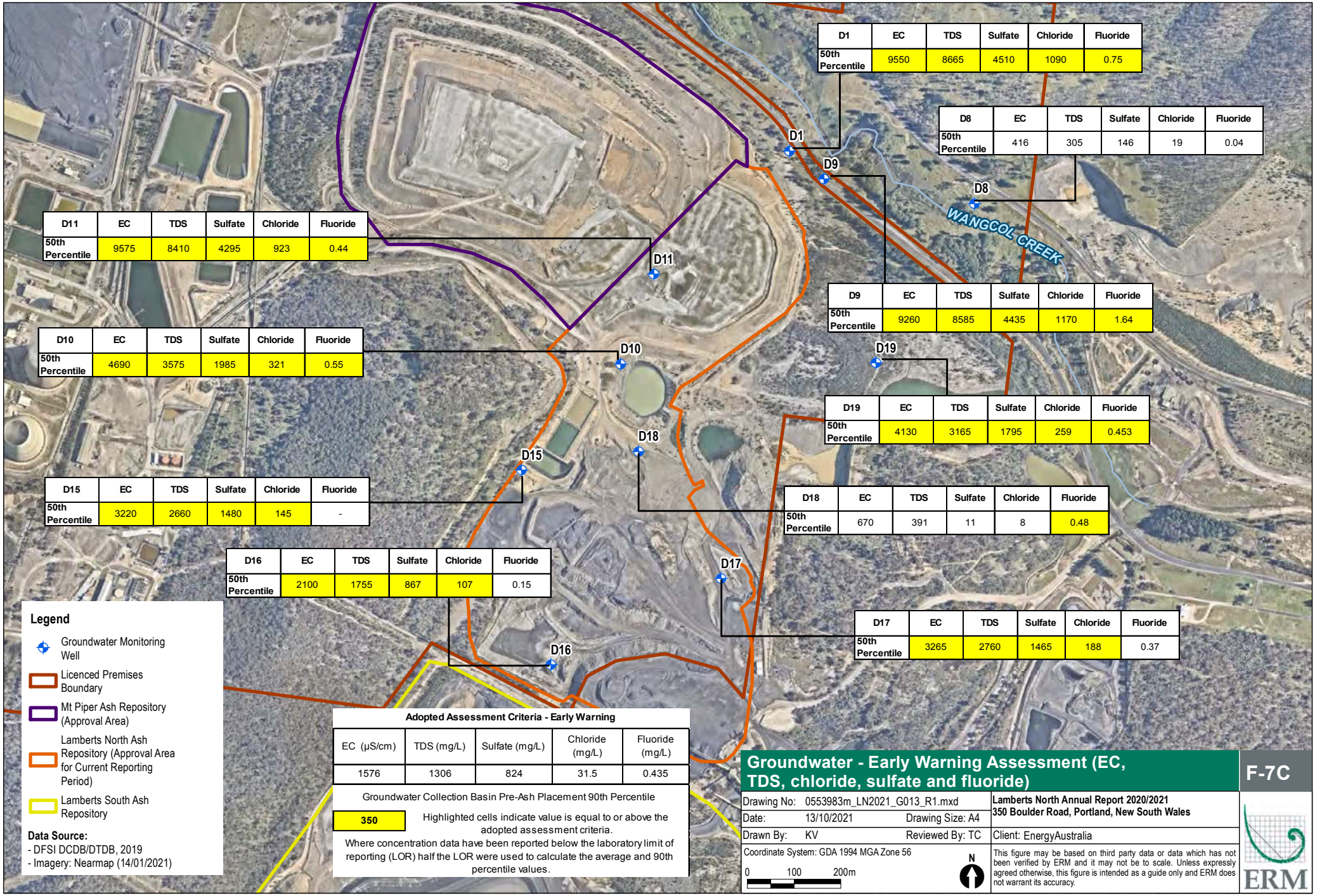
0 100 200 300m

N

Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

ERM



D1	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	9550	8665	4510	1090	0.75

D8	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	416	305	146	19	0.04

D11	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	9575	8410	4295	923	0.44

D9	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	9260	8585	4435	1170	1.64

D10	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	4690	3575	1985	321	0.55

D19	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	4130	3165	1795	259	0.453

D15	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	3220	2660	1480	145	-

D18	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	670	391	11	8	0.48

D16	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	2100	1755	867	107	0.15

D17	EC	TDS	Sulfate	Chloride	Fluoride
50th Percentile	3265	2760	1465	188	0.37

Legend

- Groundwater Monitoring Well
- Licenced Premises Boundary
- Mt Piper Ash Repository (Approval Area)
- Lamberts North Ash Repository (Approval Area for Current Reporting Period)
- Lamberts South Ash Repository

Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)

Adopted Assessment Criteria - Early Warning

EC (µS/cm)	TDS (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)
1576	1306	824	31.5	0.435

Groundwater Collection Basin Pre-Ash Placement 90th Percentile

350 Highlighted cells indicate value is equal to or above the adopted assessment criteria.

Where concentration data have been reported below the laboratory limit of reporting (LOR) half the LOR were used to calculate the average and 90th percentile values.

Groundwater - Early Warning Assessment (EC, TDS, chloride, sulfate and fluoride)

F-7C

Drawing No: 0553983m_LN2021_G013_R1.mxd
Date: 13/10/2021 Drawing Size: A4
Drawn By: KV Reviewed By: TC
Coordinate System: GDA 1994 MGA Zone 56

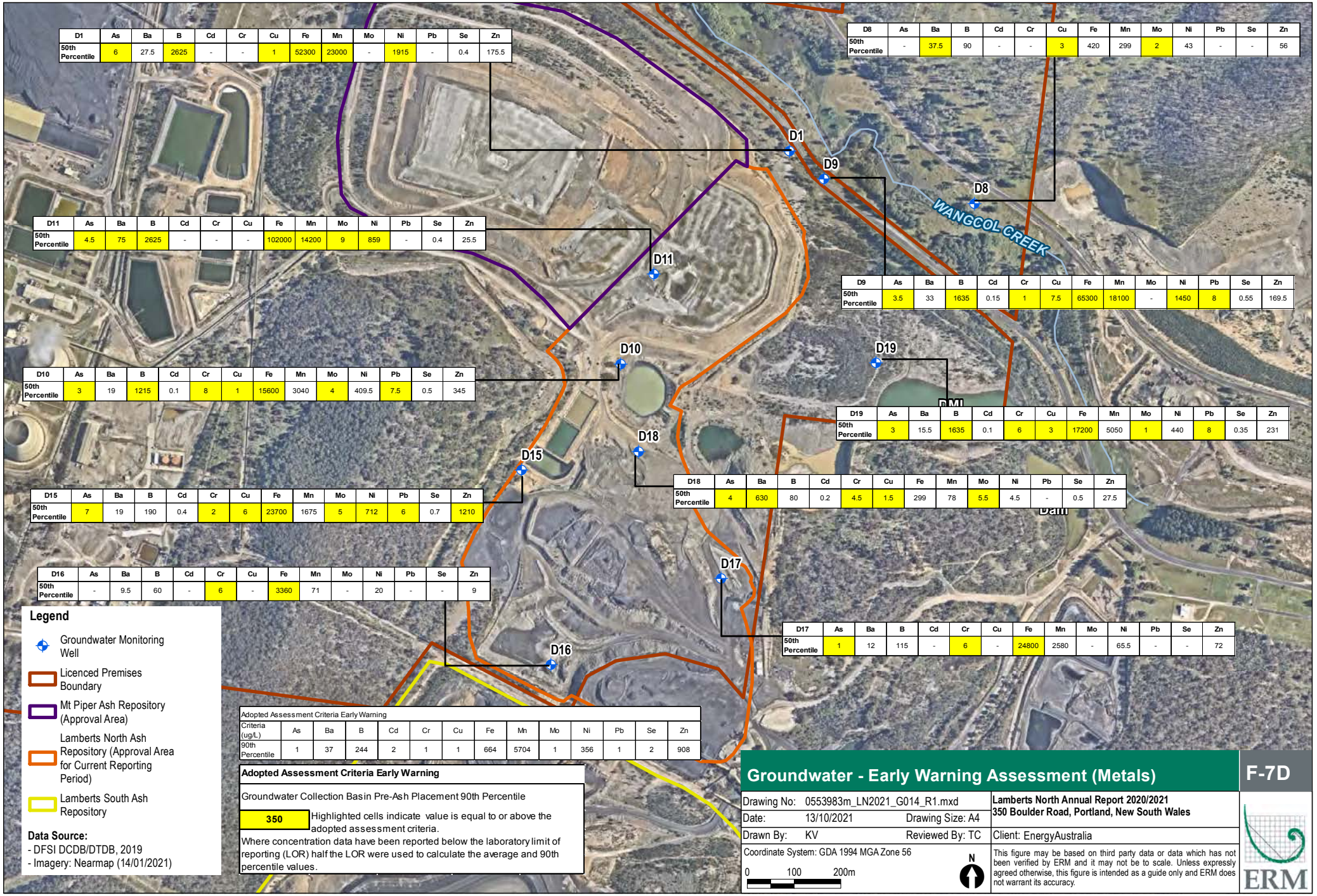
0 100 200m

N

Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

ERM



D1	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	6	27.5	2625	-	-	1	52300	23000	-	1915	-	0.4	175.5

D8	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	-	37.5	90	-	-	3	420	299	2	43	-	-	56

D11	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	4.5	75	2625	-	-	-	102000	14200	9	859	-	0.4	25.5

D9	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	3.5	33	1635	0.15	1	7.5	65300	18100	-	1450	8	0.55	169.5

D10	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	3	19	1215	0.1	8	1	15600	3040	4	409.5	7.5	0.5	345

D19	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	3	15.5	1635	0.1	6	3	17200	5050	1	440	8	0.35	231

D18	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	4	630	80	0.2	4.5	1.5	299	78	5.5	4.5	-	0.5	27.5

D15	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	7	19	190	0.4	2	6	23700	1675	5	712	6	0.7	1210

D16	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	-	9.5	60	-	6	-	3360	71	-	20	-	-	9

D17	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
50th Percentile	1	12	115	-	6	-	24800	2580	-	65.5	-	-	72

Legend

- Groundwater Monitoring Well
- Licenced Premises Boundary
- Mt Piper Ash Repository (Approval Area)
- Lamberts North Ash Repository (Approval Area for Current Reporting Period)
- Lamberts South Ash Repository

Data Source:
- DFSI DCDB/DTDB, 2019
- Imagery: Nearmap (14/01/2021)

Adopted Assessment Criteria Early Warning													
Criteria (ug/L)	As	Ba	B	Cd	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Se	Zn
90th Percentile	1	37	244	2	1	1	664	5704	1	356	1	2	908

Adopted Assessment Criteria Early Warning

Groundwater Collection Basin Pre-Ash Placement 90th Percentile

350 Highlighted cells indicate value is equal to or above the adopted assessment criteria.

Where concentration data have been reported below the laboratory limit of reporting (LOR) half the LOR were used to calculate the average and 90th percentile values.

Groundwater - Early Warning Assessment (Metals)

F-7D

Drawing No: 0553983m_LN2021_G014_R1.mxd
Date: 13/10/2021 Drawing Size: A4
Drawn By: KV Reviewed By: TC
Coordinate System: GDA 1994 MGA Zone 56

0 100 200m

N

Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

ERM

APPENDIX B TABULATED SURFACE WATER DATA

			Field Parameters				Major Anions and Cations													NA	Nutrients							Physical Parameters																	
			Dissolved Oxygen (Field)	Electrical Conductivity (Field)	pH (Field)	Temperature (Field)	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Carbonate Alkalinity (as CaCO3)	Chloride	Magnesium	Fluoride	Fluoride (Filtered)	Phenolphthalein Alkalinity (CaCO3)	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)	Oil & Grease	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)	Nitrite + Nitrate (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Total Dissolved Solids (TDS)	Total Suspended Solids (TSS)	Turbidity	Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)
			mg/L	uS/cm	pH units	oC	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Surface Water				2200	6.5-8						350[#1]		1.5[#2]	1.5[#2]						1000[#3]									1500[#4]						24	24	700[#2]	700[#2]	100	370	370	0.85[#5]	0.85[#5]
Wangcol Creek at WX22 Pre-placement 90th Percentile				894	6.7-7.8						22		0.338	0.338						332									580						1	1	29	29	1	90	90	1	1
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																																										
Final Holding Pond Weir	LMP01	7/09/2020	-	510	8.5	-	-	-	-	-	29	-	-	-	-	-	-	-	-	150	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	23/09/2020	9.6	364	7.97	-	-	55	23.3	55	8.74	14.4	0.103	-	<1	5.04	-	20.8	-	98.5	-	<100	-	50	<10	0.05	0.4	0.4	224	-	33.9	530	20	-	<1	-	22	-	<1	50	-	0.1	-
Final Holding Pond Weir	LMP01	28/09/2020	-	459	7.82	-	-	-	-	-	15.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	6/10/2020	-	427	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	12/10/2020	-	456	7.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	19/10/2020	-	456	8.03	-	-	-	-	-	12.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	26/10/2020	-	196.4	7.59	-	-	-	-	-	2.967	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	2/11/2020	-	-	7.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	9/11/2020	-	-	-	-	-	-	-	-	10.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	16/11/2020	-	-	-	-	-	-	-	-	2.999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	18/11/2020	7.8	404	7.89	-	-	60	26.1	60	18.2	14.6	0.19	-	<1	5.56	-	31.7	-	224	-	<100	-	140	<10	0.14	0.2	0.3	242	-	22.4	340	10	-	<1	-	23	-	<1	<50	-	0.1	-
Final Holding Pond Weir	LMP01	23/11/2020	-	-	-	-	-	-	-	-	4.998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	7/12/2020	-	305	7.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	14/12/2020	-	354	7.8	-	-	-	-	-	9.997	-	-	-	-	-	-	-	-	76.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	16/12/2020	7.7	379	7.6	-	<1	107	27.8	107	9.08	17.4	0.198	-	<1	4.86	-	23.4	-	80.5	-	-	-	20	<10	0.02	0.3	0.3	234	-	8.7	310	30	<1	<1	<1	23	-	<1	<50	<50	<0.1	-
Final Holding Pond Weir	LMP01	21/12/2020	-	366	7.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	4/01/2021	-	209	7.59	-	-	-	-	-	8.997	-	-	-	-	-	-	-	-	42.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	7/01/2021	6.5	184	7.17	-	<1	58	13.7	58	4.66	6.98	0.13	-	<1	3.91	-	8.08	-	31.6	-	10	9	110	<10	0.11	0.6	0.7	154	-	106	1190	170	<1	1	<1	21	-	<1	<50	<50	<0.1	-
Final Holding Pond Weir	LMP01	11/01/2021	6.5	244	7.54	-	-	-	-	-	4.013	-	-	0.2	-	-	-	-	-	53.54	<5	-	-	-	-	-	-	-	174	-	55.5	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	1/02/2021	6.7	292	7.62	-	-	-	-	-	10.03	-	-	0.17	-	-	-	-	-	65.64	<5	-	-	-	-	-	-	-	200	-	122	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	1/03/2021	7.5	419	7.72	-	-	-	-	-	12.04	-	-	0.21	-	-	-	-	-	86.02	<5	-	-	-	-	-	-	-	250	-	20.1	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	8/03/2021	8.5	453	7.88	-	-	-	5.34	-	14.05	2.07	-	0.21	-	10.7	-	250	-	99.16	<5	-	8	-	-	-	-	-	238	-	12	140	<10	<1	<1	<1	27	-	<1	<50	<50	0.2	-
Final Holding Pond Weir	LMP01	6/04/2021	9	568	8.01	-	-	-	-	-	19.06	-	-	0.18	-	-	-	-	-	141.4	<5	-	-	-	-	-	-	-	354	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	3/05/2021	9.4	535	7.78	-	-	-	-	-	18.06	-	-	0.16	-	-	-	-	-	145.2	<5	-	-	-	-	-	-	-	390	-	6.6	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	7/06/2021	8	230	7.73	-	-	-	-	-	12.04	-	-	0.105	-	-	-	-	-	50	<5	-	-	-	-	-	-	-	150	-	18.1	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	5/07/2021	7.1	302	8.08	-	-	-	-	-	9.029	-	-	0.159	-	-	-	-	-	69.4	-	-	-	-	-	-	-	-	234	7.2	31.2	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	2/08/2021	9.4	373	8.02	-	-	-	-	-	19.78	-	-	0.09	-	-	-	-	-	71	-	-	-	-	-	-	-	-	242	10.67	32.8	-	-	-	-	-	-	-	-	-	-	-	-
	Count Detects		**13**	**23**	**24**	0	0	**4**	**5**	**4**	**22**	**5**	**4**	**9**	0	**5**	0	**5**	0	**16**	0	**1**	**2**	**4**	0	**4**	**4**	**4**	**13**	**3**	**13**	**5**	**4**	0	**1**	0	**5**	0	0	**1**	0	**3**	0
	Average		**8.0**	**368.93**		-	-	**70**	**19.248**	**70**	**11.695**	**11.09**	**0.1553**	**0.1649**	-	**6.014**	-	**66.796**	-	**92.776**	-	**10**	**8.5**	**80**	-	**0.08**	**0.375**	**0.425**	**237.38**	**7.62**	**37.32**	**502**	**57.5**	-	**1**	-	**23.2**	-	-	**50**	-	**0.1333**	-
	50th Percentile		**7.8**	**373**	**7.81**	-	-	**59**	**23.3**	**59**	**10.455**	**14.4**	**0.16**	**0.17**	-	**5.04**	-	**23.4**	-	**78.275**	-	**10**	**8.5**	**80**	-	**0.08**	**0.35**	**0.35**	**234**	**7.20**	**22.4**	**340**	**25**	-	**1**	-	**23**	-	-	**50**	-	**0.1**	-
	90th Percentile		**9.4**	**499.8**	**8.07**	-	-	**92.9**	**27.12**	**92.9**	**18.974**	**16.28**	**0.1956**	**0.21**	-	**8.644**	-	**162.68**	-	**147.6**	-	**10**	**8.9**	**131**	-	**0.131**	**0.54**	**0.61**	**333.2**	**9.98**	**95.9**	**926**	**128**	-	**1**	-	**25.4**	-	-	**50**	-	**0.18**	-
	Minimum		**6.5**	**184**	**7.17**	-	-	**55**	**5.34**	**55**	**2.967**	**2.07**	**0.103**	**0.09**	-	**3.91**	-	**8.08**	-	**31.6**	-	**10**	**8**	**20**	-	**0.02**	**0.2**	**0.3**	**150**	**5.00**	**6.6**	**140**	**10**	-	**1**	-	**21**	-	-	**50**	-	**0.1**	-
	Maximum		**9.6**	**568**	**8.5**	-	-	**107**	**27.8**	**107**	**29**	**17.4**	**0.198**	**0.21**	-	**10.7**	-	**250**	-	**224**	-	**10**	**9**	**140**	-	**0.14**	**0.6**	**0.7**	**390**	**10.67**	**122**	**1190**	**170**	-	**1**	-	**27**	-	-	**50**	-	**0.2**	-
Wangcol Creek	NC01	24/09/2020	10	251	6.75	-	-	52	15.4	52	9.68	8.8	0.068	-	<1	3.9	-	15.3	-	51.8	-	-	-	240	<10	0.24	0.3	0.5	117	-	11	280	50	-	<1	-	30	-	<1	60	-	<0.1	-
Wangcol Creek	NC01	22/10/2020	8	237	6.75	-	-	47	14.3	47	11.9	8.88	0.099	-	<1	4.02	-	19.7	-	51.7	-	-	-	80	<10	0.08	0.2	0.3	145	-	8	340	100	-	<1	-	33	-	<1	<50	-	<0.1	-
Wangcol Creek	NC01	19/11/2020	7.3	265	7.11	-	-	42	18.6	42	8.98	9.93	0.21	-	<1	3.23	-	20.3	-	60.9	-	-	-	<10	<10	<0.01	0.2	0.2	188	-	13.9	270	20	-	<1	-	28	-	<1	<50	-	<0.1	-
Wangcol Creek	NC01	16/12/2020	6.7	180	7.02	-	<1	52	11	52	11.1	6.65	0.09	-	<1	2.59	-	14.5	-	25.3	-	-	-	<10	<10	<0.01	0.4	0.4	92	-	6	250	70	<1	<1	<1	29	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	7/01/2021	5.8	147	7.15	-	<1	53	9.9	53	6.83	4.99	0.087	-	<1	2.86	-	8.1	-	15.2	-	<10	4	20	<10	0.02	0.6	0.6	101	-	49.5	440	140	<1	<1	<1	21	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	17/02/2021	6	187	7.04	-	<1	46	10.8	46	12.1	6.08	0.095	-	<1	3.76	-	16.4	-	21.4	-	-	8	20	<10	0.02	0.1	0.1	114	-	9	170	30	<1	<1	<1	27	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	26/03/2021	9.2	238	7.34	-	<1	48	15.5	48	14.2	8.25	0.096	-	<1	6.11	-	28	-	36.3	-	-	15	60	<10	0.06	0.3	0.4	161	-	27.3	670	90	<1	<1	<1	23	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	28/04/2021	8.1	307	7.82	-	<1	56	15.5	56	12.7	11.2	0.071	-	<1	4.48	-	19	-	62.8	-	-	17	30	<10	0.03	0.2	0.2	150	-	3.5	100	20	<1	<1	<1	32	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	20/05/2021	9	220	7.27	-	<1	49	12.3	49	12.6	8.95	0.05	-	<1	3.78	-	17.5	-	45.6	-	-	15	30	<10	0.03	<0.1	<0.1	116	-	2	50	10	<1	<1	<1	28	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	16/06/2021	10.8	157	7.04	-	<1	52	9.02	52	12.4	5.5	0.066	-	<1	3.6	-	13.8	-	24.3	-	-	9	10	<10	0.01	0.2	0.2	95	-	4.1	150	30	<1	<1	<1	22	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	29/07/2021	12.7	231	7.35	-	<1	51	16	51	10.4	8.74	0.043	-	<1	4.33	-	17.8	-	43.1	-	<10	14	40	<10	0.04	-	0.2	188	12	14.6	420	70	<1	<1	<1	23	-	<1	<50	<50	<0.1	-
Wangcol Creek	NC01	25/08/2021	10.6	139	7.07	-	<1	36	9.6	36	4.98	4.67	0.084	-	<1	4.04	-	11.7	-	24	-	20	8	90	<10	0.09	-	0.7	113	17	53.6	1170	270	<1	<1	<1	16	-	<1	<50	<50	<0.1	-
	Count Detects		**12**	**12**	**12**	0	0	**12**	**12**	**12**	**12**	**12**	**12**	0	0	**12**	0	**12**	0	**12**	0	**1**	**8**	**10**	0	**10**	**9**	**11**	**12**	**2**	**12**	**12**	**12**	0	0	0	**12**	0	0	**1**	0	0	0
	Average		**8.7**	**213.25**		-	-	**48.7**	**13.16**	**48.7**	**10.656**	**7.72**	**0.0883**	-	-	**3.892**	-	**16.842**	-	**38.533**	-	**20**	**11.3**	**62**	-	**0.062**	**0.278**	**0.345**	**131.67**	**14.5**	**16.88**	**359.17**	**75**	-	-	-	**26**	-	-	**60**	-	-	-
	50th Percentile		**8.6**	**225.5**	**7.09**	-	-	**50**	**13.3**	**50**	**11.5**	**8.495**	**0.0855**	-	-	**3.84**	-	**16.95**	-	**39.7**	-	**20**	**11.5**	**35**	-	**0.035**	**0.2**	**0.3**	**116.5**	**14.5**	**10**	**275**	**60**	-	-	-	**27.5**	-	-	**60**	-	-	-
	90th Percentile		**10.8**	**263.6**	**7.35**	-	-	**52.9**	**15.95**	**52.9**	**12.69**	**9.832**	**0.0987**	-	-	**4.465**	-	**20.24**	-	**59.99**	-	**20**	**15.6**	**105**	-	**0.105**	**0.44**	**0.6**	**185.3**	**16.5**	**47.28**	**647**	**136**	-	-	-	**31.8**	-	-	**60**	-	-	-
	Minimum		**5.8**	**139**	**6.75**	-	-	**36**	**9.02**	**36**	**4.98**	**4.67**	**0.043**	-	-	**2.59**	-	**8.1**	-	**15.2**	-	**20**	**4**	**10**	-	**0.01**	**0.1**	**0.1**	**92**	**12**	**2**	**50**	**10**	-	-	-	**16**	-	-	**60**	-	-	-
	Maximum		**12.7**	**307**	**7.82**	-	-	**56**	**18.6**	**56**	**14.2**	**11.2**	**0.21**	-	-	**6.11**	-	**28**	-	**62.8**	-	**20**	**17**	**240**	-	**0.24**	**0.6**	**0.7**	**188**	**17**	**53.6**	**1170**	**270**	-	-	-	**33**	-	-	**60**	-	-	-

			Field Parameters				Major Anions and Cations													NA	Nutrients								Physical Parameters			Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)
			Dissolved Oxygen (Field)	Electrical Conductivity (Field)	pH (Field)	Temperature (Field)	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Carbonate Alkalinity (as CaCO3)	Chloride	Magnesium	Fluoride	Fluoride (Filtered)	Phenolphthalein Alkalinity (CaCO3)	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)	Oil & Grease	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)	Nitrite + Nitrate (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Total Dissolved Solids (TDS)	Total Suspended Solids (TSS)	Turbidity											
			mg/L	uS/cm	pH units	oC	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Surface Water				2200	6.5-8						350[#1]		1.5[#2]	1.5[#2]						1000[#3]									1500[#4]						24	24	700[#2]	700[#2]	100	370	370	0.85[#5]	0.85[#5]
Wangcol Creek at WX22 Pre-placement 90th Percentile				894	6.7-7.8						22		0.338	0.338						332									580						1	1	29	29	1	90	90	1	1
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																																									
Wangcol Creek (Stream Gauge)	WX22	16/09/2020	10.6	387	6.77	12.4	-	52	22.2	52	23.1	14.7	0.074	-	<1	6.03	5.54	35.6	32.3	81.1	-	-	-	150	<10	0.12	0.2	0.4	242	-	1.2	30	<10	-	<1	<1	17	15	-	<50	<50	<0.1	<0.1
Wangcol Creek (Stream Gauge)	WX22	21/10/2020	9.5	650	7.17	-	-	71	32.1	71	39.4	23.4	0.07	-	<1	5.9	-	54.2	-	165	-	-	-	70	<10	0.07	<0.1	<0.1	349	-	0.8	20	<10	-	<1	-	19	-	-	<50	-	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	25/11/2020	8.6	454	7.23	-	<1	85	25.8	85	21.6	17.2	0.058	-	<1	4.05	-	38.5	-	92.7	-	-	36	<10	<10	<0.01	0.2	0.2	300	-	3.53	160	<10	<1	<1	<1	11	-	<1	120	<50	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	27/11/2020	8.6	454	7.23	-	<1	98	25.1	98	22.8	16.9	0.097	-	<1	4.07	-	38.8	-	97.5	-	-	35	<10	<10	<0.01	0.2	0.2	308	-	1.7	50	10	<1	<1	<1	12	-	<1	<50	<50	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	16/12/2020	8.1	930	7.34	-	<1	116	49.2	116	79	38.3	0.173	-	<1	5.03	-	92.6	-	279	-	<10	84	<10	<10	<0.01	0.3	0.3	560	-	1.2	10	<10	<1	<1	<1	20	-	<1	80	80	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	7/01/2021	7.1	249	7.54	-	<1	67	14.6	67	12.9	8.99	0.152	-	<1	3.19	-	16.2	-	42.7	-	<10	12	<10	<10	<0.01	0.3	0.3	146	-	19.3	270	60	<1	<1	<1	10	-	<1	<50	<50	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	17/02/2021	7.6	495	7.54	-	<1	94	27.4	94	33.4	18.6	0.179	-	<1	5.6	-	41.3	-	99.3	-	<10	34	<10	<10	<0.01	<0.1	<0.1	324	-	1.4	<10	20	<1	<1	<1	14	-	<1	50	<50	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	25/03/2021	8.7	213	7.2	-	<1	38	15.3	38	12.4	8.28	0.11	-	<1	5.98	-	20	-	37	-	<10	15	<10	<10	<0.01	0.3	0.3	145	-	16.5	520	130	<1	<1	<1	12	-	<1	<50	<50	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	28/04/2021	9.1	649	7.15	-	<1	52	39.7	52	38.8	25.1	0.105	-	<1	6.05	-	50.8	-	224	-	<10	61	20	<10	0.02	0.1	0.1	475	-	1	10	<10	<1	<1	<1	29	-	<1	60	60	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	20/05/2021	9	704	7.12	-	<1	54	35.7	54	50.7	26.3	<0.1	-	<1	6.07	-	56	-	224	-	<10	72	20	<10	0.02	<0.1	<0.1	451	-	0.6	20	<10	<1	<1	<1	24	-	<1	60	70	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	16/06/2021	10.7	497	7.1	-	<1	64	27.6	64	37.7	20.2	0.121	-	<1	6.19	-	48.5	-	142	-	<10	54	<10	<10	<0.01	0.1	0.1	294	-	1	<10	<10	<1	<1	<1	12	-	<1	50	<50	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	29/07/2021	13.2	484	7.2	-	<1	47	24.2	47	32.4	18	0.052	-	<1	5.85	-	43.1	-	131	-	<10	43	20	<10	0.02	0.1	0.1	342	-	1.8	20	<10	<1	<1	<1	8	-	<1	<50	<50	<0.1	-
Wangcol Creek (Stream Gauge)	WX22	25/08/2021	10.9	224	6.99	-	<1	36	11.9	36	12	7.65	0.102	-	<1	4.56	-	20	-	51.7	-	<10	16	60	<10	0.06	0.4	0.5	139	-	57.1	900	180	<1	<1	<1	11	-	<1	<50	<50	<0.1	-
	Count Detects		**13**	**13**	**13**	**1**	**0**	**13**	**13**	**13**	**13**	**13**	**12**	**0**	**0**	**13**	**1**	**13**	**1**	**13**	**0**	**0**	**11**	**6**	**0**	**6**	**10**	**10**	**13**	**0**	**13**	**11**	**5**	**0**	**0**	**0**	**13**	**1**	**0**	**6**	**3**	**0**	**0**
	Average		**9.4**	**491.54**		**12.4**	**-**	**67.2**	**26.985**	**67.2**	**32.015**	**18.74**	**0.1078**	**-**	**-**	**5.275**	**5.54**	**42.738**	**32.3**	**128.23**	**-**	**-**	**42**	**56.667**	**-**	**0.0517**	**0.22**	**0.25**	**313.46**	**-**	**8.241**	**182.73**	**80**	**-**	**-**	**-**	**15.31**	**15**	**-**	**70**	**70**	**-**	**-**
	50th Percentile		**9.0**	**484**	**7.2**	**12.4**	**-**	**64**	**25.8**	**64**	**32**	**18**	**0.1035**	**-**	**-**	**5.85**	**5.54**	**41.3**	**32.3**	**99.3**	**-**	**-**	**36**	**40**	**-**	**0.04**	**0.2**	**0.25**	**308**	**-**	**1.4**	**30**	**60**	**-**	**-**	**-**	**12**	**15**	**-**	**60**	**70**	**-**	**-**
	90th Percentile		**10.9**	**693.2**	**7.5**	**12.4**	**-**	**97.2**	**38.9**	**97.2**	**48**	**26.06**	**0.1709**	**-**	**-**	**6.066**	**5.54**	**55.64**	**32.3**	**224**	**-**	**-**	**72**	**110**	**-**	**0.095**	**0.31**	**0.41**	**470.2**	**-**	**18.74**	**520**	**160**	**-**	**-**	**-**	**23.2**	**15**	**-**	**100**	**78**	**-**	**-**
	Minimum		**7.1**	**213**	**6.77**	**12.4**	**-**	**36**	**11.9**	**36**	**12**	**7.65**	**0.052**	**-**	**-**	**3.19**	**5.54**	**16.2**	**32.3**	**37**	**-**	**-**	**12**	**20**	**-**	**0.02**	**0.1**	**0.1**	**139**	**-**	**0.6**	**10**	**10**	**-**	**-**	**-**	**8**	**15**	**-**	**50**	**60**	**-**	**-**
	Maximum		**13.2**	**930**	**7.54**	**12.4**	**-**	**116**	**49.2**	**116**	**79**	**38.3**	**0.179**	**-**	**-**	**6.19**	**5.54**	**92.6**	**32.3**	**279**	**-**	**-**	**84**	**150**	**-**	**0.12**	**0.4**	**0.5**	**560**	**-**	**57.1**	**900**	**180**	**-**	**-**	**-**	**29**	**15**	**-**	**120**	**80**	**-**	**-**

Env Stds Comments
#1:Irrigation water; moderately tolerant crops.
#2:Drinking water
#3:Livestock
#4:Low land river conductivity; 0.68 x 2200 uS/cm.
#5:Adjusted for effects of hardness.
#6:Irrigation water; moderately tolerant crops. Note: Molybdenum drinking water Screening Level is 0.05 mg/L.
#7:Local guideline based upon 90th percentile pre-brine placement; Adjusted for effects of hardness

			Metals																										
			Chromium	Chromium (Filtered)	Chromium (Hexavalent)	Chromium (Trivalent)	Cobalt	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Phosphorus	Selenium	Selenium (Filtered)	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Surface Water			2[#5]	2[#5]				3.5[#5]	3.5[#5]	300[#2]	300[#2]	5[#5]	5[#5]	1900	1900	0.06	10[#6]	10[#6]	17[#5]	17[#5]		5	5	0.05				116[#7]	116[#7]
Wangcol Creek at WX22 Pre-placement 90th Percentile			1	1				1	1	281	281	1	1	720	720		1	1	5	5		1	1					116	116
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																											
Final Holding Pond Weir	LMP01	7/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	23/09/2020	<1	-	-	-	-	6	3	783	54	<1	-	76	23	<0.04	12	-	7	-	0.02	0.5	-	<1	0.072	<10	<10	31	14
Final Holding Pond Weir	LMP01	28/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	6/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	12/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	19/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	26/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	2/11/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	9/11/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	16/11/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	18/11/2020	<1	-	-	-	-	5	2	395	20	<1	-	168	50	<0.04	8	-	10	-	<0.01	1.4	-	<1	0.062	<10	<10	34	17
Final Holding Pond Weir	LMP01	23/11/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	7/12/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	14/12/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	16/12/2020	<1	-	<10	<10	<1	4	2	312	<50	<1	-	136	56	<0.04	11	-	6	4	0.01	0.4	-	<1	0.063	<10	<10	13	9
Final Holding Pond Weir	LMP01	21/12/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	4/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	7/01/2021	1	-	<10	<10	<1	6	3	1340	210	2	-	86	43	<0.04	8	-	8	5	0.06	<10	-	<1	0.039	<10	<10	28	9
Final Holding Pond Weir	LMP01	11/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	1/02/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	1/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	8/03/2021	<1	-	<10	<10	<1	4	2	200	<50	<1	-	71	15	<0.04	8	-	6	6	-	<10	-	<1	0.095	<10	<10	35	33
Final Holding Pond Weir	LMP01	6/04/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	3/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	7/06/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	5/07/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final Holding Pond Weir	LMP01	2/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Count Detects		**1**	**0**	**0**	**0**	**0**	**5**	**5**	**5**	**3**	**1**	**0**	**5**	**5**	**0**	**5**	**0**	**5**	**3**	**3**	**3**	**0**	**0**	**5**	**0**	**0**	**5**	**5**
	Average		**1**	**-**	**-**	**-**	**-**	**5**	**2.4**	**606**	**94.67**	**2**	**-**	**107.4**	**37.4**	**-**	**9.4**	**-**	**7.4**	**5**	**0.03**	**0.767**	**-**	**-**	**0.0662**	**-**	**-**	**28.2**	**16.4**
	50th Percentile		**1**	**-**	**-**	**-**	**-**	**5**	**2**	**395**	**54**	**2**	**-**	**86**	**43**	**-**	**8**	**-**	**7**	**5**	**0.02**	**0.5**	**-**	**-**	**0.063**	**-**	**-**	**31**	**14**
	90th Percentile		**1**	**-**	**-**	**-**	**-**	**6**	**3**	**1117.2**	**178.8**	**2**	**-**	**155.2**	**53.6**	**-**	**11.6**	**-**	**9.2**	**5.8**	**0.052**	**1.22**	**-**	**-**	**0.0858**	**-**	**-**	**34.6**	**26.6**
	Minimum		**1**	**-**	**-**	**-**	**-**	**4**	**2**	**200**	**20**	**2**	**-**	**71**	**15**	**-**	**8**	**-**	**6**	**4**	**0.01**	**0.4**	**-**	**-**	**0.039**	**-**	**-**	**13**	**9**
	Maximum		**1**	**-**	**-**	**-**	**-**	**6**	**3**	**1340**	**210**	**2**	**-**	**168**	**56**	**-**	**12**	**-**	**10**	**6**	**0.06**	**1.4**	**-**	**-**	**0.095**	**-**	**-**	**35**	**33**
Wangcol Creek	NC01	24/09/2020	<1	-	-	-	-	2	1	558	106	<1	-	111	104	<0.04	4	-	3	-	0.05	<0.2	-	<1	0.054	<10	<10	9	7
Wangcol Creek	NC01	22/10/2020	<1	-	-	-	-	1	<1	655	220	<1	-	209	196	<0.04	2	-	3	-	0.01	<0.2	-	<1	0.054	<10	<10	<5	<5
Wangcol Creek	NC01	19/11/2020	<1	-	-	-	-	3	<1	695	98	<1	-	277	164	<0.04	3	-	4	-	<0.01	0.4	-	<1	0.051	<10	<10	10	5
Wangcol Creek	NC01	16/12/2020	<1	-	<10	<10	<1	3	<1	622	200	<1	-	141	135	<0.04	1	-	2	2	<0.01	<0.2	-	<1	0.042	<10	<10	6	<5
Wangcol Creek	NC01	7/01/2021	<1	-	<10	<10	<1	2	1	1170	250	<1	-	166	<1	0.06	2	-	3	3	<0.02	0.2	-	<1	0.033	<10	<10	7	<5
Wangcol Creek	NC01	17/02/2021	<1	-	<10	<10	<1	<1	<1	620	180	<1	-	199	172	<0.04	2	-	2	2	0.01	0.3	-	<1	0.042	<10	<10	<5	5
Wangcol Creek	NC01	26/03/2021	<1	-	<10	<10	<1	2	<1	1020	160	<1	-	71	55	<0.04	2	-	4	3	0.02	1.6	-	<1	0.046	<10	<10	9	6
Wangcol Creek	NC01	28/04/2021	<1	-	<10	<10	<1	1	<1	580	160	<1	-	314	164	<0.04	<1	-	2	1	<0.01	<0.2	-	<1	0.053	<10	<10	5	<5
Wangcol Creek	NC01	20/05/2021	<1	-	<10	<10	<1	<1	<1	294	100	<1	-	119	116	<0.04	<1	-	1	<1	<0.01	<0.2	-	<1	0.048	<10	<10	<5	<5
Wangcol Creek	NC01	16/06/2021	<1	-	<10	<10	<1	1	<1	246	100	<1	-	72	75	<0.04	<1	-	1	<1	<0.01	<0.2	-	<1	0.033	<10	<10	6	6
Wangcol Creek	NC01	29/07/2021	<1	-	<10	<10	<1	2	1	408	80	<1	-	74	71	<0.04	<1	-	1	1	0.03	<0.2	-	<1	0.042	<10	<10	6	<5
Wangcol Creek	NC01	25/08/2021	1	-	<10	<10	<1	3	2	1520	220	1	-	32	31	<0.04	<1	-	3	3	0.06	0.3	-	<1	0.025	<10	<10	13	7
	Count Detects		**1**	**0**	**0**	**0**	**0**	**10**	**4**	**12**	**12**	**1**	**0**	**12**	**11**	**1**	**7**	**0**	**12**	**7**	**6**	**5**	**0**	**0**	**12**	**0**	**0**	**9**	**6**
	Average		**1**	**-**	**-**	**-**	**-**	**2**	**1.25**	**699**	**156.2**	**1**	**-**	**148.75**	**116.64**	**0.06**	**2.286**	**-**	**2.42**	**2.14**	**0.03**	**0.56**	**-**	**-**	**0.0436**	**-**	**-**	**7.889**	**6**
	50th Percentile		**1**	**-**	**-**	**-**	**-**	**2**	**1**	**621**	**160**	**1**	**-**	**130**	**116**	**0.06**	**2**	**-**	**2.5**	**2**	**0.025**	**0.3**	**-**	**-**	**0.044**	**-**	**-**	**7**	**6**
	90th Percentile		**1**	**-**	**-**	**-**	**-**	**3**	**1.7**	**1155**	**220**	**1**	**-**	**270.2**	**172**	**0.06**	**3.4**	**-**	**3.9**	**3**	**0.055**	**1.12**	**-**	**-**	**0.0539**	**-**	**-**	**10.6**	**7**
	Minimum		**1**	**-**	**-**	**-**	**-**	**1**	**1**	**246**	**80**	**1**	**-**	**32**	**31**	**0.06**	**1**	**-**	**1**	**1**	**0.01**	**0.2**	**-**	**-**	**0.025**	**-**	**-**	**5**	**5**
	Maximum		**1**	**-**	**-**	**-**	**-**	**3**	**2**	**1520**	**250**	**1**	**-**	**314**	**196**	**0.06**	**4**	**-**	**4**	**3**	**0.06**	**1.6**	**-**	**-**	**0.054**	**-**	**-**	**13**	**7**

			Metals																										
			Chromium	Chromium (Filtered)	Chromium (Hexavalent)	Chromium (Trivalent)	Cobalt	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Phosphorus	Selenium	Selenium (Filtered)	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Surface Water			2[#5]	2[#5]				3.5[#5]	3.5[#5]	300[#2]	300[#2]	5[#5]	5[#5]	1900	1900	0.06	10[#6]	10[#6]	17[#5]	17[#5]		5	5	0.05				116[#7]	116[#7]
Wangcol Creek at WX22 Pre-placement 90th Percentile			1	1				1	1	281	281	1	1	720	720		1	1	5	5		1	1					116	116
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																											
Wangcol Creek (Stream Gauge)	WX22	16/09/2020	<1	<1	-	-	-	1	<1	147	61	<1	<1	44	41	<0.04	<1	<1	12	9	<0.01	<0.2	<0.2	<1	0.085	<10	<10	5	<5
Wangcol Creek (Stream Gauge)	WX22	21/10/2020	<1	-	-	-	-	<1	<1	168	77	<1	-	174	165	<0.04	<1	-	28	-	<0.01	<0.2	-	<1	0.147	<10	<10	<5	6
Wangcol Creek (Stream Gauge)	WX22	25/11/2020	<1	-	<10	<10	<1	2	1	390	70	<1	-	131	123	<0.04	<1	-	16	16	<0.1	0.2	-	<1	0.1	<10	<10	6	7
Wangcol Creek (Stream Gauge)	WX22	27/11/2020	<1	-	-	-	1	<1	-	230	150	<1	-	230	231	<0.04	2	-	18	17	<0.01	<0.2	-	<1	0.109	<10	<10	7	6
Wangcol Creek (Stream Gauge)	WX22	16/12/2020	<1	-	<10	<10	2	2	<1	236	70	<1	-	444	421	<0.04	<1	-	47	46	<0.01	<0.2	-	<1	0.203	<10	<10	5	<5
Wangcol Creek (Stream Gauge)	WX22	7/01/2021	<1	-	<10	<10	<1	2	<1	514	170	<1	-	95	80	<0.04	<1	-	9	8	<0.01	<0.2	-	<1	0.054	<10	<10	<5	<5
Wangcol Creek (Stream Gauge)	WX22	17/02/2021	<1	-	<10	<10	<1	<1	<1	191	180	<1	-	374	376	<0.04	1	-	18	18	<0.01	0.3	-	<1	0.116	<10	<10	<5	<5
Wangcol Creek (Stream Gauge)	WX22	25/03/2021	<1	-	<10	<10	<1	1	<1	768	270	<1	-	69	41	<0.04	1	-	7	6	0.02	0.4	-	<1	0.05	<10	<10	7	<5
Wangcol Creek (Stream Gauge)	WX22	28/04/2021	<1	-	<10	<10	1	<1	<1	122	<50	<1	-	782	752	<0.04	<1	-	27	28	<0.01	<0.2	-	<1	0.154	<10	<10	8	8
Wangcol Creek (Stream Gauge)	WX22	20/05/2021	<1	-	<10	<10	2	<1	<1	124	<50	<1	-	483	494	<0.04	<1	-	34	32	<0.01	<0.2	-	<1	0.154	<10	<10	11	<5
Wangcol Creek (Stream Gauge)	WX22	16/06/2021	<1	-	<10	<10	<1	<1	<1	161	110	<1	-	116	113	<0.04	<1	-	20	20	<0.01	<0.2	-	<1	0.099	<10	<10	<5	8
Wangcol Creek (Stream Gauge)	WX22	29/07/2021	<1	-	-	-	<1	<1	-	221	80	<1	-	43	44	<0.04	<1	-	16	17	0.02	<0.2	-	<1	0.085	<10	<10	<5	8
Wangcol Creek (Stream Gauge)	WX22	25/08/2021	<1	-	-	-	<1	2	-	1450	180	<1	-	122	126	<0.04	<1	-	8	7	0.05	0.2	-	<1	0.044	<10	<10	9	<5
	Count Detects		**0**	**0**	**0**	**0**	**4**	**6**	**1**	**13**	**11**	**0**	**0**	**13**	**13**	**0**	**3**	**0**	**13**	**12**	**3**	**4**	**0**	**0**	**13**	**0**	**0**	**8**	**6**
	Average		**-**	**-**	**-**	**-**	**1.5**	**1.67**	**1**	**363.23**	**128.9**	**-**	**-**	**239**	**231.31**	**-**	**1.333**	**-**	**20**	**18.7**	**0.03**	**0.275**	**-**	**-**	**0.1077**	**-**	**-**	**7.25**	**7.167**
	50th Percentile		**-**	**-**	**-**	**-**	**1.5**	**2**	**1**	**221**	**110**	**-**	**-**	**131**	**126**	**-**	**1**	**-**	**18**	**17**	**0.02**	**0.25**	**-**	**-**	**0.1**	**-**	**-**	**7**	**7.5**
	90th Percentile		**-**	**-**	**-**	**-**	**2**	**2**	**1**	**717.2**	**180**	**-**	**-**	**475.2**	**479.4**	**-**	**1.8**	**-**	**32.8**	**31.6**	**0.044**	**0.37**	**-**	**-**	**0.154**	**-**	**-**	**9.6**	**8**
	Minimum		**-**	**-**	**-**	**-**	**1**	**1**	**1**	**122**	**61**	**-**	**-**	**43**	**41**	**-**	**1**	**-**	**7**	**6**	**0.02**	**0.2**	**-**	**-**	**0.044**	**-**	**-**	**5**	**6**
	Maximum		**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1450**	**270**	**-**	**-**	**782**	**752**	**-**	**2**	**-**	**47**	**46**	**0.05**	**0.4**	**-**	**-**	**0.203**	**-**	**-**	**11**	**8**

Env Stds Comments
#1:Irrigation water; moderately tolerant crops.
#2:Drinking water
#3:Livestock
#4:Low land river conductivity; 0.68 x 2200 uS/cm.
#5:Adjusted for effects of hardness.
#6:Irrigation water; moderately tolerant crops. Note: Molybdenum drinking wat
#7:Local guideline based upon 90th percentile pre-brine placement; Adjusted fo

			Field Parameters		TDS			Anions / Cations																
			Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Total Suspended Solids (TSS)	Turbidity	Carbonate (as CaCO3)	Total Alkalinity (as CaCO3)	Carbonate Alkalinity (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Phenolphthalein Alkalinity (CaCO3)	Calcium	Calcium (Filtered)	Chloride	Magnesium	Magnesium (Filtered)	Fluoride	Fluoride (Filtered)	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)
			uS/cm	pH units	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Environmental Goal			2200	6.5-8	1500										350			1.5	1.5					1000
EPL Discharge Limits for LDP12			500	6.5-8.5		50	25																	
Purpose	**LocCode**	**Sampled_Date-Time**																						
Upstream	LDP12	12/08/2020	454	7.47	-	8	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	13/08/2020	467	7.55	-	9.4	9.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	18/08/2020	476	7.66	-	4.4	3.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	19/08/2020	491	7.41	-	2	2.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	22/09/2020	475	7.07	-	11	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	18/12/2020	406	7.49	-	6.333	9.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	21/12/2020	421	7.64	-	3.4	7.66	-	-	-	-	-	-	-	12.7	-	-	0.123	-	-	-	-	-	152
Upstream	LDP12	11/01/2021	307	7.78	-	15.33	21	-	-	-	-	-	-	-	10.3	-	-	0.08	-	-	-	-	-	78.7
Upstream	LDP12	12/01/2021	317	7.89	-	6.4	7.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	11/02/2021	353	7.68	-	10.6	12.6	-	-	-	-	-	8.2	7.6	-	3.81	3.56	-	-	4.67	3.72	48.5	45.9	-
Upstream	LDP12	9/03/2021	426	7.97	252	6.4	9.34	-	-	-	-	-	10.9	11	-	4.59	4.77	-	-	7.54	7.76	75.6	76.8	-
Upstream	LDP12	29/07/2021	414	7.61	288	11.2	15.9	-		73.44	73.44	0	8.4	-	26.7	3.57		-	0.085	5.94		63.7		72.3
Upstream	LDP12_CSP	3/08/2020	564	6.88	-	-	5.8	-	-	-	-	-	16	38.4	7.54	9.42	-	0.107	-	5.73	-	81.5	-	165
Upstream	LDP12_CSP	10/08/2020	416	7.89	-	-	344	-	-	-	-	-	-	-	5.12	-	-	0.122	-	-	-	-	-	135
Upstream	LDP12_CSP	17/08/2020	491	7.92	-	-	6.9	-	-	-	-	-	-	-	6.21	-	-	0.11	-	-	-	-	-	164
Upstream	LDP12_CSP	24/08/2020	516	9.97	-	18	23.5	-	-	-	-	-	-	-	7.76	-	-	0.108	-	-	-	-	-	207
Upstream	LDP12_CSP	31/08/2020	617	6.72	-	14.5	18.3	-	-	-	-	-	-	-	10.7	-	-	0.121	-	-	-	-	-	300
Upstream	LDP12_CSP	7/09/2020	754	4.82	-	10.4	7.77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	14/09/2020	594	7.3	-	8	7.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	18/09/2020	575	7	-	2.4	3.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	21/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	11.7	-	-	0.091	-	-	-	-	-	177
Upstream	LDP12_CSP	28/09/2020	549	5.93	-	11.8	8.39	-	-	-	-	-	-	-	16.7	-	-	0.087	-	-	-	-	-	282
Upstream	LDP12_CSP	6/10/2020	556	8.34	-	34.8	40.5	-	-	-	-	-	25.5	55.7	28.1	16	-	0.157	-	5.78	-	65	-	264
Upstream	LDP12_CSP	12/10/2020	557	6.95	-	1	2.37	-	-	-	-	-	-	-	13.5	-	-	0.113	-	-	-	-	-	216
Upstream	LDP12_CSP	19/10/2020	586	8.07	-	2.8	5.58	-	-	-	-	-	-	-	18.5	-	-	0.135	-	-	-	-	-	284
Upstream	LDP12_CSP	26/10/2020	419	7.1	-	36.4	51.9	-	-	-	-	-	20.6	21	6.34	11	13	<0.05	-	5.23	8.88	48.1	55.6	170
Upstream	LDP12_CSP	2/11/2020	420	7.03	-	3.6	2.4	-	-	-	-	-	16.9	44.7	8.76	9.61	10.3	0.056	-	5.33	5.58	46.9	48.2	198
Upstream	LDP12_CSP	9/11/2020	425	7.51	-	2.667	3.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	23/11/2020	-	-	-	-	14.7	-	-	-	-	-	-	-	7.24	-	-	0.067	-	-	-	-	-	313
Upstream	LDP12_CSP	30/11/2020	444	7.21	-	7.6	8.97	-	-	-	-	-	-	-	5.72	-	-	0.117	-	-	-	-	-	199
Upstream	LDP12_CSP	7/12/2020	399	7.78	-	26.5	88.1	-	-	-	-	-	27.4	50.4	4.6	14	-	0.063	-	7.42	-	52.2	-	146
Upstream	LDP12_CSP	14/12/2020	412	7.94	-	9	45.6	-	-	-	-	-	-	-	4.68	-	-	0.109	-	-	-	-	-	118
Upstream	LDP12_CSP	4/01/2021	329	8.05	-	19.5	93.1	-	-	-	-	-	12.1	29	10.6	5.34	-	0.085	-	4.04	-	36.4	-	93.2
Upstream	LDP12_CSP	6/01/2021	277	7.06	-	42.5	116	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	7/01/2021	-	-	-	-	78.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	18/01/2021	643	8.22	-	2335	4616	-	-	-	-	-	-	-	24.6	-	-	0.108	-	-	-	-	-	185
Upstream	LDP12_CSP	25/01/2021	760	7.63	-	117.2	96.8	-	-	-	-	-	-	-	21.2	-	-	0.117	-	-	-	-	-	255
Upstream	LDP12_CSP	1/02/2021	411	8.17	-	188	552	-	-	-	-	-	16.6	36.2	8.57	6.57	-	0.302	-	6.6	-	52.4	-	128
Upstream	LDP12_CSP	8/02/2021	327	8.19	-	666	1484	-	-	-	-	-	-	-	9.22	-	-	0.288	-	-	-	-	-	82.2
Upstream	LDP12_CSP	9/02/2021	338	7.82	-	10	36.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	15/02/2021	382	8.29	-	346	766	-	-	-	-	-	-	-	14.3	-	-	0.207	-	-	-	-	-	95
Upstream	LDP12_CSP	22/02/2021	429	8.71	-	25.4	51.4	-	-	-	-	-	-	-	29	-	-	0.103	-	-	-	-	-	110
Upstream	LDP12_CSP	1/03/2021	442	8.38	-	56	117	-	-	76.38	76.38	0	10.6	25.5	25.5	4.43	-	0.164	-	6.52	-	69.1	-	101
Upstream	LDP12_CSP	8/03/2021	217	8.14	-	10.2	34.4	-	-	-	-	-	-	-	31.1	-	-	0.194	-	-	-	-	-	119
Upstream	LDP12_CSP	15/03/2021	306	8.21	-	875	4244	-	-	-	-	-	-	-	25.44	-	-	-	0.216	-	-	-	-	89.22
Upstream	LDP12_CSP	18/03/2021	384	7.22	-	24	41.3	-	-	-	-	-	8.11	7.65	-	3.11	3.04	-	-	5.98	5.44	60.9	57.4	-
Upstream	LDP12_CSP	19/03/2021	377	7.55	-	25.6	33.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	22/03/2021	353	8.02	-	30.8	43.5	-	-	-	-	-	-	-	35.22	-	-	-	0.142	-	-	-	-	66.34
Upstream	LDP12_CSP	23/03/2021	-	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	25/03/2021	366	7.44	-	43	218	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	29/03/2021	436	8.44	-	3	22.6	-	-	-	-	-	-	-	42.07	-	-	-	0.119	-	-	-	-	61.7
Upstream	LDP12_CSP	6/04/2021	620	8.34	-	8.2	128	-	-	129.6	129.6	0	11.6	27.2	38.4	5	-	0.115	-	8.55	-	99.8	-	117
Upstream	LDP12_CSP	12/04/2021	667	8.37	-	202	314	-	-	-	-	-	-	-	65.21	-	-	-	0.181	-	-	-	-	140.5
Upstream	LDP12_CSP	19/04/2021	699	8.55	-	14.8	150	-	-	-	-	-	-	-	37.12	-	-	-	0.224	-	-	-	-	168.6
Upstream	LDP12_CSP	26/04/2021	756	8.51	-	18	158	-	-	-	-	-	-	-	42.64	-	-	-	0.208	-	-	-	-	183.2
Upstream	LDP12_CSP	3/05/2021	793	8.49	-	3.667	31.7	-	-	177.9	177.9	0	10.8	26.7	42.8	5.99	-	0.262	-	9.46	-	134	-	195
Upstream	LDP12_CSP	10/05/2021	712	8.57	-	60	277	-	-	-	-	-	-	-	30.1	-	-	-	0.285	-	-	-	-	184.6
Upstream	LDP12_CSP	17/05/2021	700	8.7	-	158	821	-	-	-	-	-	-	-	50.16	-	-	-	0.26	-	-	-	-	214.2
Upstream	LDP12_CSP	24/05/2021	705	8.72	-	-0.4	-	-	-	-	-	-	-	-	-	-	-	-	0.287	-	-	-	-	145.5
Upstream	LDP12_CSP	31/05/2021	695	8.58	-	18	92	-	-	-	-	-	-	-	40.13	-	-	-	0.3	-	-	-	-	157.6
Upstream	LDP12_CSP	7/06/2021	592	8.32	-	228	995	-	-	119.3	119.3	0	11.9	25	31.3	4.81	-	0.192	-	9.71	-	103	-	136
Upstream	LDP12_CSP	15/06/2021	558	8.35	-	91.67	255	-	-	-	-	-	-	-	25.08	-	-	-	0.198	-	-	-	-	149.6
Upstream	LDP12_CSP	21/06/2021	540	8.28	-	246	711	-	-	-	-	-	-	-	32.1	-	-	-	0.203	-	-	-	-	158.2
Upstream	LDP12_CSP	28/06/2021	521	8.16	-	160	870	-	-	-	-	-	-	-	20.06	-	-	-	0.208	-	-	-	-	136.6
Upstream	LDP12_CSP	1/07/2021	562	8.22	-	94.8	162	-		-	-	-	-	-	-	-		-	-	-		-		-
Upstream	LDP12_CSP	5/07/2021	520	8.54	-	17.33	103	-		-	-	-	-	-	-	-		-	-	-		-		-
Upstream	LDP12_CSP	1/07/2021	562	8.22	-	94.8		-		-	-	-	-	-	-	-		-	-	-		-		-
Upstream	LDP12_CSP	5/07/2021	520	8.54	-	17.33	103	-		98.94	98.94	0	8.58	20.8	34.7	3.62		0.112	-	7.99		90.3		114
Upstream	LDP12_CSP	12/07/2021	542	8.51	-	27	150	-		-	-	-	-	-	31.65	-		-	0.2	-		-		115.5
Upstream	LDP12_CSP	19/07/2021	460	8.38	-	588	1630	-		-	-	-	-	-	64.29	-		-	0.208	-		-		179.6
Upstream	LDP12_CSP	26/07/2021	440	8.17	-	798	2324	-		-	-	-	-	-	23.74	-		-	0.182	-		-		127.5
Upstream	LDP12_CSP	29/07/2021	410	7.92	-	20	29.1	-		-	-	-	-	-	-	-		-	-	-		-		-
Upstream	LDP12_CSP	2/08/2021	511	8.41	-	49	109	-		99.96	99.96	0	13.5	33.2	26.7	6.57		0.125	-	7.52		74.6		116

Note: LDP12 in EPL 13007. LDP12_CSP is representative sample when not discharging - EPL discharge limits and Environmental Goals do not apply.

			Nutrients						Metals																															
			Nitrate	Nitrite (as NO_2-)	Nitrite (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Phosphorus	Aluminium	Aluminium (Filtered)	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)	Chromium	Chromium (Filtered)	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Selenium	Selenium (Filtered)	Silver	Silver (Filtered)	Zinc	Zinc (Filtered)
			µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal											24	24	700	700	100	370	370	0.85	0.85	2	2	3.5	3.5	300	300	5	5	1900	1900	0.06	10	10	17	17	5	5	0.05	0.05	116	116
EPL Discharge Limits for LDP12																																								
Purpose	**LocCode**	**Sampled_Date-Time**																																						
Upstream	LDP12	12/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	13/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	18/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	19/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	22/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	18/12/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	21/12/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	11/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	12/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12	11/02/2021	-	-	-	-	-	-	920	60	<1	<1	11	10	-	<50	<50	<0.1	<0.1	<1	-	<1	<1	70	<50	<1	<1	38	41	<0.04	3	-	2	1	<10	<10	<1	-	6	<5
Upstream	LDP12	9/03/2021	-	-	-	-	-	-	900	20	<1	<1	14	13	-	<50	60	0.1	<0.1	<1	-	<1	<1	110	<50	<1	<1	48	48	<0.04	5	-	2	2	<10	<10	<1	-	<5	<5
Upstream	LDP12	29/07/2021	370	<10			0.7	0.02	300	<10	<1	<1	10		<1	<50	<50	<0.1		<1		<1	<1	130	<50	<1		86	84	<0.04	6		3	3	<10		<1		11	9
Upstream	LDP12_CSP	3/08/2020	280	20	-	-	0.5	<0.01	100	<10	<1	<1	14	-	<1	50	60	0.6	-	<1	-	4	<1	57	<2	<1	-	379	365	<0.04	6	-	46	38	5.5	-	<1	-	165	95
Upstream	LDP12_CSP	10/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	17/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	24/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	31/08/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	7/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	14/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	18/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	21/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	28/09/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	6/10/2020	340	<10	-	-	0.7	<0.01	330	<10	<1	<1	24	-	<1	<50	<50	1.9	-	<1	-	7	<1	494	<2	<1	-	810	729	-	2	-	85	70	3.5	-	<1	-	311	231
Upstream	LDP12_CSP	12/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	19/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	26/10/2020	-	-	-	-	-	-	660	10	<1	<1	20	15	-	<50	<50	1.9	1.8	<1	-	3	5	422	6	1	<1	541	518	<0.04	2	-	97	92	4.1	4.1	<1	-	583	529
Upstream	LDP12_CSP	2/11/2020	320	<10	-	-	0.4	<0.01	300	60	<1	<1	14	14	<1	<50	<50	1.1	1.2	<1	-	<1	<1	21	<2	<1	<1	433	432	<0.04	3	-	62	58	3.7	3.5	<1	-	291	256
Upstream	LDP12_CSP	9/11/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	23/11/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	30/11/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	7/12/2020	420	10	-	-	0.7	<0.02	320	20	<1	<1	18	-	<1	<50	<50	0.7	-	<1	-	1	<1	500	<50	1	-	418	409	-	2	-	31	24	<10	-	<1	-	102	75
Upstream	LDP12_CSP	14/12/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	4/01/2021	340	<10	-	-	0.9	0.06	1230	20	<1	<1	13	-	<1	<50	<50	0.2	-	<1	-	2	<1	610	<50	2	-	222	191	-	4	-	12	9	<10	-	<1	-	29	14
Upstream	LDP12_CSP	6/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	7/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	18/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	25/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	1/02/2021	430	20	-	-	1.6	0.12	3890	10	2	<1	36	-	<1	<50	<50	0.2	-	3	-	5	<1	2630	<50	11	-	186	103	-	5	-	12	4	<10	-	<1	-	66	9
Upstream	LDP12_CSP	8/02/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	9/02/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	15/02/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	22/02/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	1/03/2021	480	<10	-	-	0.7	0.03	990	10	<1	<1	18	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	500	<50	2	-	79	50	-	4	-	4	2	<10	-	<1	-	13	<5
Upstream	LDP12_CSP	8/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	15/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	18/03/2021	-	-	-	-	-	-	6740	620	<1	<1	13	11	-	<50	<50	<0.1	<0.1	<1	-	<1	<1	150	<50	<1	<1	62	58	<0.04	2	-	3	3	<10	<10	<1	-	<5	<5
Upstream	LDP12_CSP	19/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	22/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	23/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	25/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	29/03/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	6/04/2021	350	<10	-	-	0.8	0.03	1840	<10	<1	<1	23	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	698	<2	2	-	112	66	-	4	-	4	2	<10	-	<1	-	24	<5
Upstream	LDP12_CSP	12/04/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	19/04/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	26/04/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	3/05/2021	420	<10	-	-	0.8	<0.01	410	<10	<1	<1	19	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	155	18	<1	-	66	44	-	10	-	4	3	<10	-	<1	-	9	8
Upstream	LDP12_CSP	10/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	17/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	24/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	31/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	7/06/2021	410	<10	-	-	3.3	0.29	4650	10	2	<1	43	-	<1	<50	<50	0.2	-	2	-	5	<1	4170	<50	15	-	183	67	-	10	-	12	3	<10	-	<1	-	112	6
Upstream	LDP12_CSP	15/06/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	21/06/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	28/06/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP12_CSP	1/07/2021	-	-			-	-	-	-	-	-	-		-	-	-	-		-		-	-	-	-	-	-	-	-		-	-	-		-		-	-	-
Upstream	LDP12_CSP	5/07/2021	-	-			-	-	-	-	-	-	-		-	-	-	-		-		-	-	-	-	-	-	-	-		-	-	-		-		-	-	-
Upstream	LDP12_CSP	1/07/2021	-	-			-	-	-	-	-	-	-		-	-	-	-		-		-	-	-	-	-	-	-	-		-	-	-		-		-	-	-
Upstream	LDP12_CSP	5/07/2021	410	<10			0.9	0.04	830	<10	<1	<1	16		<1	<50	<50	<0.1		<1		<1	<1	442	<2	2		79	63	-	9		4	3	<10		<1		15	<5
Upstream	LDP12_CSP	12/07/2021	-	-			-	-	-	-	-	-	-		-	-	-	-		-		-	-	-	-	-	-	-	-		-	-	-		-		-	-	-
Upstream	LDP12_CSP	19/07/2021	-	-			-	-	-	-	-	-	-		-	-	-	-		-		-	-	-	-	-	-	-	-		-	-	-		-		-	-	-
Upstream	LDP12_CSP	26/07/2021	-	-			-	-	-	-	-	-	-		-	-	-	-		-		-	-	-	-	-	-	-	-		-	-	-		-		-	-	-
Upstream	LDP12_CSP	29/07/2021	-	-			-	-	-	-	-	-	-		-	-	-	-		-		-	-	-	-	-	-	-	-		-	-	-		-		-	-	-
Upstream	LDP12_CSP	2/08/2021	360	<10			0.8	0.02	860	<10	<1	<1	17		<1	<50	<50	<0.1		<1		<1	<1	540	<2	2		275	240	-	7		5	3	<10		<1		18	<5
Note: LDP12 in EPL 13007. LDP12_CSP is representative sample wh																																							

APPENDIX C TABULATED GROUNDWATER DATA

			Field Parameters				Major Anions and Cations												Nutrients			
			Dissolved Oxygen (Field)	Electrical Conductivity (Field)	pH (Field)	Purge Volume	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Carbonate Alkalinity (as CaCO3)	Chloride	Magnesium	Fluoride	Phenolphthalein Alkalinity (CaCO3)	Potassium	Sodium	Sulfate (as SO4)	Total Alkalinity (as CaCO3)	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)
			mg/L	uS/cm	pH units	L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L
Environmental Goal - Groundwater				2600[#1]	6.5-8						350		1.5				1000					
Groundwater Collection Basin Pre-placement 90th Percentile				1576							31.5		0.435				824					
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																				
Centennial Coal leased area south of LNAR	D15	16/09/2020	-	3280	5.11	23	-	-	210	17	145	96.7	<0.5	-	42.5	377	1480	-	-	-	-	-
Centennial Coal leased area south of LNAR	D15	26/11/2020	-	3220	5.13	23	<1	12	198	12	228	90.9	<0.5	-	38.7	388	1680	-	<100	-	<10	<10
Centennial Coal leased area south of LNAR	D15	24/06/2021	2.8	2790	5	5	<1	16	176	16	138	74.8	<0.5	<1	38.8	335	1460	-	430	460	80	<10
	Count Detects		**1**	**3**	**3**	**3**	**0**	**2**	**3**	**3**	**3**	**3**	**0**	**0**	**3**	**3**	**3**	**0**	**1**	**1**	**1**	**0**
	Average		**2.8**	**3097**		**17**	**-**	**14**	**195**	**15**	**170**	**87**	**-**	**-**	**40**	**367**	**1540**	**-**	**430**	**460**	**80**	**-**
	50th Percentile		**2.8**	**3220**	**5.11**	**23**	**-**	**14**	**198**	**16**	**145**	**91**	**-**	**-**	**39**	**377**	**1480**	**-**	**430**	**460**	**80**	**-**
	90th Percentile		**2.8**	**3268**	**5.13**	**23**	**-**	**16**	**208**	**17**	**211**	**96**	**-**	**-**	**42**	**386**	**1640**	**-**	**430**	**460**	**80**	**-**
	Minimum		**2.8**	**2790**	**5.00**	**5**	**-**	**12**	**176**	**12**	**138**	**75**	**-**	**-**	**39**	**335**	**1460**	**-**	**430**	**460**	**80**	**-**
	Maximum		**2.8**	**3280**	**5.13**	**23**	**-**	**16**	**210**	**17**	**228**	**97**	**-**	**-**	**43**	**388**	**1680**	**-**	**430**	**460**	**80**	**-**
Centennial Coal leased area south of LNAR	D16	16/09/2020	-	2120	6.27	147	-	-	275	199	99.2	101	<0.2	-	31.9	59.1	779	-	-	-	-	-
Centennial Coal leased area south of LNAR	D16	26/11/2020	11.7	2080	6.28	143	<1	201	278	201	110	99.3	0.063	-	29.4	46.8	883	-	400	280	<10	<10
Centennial Coal leased area south of LNAR	D16	15/04/2021	1.3	2160	6.31	146	<1	201	305	201	123	104	0.227	<1	31.6	54.2	958	-	330	303	<10	<10
Centennial Coal leased area south of LNAR	D16	23/06/2021	1.1	2000	6.34	142	<1	217	280	217	104	96.3	<0.2	<1	31.2	41.9	850	-	320	270	<10	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**4**	**4**	**4**	**2**	**0**	**4**	**4**	**4**	**0**	**3**	**3**	**0**	**0**
	Average		**4.7**	**2090**		**145**	**-**	**206**	**285**	**205**	**109**	**100**	**0**	**-**	**31**	**51**	**868**	**-**	**350**	**284**	**-**	**-**
	50th Percentile		**1.3**	**2100**	**6.30**	**145**	**-**	**201**	**279**	**201**	**107**	**100**	**0**	**-**	**31**	**51**	**867**	**-**	**330**	**280**	**-**	**-**
	90th Percentile		**9.6**	**2148**	**6.33**	**147**	**-**	**214**	**298**	**212**	**119**	**103**	**0**	**-**	**32**	**58**	**936**	**-**	**386**	**298**	**-**	**-**
	Minimum		**1.1**	**2000**	**6.27**	**142**	**-**	**201**	**275**	**199**	**99**	**96**	**0**	**-**	**29**	**42**	**779**	**-**	**320**	**270**	**-**	**-**
	Maximum		**11.7**	**2160**	**6.34**	**147**	**-**	**217**	**305**	**217**	**123**	**104**	**0**	**-**	**32**	**59**	**958**	**-**	**400**	**303**	**-**	**-**
Centennial Coal leased area south of LNAR	D17	16/09/2020	-	3520	6.12	38	-	-	225	116	187	143	<0.5	-	26.4	332	1400	-	-	-	-	-
Centennial Coal leased area south of LNAR	D17	26/11/2020	11.4	3360	6.06	36	<1	107	233	107	210	145	<0.5	-	24.6	339	1630	-	<100	505	<10	<10
Centennial Coal leased area south of LNAR	D17	15/04/2021	0.9	3170	6.11	39	<1	138	226	138	189	134	0.368	<1	24.9	294	1520	-	120	485	10	<10
Centennial Coal leased area south of LNAR	D17	23/06/2021	1.1	3060	6.1	34	<1	145	240	145	176	134	<0.5	<1	25.7	271	1410	-	110	466	<10	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**4**	**4**	**4**	**1**	**0**	**4**	**4**	**4**	**0**	**2**	**3**	**1**	**0**
	Average		**4**	**3278**		**36.75**	**-**	**130**	**231**	**127**	**191**	**139**	**0**	**-**	**25**	**309**	**1490**	**-**	**115**	**485**	**10**	**-**
	50th Percentile		**1**	**3265**	**6.11**	**37**	**-**	**138**	**230**	**127**	**188**	**139**	**0**	**-**	**25**	**313**	**1465**	**-**	**115**	**485**	**10**	**-**
	90th Percentile		**9**	**3472**	**6.12**	**38.7**	**-**	**144**	**238**	**143**	**204**	**144**	**0**	**-**	**26**	**337**	**1597**	**-**	**119**	**501**	**10**	**-**
	Minimum		**1**	**3060**	**6.06**	**34**	**-**	**107**	**225**	**107**	**176**	**134**	**0**	**-**	**25**	**271**	**1400**	**-**	**110**	**466**	**10**	**-**
	Maximum		**11**	**3520**	**6.12**	**39**	**-**	**145**	**240**	**145**	**210**	**145**	**0**	**-**	**26**	**339**	**1630**	**-**	**120**	**505**	**10**	**-**
Centennial Coal leased area south of LNAR	D18	17/09/2020	-	680	6.67	26	-	-	81	380	7.53	30.2	0.457	-	20.3	17.4	7.42	-	-	-	-	-
Centennial Coal leased area south of LNAR	D18	26/11/2020	11.3	670	6.67	17	<1	388	75.9	388	77.7	28.9	3.04	-	18	16.4	88.7	-	<100	3	220	10
Centennial Coal leased area south of LNAR	D18	15/04/2021	2.9	670	6.74	32	<1	362	77.5	362	8.77	27.1	0.274	<1	18.3	17.7	11.2	-	80	4	100	<10
Centennial Coal leased area south of LNAR	D18	25/06/2021	1.9	670	6.73	12	<1	370	83.3	370	8	29	0.501	<1	20.2	18.5	10	-	80	3	100	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**4**	**4**	**4**	**4**	**0**	**4**	**4**	**4**	**0**	**2**	**3**	**3**	**1**
	Average		**5.4**	**673**		**22**	**-**	**373**	**79**	**375**	**26**	**29**	**1**	**-**	**19**	**18**	**29**	**-**	**80**	**3**	**140**	**10**
	50th Percentile		**2.9**	**670**	**6.70**	**22**	**-**	**370**	**79**	**375**	**8**	**29**	**0**	**-**	**19**	**18**	**11**	**-**	**80**	**3**	**100**	**10**
	90th Percentile		**9.6**	**677**	**6.74**	**30**	**-**	**384**	**83**	**386**	**57**	**30**	**2**	**-**	**20**	**18**	**65**	**-**	**80**	**4**	**196**	**10**
	Minimum		**1.9**	**670**	**6.67**	**12**	**-**	**362**	**76**	**362**	**8**	**27**	**0**	**-**	**18**	**16**	**7**	**-**	**80**	**3**	**100**	**10**
	Maximum		**11.3**	**680**	**6.74**	**32**	**-**	**388**	**83**	**388**	**78**	**30**	**3**	**-**	**20**	**19**	**89**	**-**	**80**	**4**	**220**	**10**
Downgradient of LNAR	D19	16/09/2020	-	4140	6.04	18	-	-	121	-	244	108	<0.5	-	73.1	568	1690	155	-	-	-	-
Downgradient of LNAR	D19	26/11/2020	11.2	4140	6.04	16	<1	167	134	167	267	121	<0.5	-	77.6	641	1900	-	100	609	<10	<10
Downgradient of LNAR	D19	15/04/2021	1.4	3930	6.08	18	<1	164	131	164	252	113	0.453	<1	71.8	557	1690	-	250	565	<100	<100
Downgradient of LNAR	D19	24/06/2021	1.5	4120	6.04	15	<1	181	155	181	266	132	<0.5	<1	84.1	578	1930	-	260	604	<10	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**3**	**4**	**4**	**1**	**0**	**4**	**4**	**4**	**1**	**3**	**3**	**0**	**0**
	Average		**4.7**	**4083**		**17**	**-**	**171**	**135**	**171**	**257**	**119**	**0**	**-**	**77**	**586**	**1803**	**155**	**203**	**593**	**-**	**-**
	50th Percentile		**1.5**	**4130**	**6.04**	**17**	**-**	**167**	**133**	**167**	**259**	**117**	**0**	**-**	**75**	**573**	**1795**	**155**	**250**	**604**	**-**	**-**
	90th Percentile		**9.3**	**4140**	**6.07**	**18**	**-**	**178**	**149**	**178**	**267**	**129**	**0**	**-**	**82**	**622**	**1921**	**155**	**258**	**608**	**-**	**-**
	Minimum		**1.4**	**3930**	**6.04**	**15**	**-**	**164**	**121**	**164**	**244**	**108**	**0**	**-**	**72**	**557**	**1690**	**155**	**100**	**565**	**-**	**-**
	Maximum		**11.2**	**4140**	**6.08**	**18**	**-**	**181**	**155**	**181**	**267**	**132**	**0**	**-**	**84**	**641**	**1930**	**155**	**260**	**609**	**-**	**-**
Downgradient of LNAR, adjacent to Wangcol Creek	D8	17/09/2020	-	358	5.58	58	-	-	25	14	14.4	18	<0.05	-	3.11	15.1	123	-	-	-	-	-
Downgradient of LNAR, adjacent to Wangcol Creek	D8	26/11/2020	11.9	211	5.49	50	<1	12	15.1	12	4.73	11	<0.02	-	2.36	5.72	94.3	-	<100	25	20	<10
Downgradient of LNAR, adjacent to Wangcol Creek	D8	15/04/2021	5.4	474	5.72	50	<1	14	95.4	14	23.3	81	0.037	<1	16.7	181	169	-	40	242	10	<10
Downgradient of LNAR, adjacent to Wangcol Creek	D8	25/06/2021	6.1	477	5.53	42	<1	13	29.5	13	25.2	21.1	<0.05	<1	4.16	30.9	172	-	10	53	40	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**4**	**4**	**4**	**1**	**0**	**4**	**4**	**4**	**0**	**2**	**3**	**3**	**0**
	Average		**8**	**380**		**50**	**-**	**13**	**41**	**13**	**17**	**33**	**0**	**-**	**7**	**58**	**140**	**-**	**25**	**107**	**23**	**-**
	50th Percentile		**6**	**416**	**5.56**	**50**	**-**	**13**	**27**	**14**	**19**	**20**	**0**	**-**	**4**	**23**	**146**	**-**	**25**	**53**	**20**	**-**
	90th Percentile		**11**	**476**	**5.68**	**56**	**-**	**14**	**76**	**14**	**25**	**63**	**0**	**-**	**13**	**136**	**171**	**-**	**37**	**204**	**36**	**-**
	Minimum		**5**	**211**	**5.49**	**42**	**-**	**12**	**15**	**12**	**5**	**11**	**0**	**-**	**2**	**6**	**94**	**-**	**10**	**25**	**10**	**-**
	Maximum		**12**	**477**	**5.72**	**58**	**-**	**14**	**95**	**14**	**25**	**81**	**0**	**-**	**17**	**181**	**172**	**-**	**40**	**242**	**40**	**-**
Downgradient of LNAR, adjacent to Wangcol Creek	D9	16/09/2020	-	8410	6.08	19	-	-	629	126	925	488	<1	-	68.5	944	3480	-	-	-	-	-
Downgradient of LNAR, adjacent to Wangcol Creek	D9	25/11/2020	10.2	9900	6.15	17	<1	78	665	78	1260	520	0.045	-	79.5	1240	4600	-	200	1720	<10	<10

			Field Parameters				Major Anions and Cations												Nutrients			
			Dissolved Oxygen (Field)	Electrical Conductivity (Field)	pH (Field)	Purge Volume	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Carbonate Alkalinity (as CaCO3)	Chloride	Magnesium	Fluoride	Phenolphthalein Alkalinity (CaCO3)	Potassium	Sodium	Sulfate (as SO4)	Total Alkalinity (as CaCO3)	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)
			mg/L	uS/cm	pH units	L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L
Environmental Goal - Groundwater				2600[#1]	6.5-8						350		1.5				1000					
Groundwater Collection Basin Pre-placement 90th Percentile				1576							31.5		0.435				824					
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																				
Downgradient of LNAR, adjacent to Wangcol Creek	D9	14/04/2021	1.6	8620	6.07	20	<1	122	621	122	1080	459	3.24	<1	71.1	1020	4270	-	320	1360	<100	<100
Downgradient of LNAR, adjacent to Wangcol Creek	D9	23/06/2021	2.8	10,330	6.1	16	<1	158	665	158	1390	579	<1	<1	105	1360	5140	-	310	1850	20	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**4**	**4**	**4**	**2**	**0**	**4**	**4**	**4**	**0**	**3**	**3**	**1**	**0**
	Average		**4.8667**	**9315**		**18**	**-**	**119**	**645**	**121**	**1164**	**512**	**2**	**-**	**81**	**1141**	**4373**	**-**	**277**	**1643**	**20**	**-**
	50th Percentile		**2.8**	**9260**	**6.09**	**18**	**-**	**122**	**647**	**124**	**1170**	**504**	**2**	**-**	**75**	**1130**	**4435**	**-**	**310**	**1720**	**20**	**-**
	90th Percentile		**8.72**	**10201**	**6.14**	**20**	**-**	**151**	**665**	**148**	**1351**	**561**	**3**	**-**	**97**	**1324**	**4978**	**-**	**318**	**1824**	**20**	**-**
	Minimum		**1.6**	**8410**	**6.07**	**16**	**-**	**78**	**621**	**78**	**925**	**459**	**0**	**-**	**69**	**944**	**3480**	**-**	**200**	**1360**	**20**	**-**
	Maximum		**10.2**	**10330**	**6.15**	**20**	**-**	**158**	**665**	**158**	**1390**	**579**	**3**	**-**	**105**	**1360**	**5140**	**-**	**320**	**1850**	**20**	**-**
Inside of MPAR	D10	17/09/2020	-	4000	6.09	174	-	-	137	155	230	106	<0.5	-	74.1	577	1500	-	-	-	-	-
Inside of MPAR	D10	26/11/2020	10.9	4680	5.98	171	<1	136	154	136	345	128	<0.5	-	88.5	755	2210	-	300	673	<10	<10
Inside of MPAR	D10	17/03/2021	1.5	5190	6	171	<1	171	165	171	334	148	0.463	<1	106	707	2070	-	320	711	<10	<10
Inside of MPAR	D10	30/06/2021	1	4700	6.22	172	<1	208	156	208	308	135	0.643	<1	106	880	1900	-	260	754	<10	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**4**	**4**	**4**	**2**	**0**	**4**	**4**	**4**	**0**	**3**	**3**	**0**	**0**
	Average		**4**	**4642.5**		**172**	**-**	**172**	**153**	**168**	**304**	**129**	**1**	**-**	**94**	**730**	**1920**	**-**	**293**	**713**	**-**	**-**
	50th Percentile		**2**	**4690**	**6**	**172**	**-**	**171**	**155**	**163**	**321**	**132**	**1**	**-**	**97**	**731**	**1985**	**-**	**300**	**711**	**-**	**-**
	90th Percentile		**9**	**5043**	**6**	**173**	**-**	**201**	**162**	**197**	**342**	**144**	**1**	**-**	**106**	**843**	**2168**	**-**	**316**	**745**	**-**	**-**
	Minimum		**1**	**4000**	**6**	**171**	**-**	**136**	**137**	**136**	**230**	**106**	**0**	**-**	**74**	**577**	**1500**	**-**	**260**	**673**	**-**	**-**
	Maximum		**11**	**5190**	**6**	**174**	**-**	**208**	**165**	**208**	**345**	**148**	**1**	**-**	**106**	**880**	**2210**	**-**	**320**	**754**	**-**	**-**
Inside of MPAR	D11	17/09/2020	-	9860	6.25	144	-	-	550	125	929	432	<1	-	108	1480	4270	-	-	-	-	-
Inside of MPAR	D11	30/06/2021	1.1	9290	6.32	39	<1	188	671	188	917	530	0.435	<1	130	1840	4320	-	2660	1780	<100	<100
	Count Detects		**1**	**2**	**2**	**2**	**0**	**1**	**2**	**2**	**2**	**2**	**1**	**0**	**2**	**2**	**2**	**0**	**1**	**1**	**0**	**0**
	Average		**1.1**	**9575**		**92**	**-**	**188**	**611**	**157**	**923**	**481**	**0**	**-**	**119**	**1660**	**4295**	**-**	**2660**	**1780**	**-**	**-**
	50th Percentile		**1.1**	**9575**	**6.29**	**92**	**-**	**188**	**611**	**157**	**923**	**481**	**0**	**-**	**119**	**1660**	**4295**	**-**	**2660**	**1780**	**-**	**-**
	90th Percentile		**1.1**	**9803**	**6.31**	**134**	**-**	**188**	**659**	**182**	**928**	**520**	**0**	**-**	**128**	**1804**	**4315**	**-**	**2660**	**1780**	**-**	**-**
	Minimum		**1.1**	**9290**	**6.25**	**39**	**-**	**188**	**550**	**125**	**917**	**432**	**0**	**-**	**108**	**1480**	**4270**	**-**	**2660**	**1780**	**-**	**-**
	Maximum		**1.1**	**9860**	**6.32**	**144**	**-**	**188**	**671**	**188**	**929**	**530**	**0**	**-**	**130**	**1840**	**4320**	**-**	**2660**	**1780**	**-**	**-**
North-east boundary of LNAR	D1	16/09/2020	-	9810	5.95	137	-	-	591	127	1110	549	<1	-	103	1240	4510	-	-	-	-	-
North-east boundary of LNAR	D1	25/11/2020	11	9920	5.84	134	<1	116	584	116	132	530	<1	-	108	1390	997	-	200	1680	<10	<10
North-east boundary of LNAR	D1	14/04/2021	1.4	9140	5.91	140	<1	154	29.9	154	1120	21	0.75	<1	3.95	25.8	4790	-	320	59	<100	<100
North-east boundary of LNAR	D1	23/06/2021	2.5	9290	5.92	130	<1	184	510	184	1070	494	<1	<1	95.1	1340	4510	-	400	1590	<10	<10
	Count Detects		**3**	**4**	**4**	**4**	**0**	**3**	**4**	**4**	**4**	**4**	**1**	**0**	**4**	**4**	**4**	**0**	**3**	**3**	**0**	**0**
	Average		**5.0**	**9540**		**135**	**-**	**151**	**429**	**145**	**858**	**399**	**1**	**-**	**78**	**999**	**3702**	**-**	**307**	**1110**	**-**	**-**
	50th Percentile		**2.5**	**9550**	**5.92**	**136**	**-**	**154**	**547**	**141**	**1090**	**512**	**1**	**-**	**99**	**1290**	**4510**	**-**	**320**	**1590**	**-**	**-**
	90th Percentile		**9.3**	**9887**	**5.94**	**139**	**-**	**178**	**589**	**175**	**1117**	**543**	**1**	**-**	**107**	**1375**	**4706**	**-**	**384**	**1662**	**-**	**-**
	Minimum		**1.4**	**9140**	**5.84**	**130**	**-**	**116**	**30**	**116**	**132**	**21**	**1**	**-**	**4**	**26**	**997**	**-**	**200**	**59**	**-**	**-**
	Maximum		**11**	**9920**	**5.95**	**140**	**-**	**184**	**591**	**184**	**1120**	**549**	**1**	**-**	**108**	**1390**	**4790**	**-**	**400**	**1680**	**-**	**-**
Statistical Summary																						
Number of Results			86	97	87	97	87	87	97	96	97	97	97	78	97	97	97	61	87	86	87	87
Number of Detects			86	97	87	97	60	87	97	96	97	97	75	60	97	97	97	61	83	86	69	61
Minimum Concentration			0.9	2	2	2	0	1	2	2	2	2	0	0	2	2	2	0	1	1	0	0
Minimum Detect			0.9	2	2	2	ND	1	2	2	2	2	0.037	ND	2	2	2	1	1	1	1	1
Maximum Concentration			11.9	10330	6.74	174	<1	388	671	388	1390	579	4	<1	130	1840	5140	155	2660	1850	220	<100
Maximum Detect			11.9	10330	6.74	174	ND	388	671	388	1390	579	4	ND	130	1840	5140	155	2660	1850	220	10
Average Concentration			4.8	4126	5.8	64	0.36	139	248	137	356	180	0.68	0.32	51	519	1781	58	368	626	37	8.8
Median Concentration			3	3280	6.06	36.75	0.5	151.3333333	176	143.95	189	106	0.444	0.5	38.7	339	1500	0	250	466	10	5
Standard Deviation			3.9	3530	0.87	60	0.23	106	219	105	419	190	0.83	0.24	40	542	1638	77	643	627	52	14
Number of Guideline Exceedances			0	69	79	0	0	0	0	0	72	0	63	0	0	0	67	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)			0	69	79	0	0	0	0	0	72	0	46	0	0	0	67	0	0	0	0	0

Env Stds Comments
#1:2000 mg/L TDS/0.77

				Physical Parameters														
			Nitrite + Nitrate (as N)	Total Dissolved Solids (TDS)	Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Barium	Beryllium	Boron	Boron (Filtered)	Cadmium	Chromium	Chromium (Hexavalent)	Chromium (Trivalent)
			mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Groundwater				2000				24	24	700	100	370	370	2[#2]	5[#2]		
Groundwater Collection Basin Pre-placement 90th Percentile				1306				1	1	37	1	244	244	2	1		
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**															
Centennial Coal leased area south of LNAR	D15	16/09/2020	-	2660	870	-	-	7	-	22	-	180	-	0.5	126	-	-
Centennial Coal leased area south of LNAR	D15	26/11/2020	<0.01	2790	810	150	<1	7	2	16	2	210	200	0.4	2	<10	<10
Centennial Coal leased area south of LNAR	D15	24/06/2021	0.08	2260	340	100	<1	3	2	19	1	190	180	0.2	1	<10	<10
	Count Detects		**1**	**3**	**3**	**2**	**0**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**3**	**0**	**0**
	Average		**0.08**	**2570**	**673.3333333**	**125**	**-**	**5.666666667**	**2**	**19**	**1.5**	**193**	**190**	**0.366666667**	**43**	**-**	**-**
	50th Percentile		**0.08**	**2660**	**810**	**125**	**-**	**7**	**2**	**19**	**1.5**	**190**	**190**	**0.4**	**2**	**-**	**-**
	90th Percentile		**0.08**	**2764**	**858**	**145**	**-**	**7**	**2**	**21.4**	**1.9**	**206**	**198**	**0.48**	**101.2**	**-**	**-**
	Minimum		**0.08**	**2260**	**340**	**100**	**-**	**3**	**2**	**16**	**1**	**180**	**180**	**0.2**	**1**	**-**	**-**
	Maximum		**0.08**	**2790**	**870**	**150**	**-**	**7**	**2**	**22**	**2**	**210**	**200**	**0.5**	**126**	**-**	**-**
Centennial Coal leased area south of LNAR	D16	16/09/2020	-	1690	10	-	-	<1	-	10	-	<50	-	<0.1	6	-	-
Centennial Coal leased area south of LNAR	D16	26/11/2020	<0.01	1820	<10	<10	<1	<1	<1	9	<1	60	60	<0.1	9	<10	<10
Centennial Coal leased area south of LNAR	D16	15/04/2021	<0.01	1870	<10	<10	<1	<1	<1	13	<1	<50	<50	<0.1	<1	<10	<10
Centennial Coal leased area south of LNAR	D16	23/06/2021	<0.01	1650	<10	<10	<1	<1	<1	8	<1	<50	<50	<0.1	5	<10	<10
	Count Detects		**0**	**4**	**1**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**1**	**0**	**3**	**0**	**0**
	Average		**-**	**1757.5**	**10**	**-**	**-**	**-**	**-**	**10**	**-**	**60**	**60**	**-**	**6.666666667**	**-**	**-**
	50th Percentile		**-**	**1755**	**10**	**-**	**-**	**-**	**-**	**9.5**	**-**	**60**	**60**	**-**	**6**	**-**	**-**
	90th Percentile		**-**	**1855**	**10**	**-**	**-**	**-**	**-**	**12.1**	**-**	**60**	**60**	**-**	**8.4**	**-**	**-**
	Minimum		**-**	**1650**	**10**	**-**	**-**	**-**	**-**	**8**	**-**	**60**	**60**	**-**	**5**	**-**	**-**
	Maximum		**-**	**1870**	**10**	**-**	**-**	**-**	**-**	**13**	**-**	**60**	**60**	**-**	**9**	**-**	**-**
Centennial Coal leased area south of LNAR	D17	16/09/2020	-	2800	30	-	-	1	-	14	-	120	-	<0.1	6	-	-
Centennial Coal leased area south of LNAR	D17	26/11/2020	<0.01	2870	<10	<10	<1	<1	2	11	<1	130	130	<0.1	<1	<10	<10
Centennial Coal leased area south of LNAR	D17	15/04/2021	0.01	2720	<10	<10	<1	<1	<1	13	<1	110	100	<0.1	<1	<100	<100
Centennial Coal leased area south of LNAR	D17	23/06/2021	<0.01	2480	<10	<10	<1	<1	<1	11	<1	80	70	<0.1	<1	<10	<10
	Count Detects		**1**	**4**	**1**	**0**	**0**	**1**	**1**	**4**	**0**	**4**	**3**	**0**	**1**	**0**	**0**
	Average		**0.01**	**2717.5**	**30**	**-**	**-**	**1**	**2**	**12.25**	**-**	**110**	**100**	**-**	**6**	**-**	**-**
	50th Percentile		**0.01**	**2760**	**30**	**-**	**-**	**1**	**2**	**12**	**-**	**115**	**100**	**-**	**6**	**-**	**-**
	90th Percentile		**0.01**	**2849**	**30**	**-**	**-**	**1**	**2**	**13.7**	**-**	**127**	**124**	**-**	**6**	**-**	**-**
	Minimum		**0.01**	**2480**	**30**	**-**	**-**	**1**	**2**	**11**	**-**	**80**	**70**	**-**	**6**	**-**	**-**
	Maximum		**0.01**	**2870**	**30**	**-**	**-**	**1**	**2**	**14**	**-**	**130**	**130**	**-**	**6**	**-**	**-**
Centennial Coal leased area south of LNAR	D18	17/09/2020	-	388	30	-	-	14	-	670	-	50	-	0.2	<1	-	-
Centennial Coal leased area south of LNAR	D18	26/11/2020	0.23	408	50	<10	<1	1	<1	603	<1	90	80	<0.1	2	<10	<10
Centennial Coal leased area south of LNAR	D18	15/04/2021	0.1	394	20	<10	<1	<1	<1	657	<1	<50	<50	<0.1	<1	<10	<10
Centennial Coal leased area south of LNAR	D18	25/06/2021	0.1	378	60	<10	<1	4	2	586	<1	80	<50	<0.1	7	<10	<10
	Count Detects		**3**	**4**	**4**	**0**	**0**	**3**	**1**	**4**	**0**	**3**	**1**	**1**	**2**	**0**	**0**
	Average		**0.143333333**	**392**	**40**	**-**	**-**	**6.333333333**	**2**	**629**	**-**	**73**	**80**	**0.2**	**4.5**	**-**	**-**
	50th Percentile		**0.1**	**391**	**40**	**-**	**-**	**4**	**2**	**630**	**-**	**80**	**80**	**0.2**	**4.5**	**-**	**-**
	90th Percentile		**0.204**	**403.8**	**57**	**-**	**-**	**12**	**2**	**666.1**	**-**	**88**	**80**	**0.2**	**6.5**	**-**	**-**
	Minimum		**0.1**	**378**	**20**	**-**	**-**	**1**	**2**	**586**	**-**	**50**	**80**	**0.2**	**2**	**-**	**-**
	Maximum		**0.23**	**408**	**60**	**-**	**-**	**14**	**2**	**670**	**-**	**90**	**80**	**0.2**	**7**	**-**	**-**
Downgradient of LNAR	D19	16/09/2020	-	3140	430	-	-	3	-	15	-	1610	-	0.1	6	-	-
Downgradient of LNAR	D19	26/11/2020	<0.01	3290	210	<10	<1	3	1	16	<1	1660	1560	0.1	2	<10	<10
Downgradient of LNAR	D19	15/04/2021	<0.1	3080	10	<10	<1	<1	1	11	<1	1530	1620	<0.1	<1	<10	<10
Downgradient of LNAR	D19	24/06/2021	<0.01	3190	340	<10	<1	4	1	17	<1	1830	1740	0.1	32	<10	<10
	Count Detects		**0**	**4**	**4**	**0**	**0**	**3**	**3**	**4**	**0**	**4**	**3**	**3**	**3**	**0**	**0**
	Average		**-**	**3175**	**247.5**	**-**	**-**	**3.333333333**	**1**	**14.75**	**-**	**1657.5**	**1640**	**0.1**	**13.33333333**	**-**	**-**
	50th Percentile		**-**	**3165**	**275**	**-**	**-**	**3**	**1**	**15.5**	**-**	**1635**	**1620**	**0.1**	**6**	**-**	**-**
	90th Percentile		**-**	**3260**	**403**	**-**	**-**	**3.8**	**1**	**16.7**	**-**	**1779**	**1716**	**0.1**	**26.8**	**-**	**-**
	Minimum		**-**	**3080**	**10**	**-**	**-**	**3**	**1**	**11**	**-**	**1530**	**1560**	**0.1**	**2**	**-**	**-**
	Maximum		**-**	**3290**	**430**	**-**	**-**	**4**	**1**	**17**	**-**	**1830**	**1740**	**0.1**	**32**	**-**	**-**
Downgradient of LNAR, adjacent to Wangcol Creek	D8	17/09/2020	-	260	210	-	-	<1	-	40	-	60	-	<0.1	<1	-	-
Downgradient of LNAR, adjacent to Wangcol Creek	D8	26/11/2020	0.02	194	490	450	<1	<1	<1	27	<1	<50	<50	<0.1	<1	<10	<10
Downgradient of LNAR, adjacent to Wangcol Creek	D8	15/04/2021	0.01	378	170	40	<1	<1	<1	52	<1	<50	<50	<0.1	<1	<10	<10
Downgradient of LNAR, adjacent to Wangcol Creek	D8	25/06/2021	0.04	349	120	<10	<1	<1	<1	35	<1	120	60	<0.1	<1	<10	<10
	Count Detects		**3**	**4**	**4**	**2**	**0**	**0**	**0**	**4**	**0**	**2**	**1**	**0**	**0**	**0**	**0**
	Average		**0.023333333**	**295.25**	**247.5**	**245**	**-**	**-**	**-**	**38.5**	**-**	**90**	**60**	**-**	**-**	**-**	**-**
	50th Percentile		**0.02**	**304.5**	**190**	**245**	**-**	**-**	**-**	**37.5**	**-**	**90**	**60**	**-**	**-**	**-**	**-**
	90th Percentile		**0.036**	**369.3**	**406**	**409**	**-**	**-**	**-**	**48.4**	**-**	**114**	**60**	**-**	**-**	**-**	**-**
	Minimum		**0.01**	**194**	**120**	**40**	**-**	**-**	**-**	**27**	**-**	**60**	**60**	**-**	**-**	**-**	**-**
	Maximum		**0.04**	**378**	**490**	**450**	**-**	**-**	**-**	**52**	**-**	**120**	**60**	**-**	**-**	**-**	**-**
Downgradient of LNAR, adjacent to Wangcol Creek	D9	16/09/2020	-	7260	100	-	-	1	-	33	-	1580	-	<0.1	<1	-	-
Downgradient of LNAR, adjacent to Wangcol Creek	D9	25/11/2020	<0.01	9410	820	<10	<1	8	<1	48	<1	1660	1580	0.2	1	<10	<10

				Physical Parameters														
			Nitrite + Nitrate (as N)	Total Dissolved Solids (TDS)	Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Barium	Beryllium	Boron	Boron (Filtered)	Cadmium	Chromium	Chromium (Hexavalent)	Chromium (Trivalent)
			mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Groundwater				2000				24	24	700	100	370	370	2[#2]	5[#2]		
Groundwater Collection Basin Pre-placement 90th Percentile				1306				1	1	37	1	244	244	2	1		
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**															
Downgradient of LNAR, adjacent to Wangcol Creek	D9	14/04/2021	<0.1	7860	170	<10	<1	2	2	33	<1	1710	1610	<0.1	<1	<100	<100
Downgradient of LNAR, adjacent to Wangcol Creek	D9	23/06/2021	0.02	9310	390	<10	<1	5	<1	30	<1	1610	1620	0.1	<1	<100	<100
	Count Detects		**1**	**4**	**4**	**0**	**0**	**4**	**1**	**4**	**0**	**4**	**3**	**2**	**1**	**0**	**0**
	Average		**0.02**	**8460**	**370**	-	-	**4**	**2**	**36**	-	**1640**	**1603.333333**	**0.15**	**1**	-	-
	50th Percentile		**0.02**	**8585**	**280**	-	-	**3.5**	**2**	**33**	-	**1635**	**1610**	**0.15**	**1**	-	-
	90th Percentile		**0.02**	**9380**	**691**	-	-	**7.1**	**2**	**43.5**	-	**1695**	**1618**	**0.19**	**1**	-	-
	Minimum		**0.02**	**7260**	**100**	-	-	**1**	**2**	**30**	-	**1580**	**1580**	**0.1**	**1**	-	-
	Maximum		**0.02**	**9410**	**820**	-	-	**8**	**2**	**48**	-	**1710**	**1620**	**0.2**	**1**	-	-
Inside of MPAR	D10	17/09/2020	-	2970	110	-	-	2	-	20	-	1020	-	0.9	<1	-	-
Inside of MPAR	D10	26/11/2020	<0.01	3780	70	60	<1	8	8	16	<1	1150	1120	0.1	1	<10	<10
Inside of MPAR	D10	17/03/2021	<0.01	4140	40	10	<1	4	2	18	<1	1440	1400	0.1	<1	<10	<10
Inside of MPAR	D10	30/06/2021	<0.01	3370	50	40	<1	2	1	21	<1	1280	1140	0.1	15	<10	<10
	Count Detects		**0**	**4**	**4**	**3**	**0**	**4**	**3**	**4**	**0**	**4**	**3**	**4**	**2**	**0**	**0**
	Average		-	**3565**	**67.5**	**36.66666667**	-	**4**	**3.666666667**	**18.75**	-	**1222.5**	**1220**	**0.3**	**8**	-	-
	50th Percentile		-	**3575**	**60**	**40**	-	**3**	**2**	**19**	-	**1215**	**1140**	**0.1**	**8**	-	-
	90th Percentile		-	**4032**	**98**	**56**	-	**6.8**	**6.8**	**20.7**	-	**1392**	**1348**	**0.66**	**13.6**	-	-
	Minimum		-	**2970**	**40**	**10**	-	**2**	**1**	**16**	-	**1020**	**1120**	**0.1**	**1**	-	-
	Maximum		-	**4140**	**110**	**60**	-	**8**	**8**	**21**	-	**1440**	**1400**	**0.9**	**15**	-	-
Inside of MPAR	D11	17/09/2020	-	8620	1480	-	-	3	-	56	-	2990	-	<0.1	<1	-	-
Inside of MPAR	D11	30/06/2021	<0.1	8200	40	<10	<1	6	6	94	<1	2260	1980	<0.1	<1	<10	<10
	Count Detects		**0**	**2**	**2**	**0**	**0**	**2**	**1**	**2**	**0**	**2**	**1**	**0**	**0**	**0**	**0**
	Average		-	**8410**	**760**	-	-	**4.5**	**6**	**75**	-	**2625**	**1980**	-	-	-	-
	50th Percentile		-	**8410**	**760**	-	-	**4.5**	**6**	**75**	-	**2625**	**1980**	-	-	-	-
	90th Percentile		-	**8578**	**1336**	-	-	**5.7**	**6**	**90.2**	-	**2917**	**1980**	-	-	-	-
	Minimum		-	**8200**	**40**	-	-	**3**	**6**	**56**	-	**2260**	**1980**	-	-	-	-
	Maximum		-	**8620**	**1480**	-	-	**6**	**6**	**94**	-	**2990**	**1980**	-	-	-	-
North-east boundary of LNAR	D1	16/09/2020	-	8740	300	-	-	6	-	37	-	2660	-	<0.1	<1	-	-
North-east boundary of LNAR	D1	25/11/2020	<0.01	9360	220	<10	<1	7	3	30	<1	2520	2460	<0.1	<1	<10	<10
North-east boundary of LNAR	D1	14/04/2021	<0.1	8590	10	<10	<1	3	5	25	<1	2750	2840	<0.1	<1	<100	<100
North-east boundary of LNAR	D1	23/06/2021	<0.01	8310	80	<10	<1	6	6	23	<1	2590	2310	<0.1	<1	<100	<100
	Count Detects		**0**	**4**	**4**	**0**	**0**	**4**	**3**	**4**	**0**	**4**	**3**	**0**	**0**	**0**	**0**
	Average		-	**8750.0**	**152.5**	-	-	**5.5**	**4.7**	**28.8**	-	**2630.0**	**2536.7**	-	-	-	-
	50th Percentile		-	**8665.0**	**150.0**	-	-	**6.0**	**5.0**	**27.5**	-	**2625.0**	**2460.0**	-	-	-	-
	90th Percentile		-	**9174.0**	**276.0**	-	-	**6.7**	**5.8**	**34.9**	-	**2723.0**	**2764.0**	-	-	-	-
	Minimum		-	**8310**	**10**	-	-	**3**	**3**	**23**	-	**2520**	**2310**	-	-	-	-
	Maximum		-	**9360**	**300**	-	-	**7**	**6**	**37**	-	**2750**	**2840**	-	-	-	-
Statistical Summary																	
Number of Results			87	97	97	87	87	97	87	97	87	97	87	97	97	87	87
Number of Detects			69	97	91	67	60	84	75	97	62	91	81	73	75	60	60
Minimum Concentration			0	2	1	0	0	0	0	2	0	1	1	0	0	0	0
Minimum Detect			0.01	2	1	2	ND	1	1	2	1	1	1	0.1	1	ND	ND
Maximum Concentration			3	9410	1480	450	<1	14	8	670	2	2990	2840	4	126	<100	<100
Maximum Detect			3	9410	1480	450	ND	14	8	670	2	2990	2840	4	126	ND	ND
Average Concentration			0.18	3546	235	61	0.36	3.8	2.4	81	0.6	906	826	0.33	9	9.7	9.7
Median Concentration			0.02	2790	70	5	0.5	3	2	20.7	0.5	190	180	0.1	2	5	5
Standard Deviation			0.56	3235	331	111	0.23	3	2	179	0.56	1011	917	0.7	23	16	16
Number of Guideline Exceedances			0	69	0	0	0	72	63	27	8	43	38	4	57	0	0
Number of Guideline Exceedances(Detects Only)			0	69	0	0	0	72	63	27	8	43	38	4	57	0	0

Env Stds Comments
#1:2000 mg/L TDS/0.77

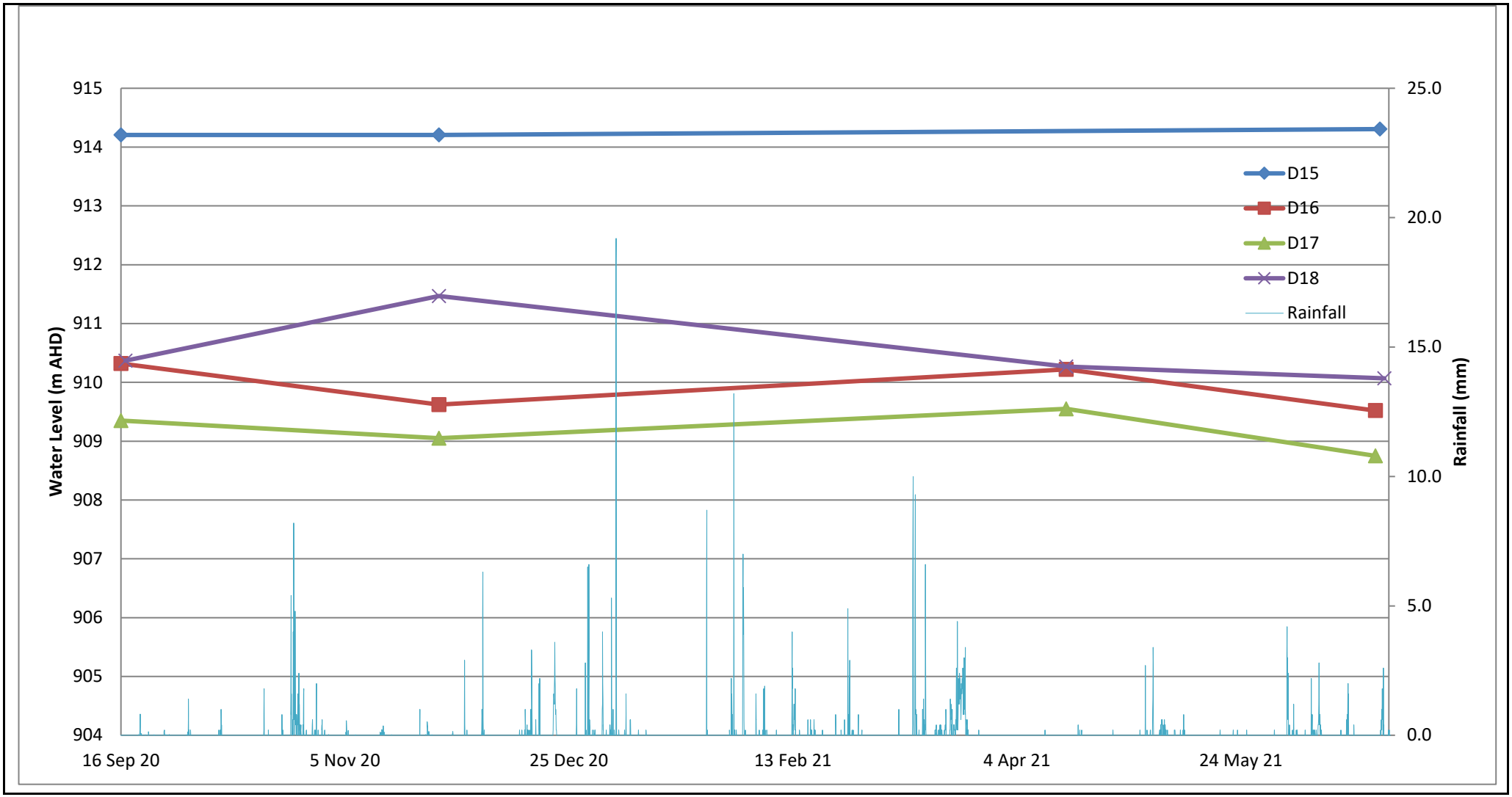
			Metals																		
			Cobalt	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Nickel	Nickel (Filtered)	Selenium	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Groundwater				5[#2]	5[#2]	664[#3]	664[#3]	5[#2]	5704[#3]	5704[#3]	0.06	10	550.9[#4]	550.9[#4]	5	0.05				908[#4]	908[#4]
Groundwater Collection Basin Pre-placement 90th Percentile				1	1	664	664	1	5704	5704	0.1	1	550.9	550.9	2	1				908	908
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																			
Centennial Coal leased area south of LNAR	D15	16/09/2020	-	11	-	-	25,800	6	-	1950	<0.04	5	802	-	1	<1	-	<10	<10	1300	-
Centennial Coal leased area south of LNAR	D15	26/11/2020	544	6	<1	24,700	22,800	6	1870	1790	<0.04	<1	712	688	0.7	<1	0.81	<10	<10	1210	1190
Centennial Coal leased area south of LNAR	D15	24/06/2021	449	1	<1	22,700	21,900	4	1480	1380	<0.04	<1	596	529	0.2	<1	0.638	<10	<10	1010	926
	Count Detects		**2**	**3**	**0**	**2**	**3**	**3**	**2**	**3**	**0**	**1**	**3**	**2**	**3**	**0**	**2**	**0**	**0**	**3**	**2**
	Average		**496.5**	**6**	**-**	**23,700**	**23,500**	**5**	**1675**	**1707**	**-**	**5**	**703.3333333**	**608.5**	**0.633333333**	**-**	**0.724**	**-**	**-**	**1173.333333**	**1058**
	50th Percentile		**496.5**	**6**	**-**	**23,700**	**22,800**	**6**	**1675**	**1790**	**-**	**5**	**712**	**608.5**	**0.7**	**-**	**0.724**	**-**	**-**	**1210**	**1058**
	90th Percentile		**534.5**	**10**	**-**	**24,500**	**25,200**	**6**	**1831**	**1918**	**-**	**5**	**784**	**672.1**	**0.94**	**-**	**0.7928**	**-**	**-**	**1282**	**1163.6**
	Minimum		**449**	**1**	**-**	**22,700**	**21,900**	**4**	**1480**	**1380**	**-**	**5**	**596**	**529**	**0.2**	**-**	**0.638**	**-**	**-**	**1010**	**926**
	Maximum		**544**	**11**	**-**	**24,700**	**25,800**	**6**	**1870**	**1950**	**-**	**5**	**802**	**688**	**1**	**-**	**0.81**	**-**	**-**	**1300**	**1190**
Centennial Coal leased area south of LNAR	D16	16/09/2020	-	<1	-	-	3960	<1	-	69	<0.04	<1	33	-	<0.2	<1	-	<10	<10	12	-
Centennial Coal leased area south of LNAR	D16	26/11/2020	<1	<1	<1	3060	2620	<1	71	67	<0.04	<1	21	16	<0.2	<1	1.18	<10	<10	6	9
Centennial Coal leased area south of LNAR	D16	15/04/2021	<1	<1	<1	4250	3630	<1	82	83	<0.04	<1	19	20	<0.2	<1	1.25	<10	<10	<5	6
Centennial Coal leased area south of LNAR	D16	23/06/2021	<1	<1	<1	3360	3200	<1	56	55	<0.04	<1	16	13	<0.2	<1	1.13	<10	<10	<5	<5
	Count Detects		**0**	**0**	**0**	**3**	**4**	**0**	**3**	**4**	**0**	**0**	**4**	**3**	**0**	**0**	**3**	**0**	**0**	**2**	**2**
	Average		**-**	**-**	**-**	**3557**	**3352.5**	**-**	**70**	**68.5**	**-**	**-**	**22.25**	**16.33333333**	**-**	**-**	**1.186666667**	**-**	**-**	**9**	**7.5**
	50th Percentile		**-**	**-**	**-**	**3360**	**3415**	**-**	**71**	**68**	**-**	**-**	**20**	**16**	**-**	**-**	**1.18**	**-**	**-**	**9**	**7.5**
	90th Percentile		**-**	**-**	**-**	**4072**	**3861**	**-**	**79.8**	**78.8**	**-**	**-**	**29.4**	**19.2**	**-**	**-**	**1.236**	**-**	**-**	**11.4**	**8.7**
	Minimum		**-**	**-**	**-**	**3060**	**2620**	**-**	**56**	**55**	**-**	**-**	**16**	**13**	**-**	**-**	**1.13**	**-**	**-**	**6**	**6**
	Maximum		**-**	**-**	**-**	**4250**	**3960**	**-**	**82**	**83**	**-**	**-**	**33**	**20**	**-**	**-**	**1.25**	**-**	**-**	**12**	**9**
Centennial Coal leased area south of LNAR	D17	16/09/2020	-	<1	-	-	13,400	<1	-	2850	<0.04	<1	84	-	<0.2	<1	-	<10	<10	78	-
Centennial Coal leased area south of LNAR	D17	26/11/2020	16	<1	<1	20,700	16,100	<1	2650	2570	<0.04	<1	74	72	<0.2	<1	0.852	<10	<10	76	72
Centennial Coal leased area south of LNAR	D17	15/04/2021	11	<1	<1	27,700	19,700	<1	2580	2570	<0.04	<1	57	60	<0.2	<1	0.847	<10	<10	68	67
Centennial Coal leased area south of LNAR	D17	23/06/2021	10	<1	<1	24,800	21,200	<1	2370	2200	<0.04	<1	54	48	<0.2	<1	0.84	<10	<10	62	58
	Count Detects		**3**	**0**	**0**	**3**	**4**	**0**	**3**	**4**	**0**	**0**	**4**	**3**	**0**	**0**	**3**	**0**	**0**	**4**	**3**
	Average		**12.33333333**	**-**	**-**	**24,400**	**17,600**	**-**	**2533**	**2547.5**	**-**	**-**	**67.25**	**60**	**-**	**-**	**0.846333333**	**-**	**-**	**71**	**65.66666667**
	50th Percentile		**11**	**-**	**-**	**24,800**	**17,900**	**-**	**2580**	**2570**	**-**	**-**	**65.5**	**60**	**-**	**-**	**0.847**	**-**	**-**	**72**	**67**
	90th Percentile		**15**	**-**	**-**	**27,120**	**20,750**	**-**	**2636**	**2766**	**-**	**-**	**81**	**69.6**	**-**	**-**	**0.851**	**-**	**-**	**77.4**	**71**
	Minimum		**10**	**-**	**-**	**20,700**	**13,400**	**-**	**2370**	**2200**	**-**	**-**	**54**	**48**	**-**	**-**	**0.84**	**-**	**-**	**62**	**58**
	Maximum		**16**	**-**	**-**	**27,700**	**21,200**	**-**	**2650**	**2850**	**-**	**-**	**84**	**72**	**-**	**-**	**0.852**	**-**	**-**	**78**	**72**
Centennial Coal leased area south of LNAR	D18	17/09/2020	-	<1	-	-	1590	<1	-	135	0.06	3	4	-	<0.2	<1	-	<10	<10	22	-
Centennial Coal leased area south of LNAR	D18	26/11/2020	<1	2	<1	200	<50	<1	48	43	<0.04	6	5	4	0.5	<1	0.384	<10	<10	33	33
Centennial Coal leased area south of LNAR	D18	15/04/2021	<1	<1	<1	299	<50	<1	78	78	<0.04	5	3	3	<0.2	<1	0.377	<10	<10	23	18
Centennial Coal leased area south of LNAR	D18	25/06/2021	1	1	<1	570	130	<1	102	94	<0.04	7	8	4	<0.2	<1	0.385	<10	<10	32	22
	Count Detects		**1**	**2**	**0**	**3**	**2**	**0**	**3**	**4**	**1**	**4**	**4**	**3**	**1**	**0**	**3**	**0**	**0**	**4**	**3**
	Average		**1**	**1.5**	**-**	**356**	**860**	**-**	**76**	**87.5**	**0.06**	**5.25**	**5**	**3.666666667**	**0.5**	**-**	**0.382**	**-**	**-**	**27.5**	**24.33333333**
	50th Percentile		**1**	**1.5**	**-**	**299**	**860**	**-**	**78**	**86**	**0.06**	**5.5**	**4.5**	**4**	**0.5**	**-**	**0.384**	**-**	**-**	**27.5**	**22**
	90th Percentile		**1**	**1.9**	**-**	**515.8**	**1444**	**-**	**97.2**	**122.7**	**0.06**	**6.7**	**7.1**	**4**	**0.5**	**-**	**0.3848**	**-**	**-**	**32.7**	**30.8**
	Minimum		**1**	**1**	**-**	**200**	**130**	**-**	**48**	**43**	**0.06**	**3**	**3**	**3**	**0.5**	**-**	**0.377**	**-**	**-**	**22**	**18**
	Maximum		**1**	**2**	**-**	**570**	**1590**	**-**	**102**	**135**	**0.06**	**7**	**8**	**4**	**0.5**	**-**	**0.385**	**-**	**-**	**33**	**33**
Downgradient of LNAR	D19	16/09/2020	-	2	-	-	16,800	8	-	4990	<0.04	<1	426	-	0.4	<1	-	<10	<10	223	-
Downgradient of LNAR	D19	26/11/2020	140	5	<1	14,200	10,900	8	5010	4830	<0.04	<1	454	445	0.3	<1	1.04	<10	<10	239	218
Downgradient of LNAR	D19	15/04/2021	136	<1	<1	17,400	12,100	2	5050	5220	<0.04	<1	424	437	<0.2	<1	0.998	<10	<10	196	223
Downgradient of LNAR	D19	24/06/2021	155	3	<1	17,200	14,000	10	5440	5080	<0.04	1	515	450	<0.2	<1	1.11	<10	<10	260	224
	Count Detects		**3**	**3**	**0**	**3**	**4**	**4**	**3**	**4**	**0**	**1**	**4**	**3**	**2**	**0**	**3**	**0**	**0**	**4**	**3**
	Average		**143.6666667**	**3.333333333**	**-**	**16,267**	**13,450**	**7**	**5166.666667**	**5030**	**-**	**1**	**454.75**	**444**	**0.35**	**-**	**1.049333333**	**-**	**-**	**229.5**	**221.6666667**
	50th Percentile		**140**	**3**	**-**	**17,200**	**13,050**	**8**	**5050**	**5035**	**-**	**1**	**440**	**445**	**0.35**	**-**	**1.04**	**-**	**-**	**231**	**223**
	90th Percentile		**152**	**4.6**	**-**	**17,360**	**15,960**	**9.4**	**5362**	**5178**	**-**	**1**	**496.7**	**449**	**0.39**	**-**	**1.096**	**-**	**-**	**253.7**	**223.8**
	Minimum		**136**	**2**	**-**	**14,200**	**10,900**	**2**	**5010**	**4830**	**-**	**1**	**424**	**437**	**0.3**	**-**	**0.998**	**-**	**-**	**196**	**218**
	Maximum		**155**	**5**	**-**	**17,400**	**16,800**	**10**	**5440**	**5220**	**-**	**1**	**515**	**450**	**0.4**	**-**	**1.11**	**-**	**-**	**260**	**224**
Downgradient of LNAR, adjacent to Wangcol Creek	D8	17/09/2020	-	3	-	-	31	<1	-	206	<0.04	2	36	-	<0.2	<1	-	<10	<10	42	-
Downgradient of LNAR, adjacent to Wangcol Creek	D8	26/11/2020	<1	3	2	420	180	<1	87	72	<0.04	<1	28	27	<0.2	<1	0.074	<10	<10	36	37
Downgradient of LNAR, adjacent to Wangcol Creek	D8	15/04/2021	6	2	2	7880	140	<1	566	518	<0.04	<1	65	57	<0.2	<1	0.149	<10	<10	70	69
Downgradient of LNAR, adjacent to Wangcol Creek	D8	25/06/2021	3	3	2	219	<50	<1	299	269	<0.04	<1	50	45	<0.2	<1	0.139	<10	<10	71	59
	Count Detects		**2**	**4**	**3**	**3**	**3**	**0**	**3**	**4**	**0**	**1**	**4**	**3**	**0**	**0**	**3**	**0**	**0**	**4**	**3**
	Average		**4.5**	**2.75**	**2**	**2839.666667**	**117**	**-**	**317.3333333**	**266.25**	**-**	**2**	**44.75**	**43**	**-**	**-**	**0.120666667**	**-**	**-**	**54.75**	**55**
	50th Percentile		**4.5**	**3**	**2**	**420**	**140**	**-**	**299**	**237.5**	**-**	**2**	**43**	**45**	**-**	**-**	**0.139**	**-**	**-**	**56**	**59**
	90th Percentile		**5.7**	**3**	**2**	**6388**	**172**	**-**	**512.6**	**443.3**	**-**	**2**	**60.5**	**54.6**	**-**	**-**	**0.147**	**-**	**-**	**70.7**	**67**
	Minimum		**3**	**2**	**2**	**219**	**31**	**-**	**87**	**72**	**-**	**2**	**28**	**27**	**-**	**-**	**0.074**	**-**	**-**	**36**	**37**
	Maximum		**6**	**3**	**2**	**7880**	**180**	**-**	**566**	**518**	**-**	**2**	**65**	**57**	**-**	**-**	**0.149**	**-**	**-**	**71**	**69**
Downgradient of LNAR, adjacent to Wangcol Creek	D9	16/09/2020	-	<1	-	-	35,100	<1	-	18,300	0.12	<1	1350	-	0.7	<1	-	<10	<10	93	-
Downgradient of LNAR, adjacent to Wangcol Creek	D9	25/11/2020	320	8	<1	67,700	25,300	10	18,100	17,000	0.7	<1	1740	1680	0.7	<1	3.26	<10	<10	589	62

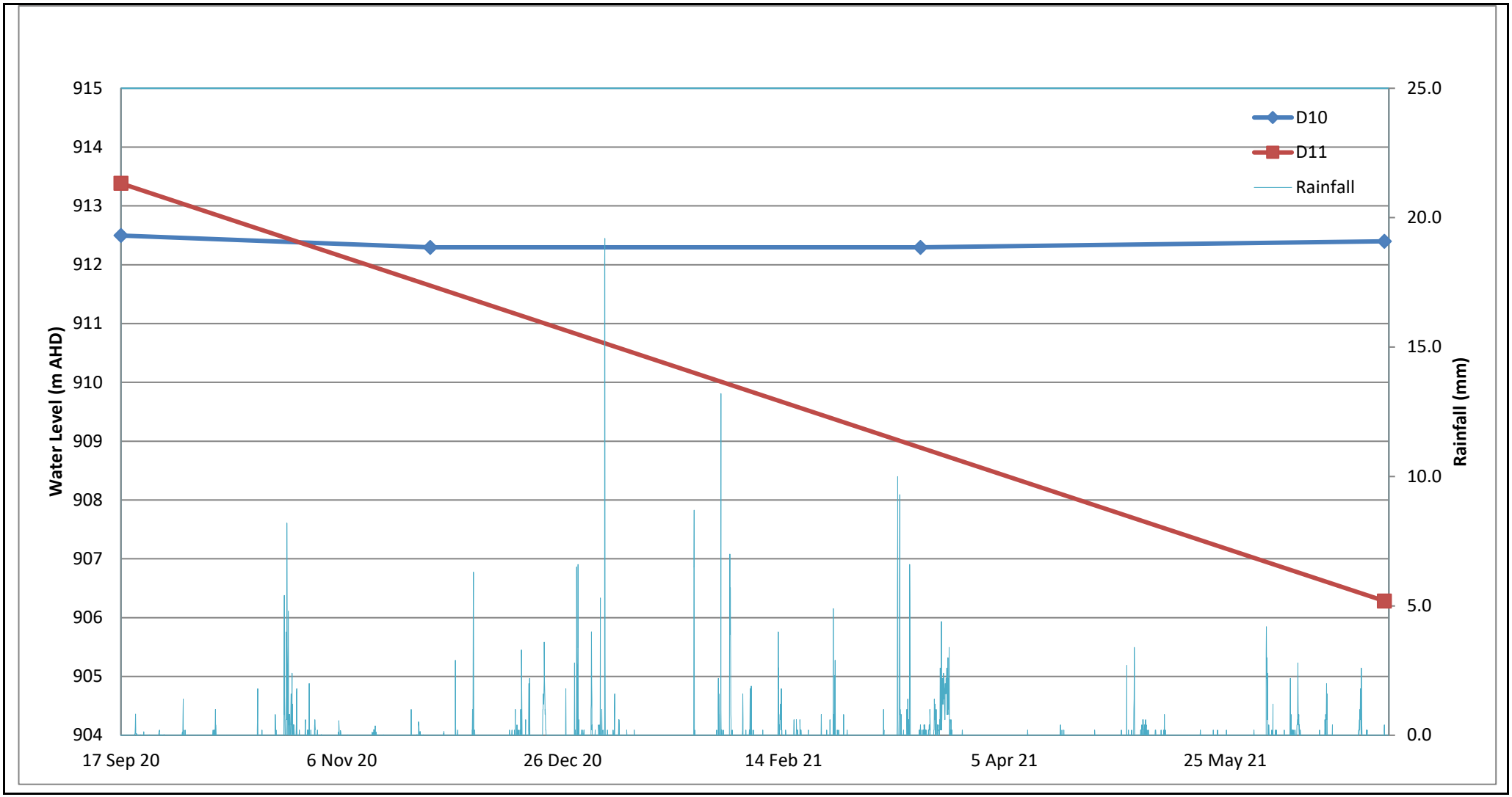
			Metals																		
			Cobalt	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Nickel	Nickel (Filtered)	Selenium	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
Environmental Goal - Groundwater				5[#2]	5[#2]	664[#3]	664[#3]	5[#2]	5704[#3]	5704[#3]	0.06	10	550.9[#4]	550.9[#4]	5	0.05				908[#4]	908[#4]
Groundwater Collection Basin Pre-placement 90th Percentile				1	1	664	664	1	5704	5704	0.1	1	550.9	550.9	2	1				908	908
Monitoring_Zone	**LocCode**	**Sampled_Date-Time**																			
Downgradient of LNAR, adjacent to Wangcol Creek	D9	14/04/2021	255	<1	<1	61,300	47,400	<1	18,900	18,900	<0.04	<1	1400	1390	0.4	<1	2.89	<10	<10	102	78
Downgradient of LNAR, adjacent to Wangcol Creek	D9	23/06/2021	254	7	<1	65,300	45,400	6	14,800	17,500	0.74	<1	1500	1750	0.3	<1	2.84	<10	<10	237	76
	Count Detects		**3**	**2**	**0**	**3**	**4**	**2**	**3**	**4**	**3**	**0**	**4**	**3**	**4**	**0**	**3**	**0**	**0**	**4**	**3**
	Average		**276.3333333**	**7.5**	**-**	**64,767**	**38,300**	**8**	**17,267**	**17,925**	**0.52**	**-**	**1497.5**	**1606.666667**	**0.525**	**-**	**2.996666667**	**-**	**-**	**255.25**	**72**
	50th Percentile		**255**	**7.5**	**-**	**65,300**	**40,250**	**8**	**18,100**	**17,900**	**0.7**	**-**	**1450**	**1680**	**0.55**	**-**	**2.89**	**-**	**-**	**169.5**	**76**
	90th Percentile		**307**	**7.9**	**-**	**67,220**	**46,800**	**9.6**	**18,740**	**18,720**	**0.732**	**-**	**1668**	**1736**	**0.7**	**-**	**3.186**	**-**	**-**	**483.4**	**77.6**
	Minimum		**254**	**7**	**-**	**61,300**	**25,300**	**6**	**14,800**	**17,000**	**0.12**	**-**	**1350**	**1390**	**0.3**	**-**	**2.84**	**-**	**-**	**93**	**62**
	Maximum		**320**	**8**	**-**	**67,700**	**47,400**	**10**	**18,900**	**18,900**	**0.74**	**-**	**1740**	**1750**	**0.7**	**-**	**3.26**	**-**	**-**	**589**	**78**
Inside of MPAR	D10	17/09/2020	-	1	-	-	12,300	32	-	2740	<0.04	2	367	-	0.6	<1	-	<10	<10	621	-
Inside of MPAR	D10	26/11/2020	168	<1	<1	15,600	15,300	8	3040	2930	<0.04	4	425	418	0.8	<1	1.26	<10	<10	391	387
Inside of MPAR	D10	17/03/2021	175	<1	<1	12,000	6850	7	3750	3540	<0.04	4	538	460	0.4	<1	1.76	<10	<10	299	246
Inside of MPAR	D10	30/06/2021	139	<1	<1	16,000	12,900	3	2940	2850	<0.04	17	394	372	0.4	<1	1.24	<10	<10	44	26
	Count Detects		**3**	**1**	**0**	**3**	**4**	**4**	**3**	**4**	**0**	**4**	**4**	**3**	**4**	**0**	**3**	**0**	**0**	**4**	**3**
	Average		**160.6666667**	**1**	**-**	**14,533**	**11,838**	**12.5**	**3243.333333**	**3015**	**-**	**6.75**	**431**	**416.6666667**	**0.55**	**-**	**1.42**	**-**	**-**	**338.75**	**219.6666667**
	50th Percentile		**168**	**1**	**-**	**15,600**	**12,600**	**7.5**	**3040**	**2890**	**-**	**4**	**409.5**	**418**	**0.5**	**-**	**1.26**	**-**	**-**	**345**	**246**
	90th Percentile		**173.6**	**1**	**-**	**15,920**	**14,580**	**24.8**	**3608**	**3357**	**-**	**13.1**	**504.1**	**451.6**	**0.74**	**-**	**1.66**	**-**	**-**	**552**	**358.8**
	Minimum		**139**	**1**	**-**	**12,000**	**6,850**	**3**	**2940**	**2740**	**-**	**2**	**367**	**372**	**0.4**	**-**	**1.24**	**-**	**-**	**44**	**26**
	Maximum		**175**	**1**	**-**	**16,000**	**15,300**	**32**	**3750**	**3540**	**-**	**17**	**538**	**460**	**0.8**	**-**	**1.76**	**-**	**-**	**621**	**387**
Inside of MPAR	D11	17/09/2020	-	<1	-	-	46,700	<1	-	14,800	<0.04	<1	879	-	0.5	<1	-	<10	<10	28	-
Inside of MPAR	D11	30/06/2021	134	<1	<1	102,000	83,100	<1	14,200	14,000	<0.04	9	839	851	0.3	<1	3.32	<10	<10	23	20
	Count Detects		**1**	**0**	**0**	**1**	**2**	**0**	**1**	**2**	**0**	**1**	**2**	**1**	**2**	**0**	**1**	**0**	**0**	**2**	**1**
	Average		**134**	**-**	**-**	**102,000**	**64,900**	**-**	**14,200**	**14,400**	**-**	**9**	**859**	**851**	**0.4**	**-**	**3.32**	**-**	**-**	**25.5**	**20**
	50th Percentile		**134**	**-**	**-**	**102,000**	**64,900**	**-**	**14,200**	**14,400**	**-**	**9**	**859**	**851**	**0.4**	**-**	**3.32**	**-**	**-**	**25.5**	**20**
	90th Percentile		**134**	**-**	**-**	**102,000**	**79,460**	**-**	**14,200**	**14,720**	**-**	**9**	**875**	**851**	**0.48**	**-**	**3.32**	**-**	**-**	**27.5**	**20**
	Minimum		**134**	**-**	**-**	**102,000**	**46,700**	**-**	**14,200**	**14,000**	**-**	**9**	**839**	**851**	**0.3**	**-**	**3.32**	**-**	**-**	**23**	**20**
	Maximum		**134**	**-**	**-**	**102,000**	**83,100**	**-**	**14,200**	**14,800**	**-**	**9**	**879**	**851**	**0.5**	**-**	**3.32**	**-**	**-**	**28**	**20**
North-east boundary of LNAR	D1	16/09/2020	-	1	-	-	36,100	<1	-	26,100	<0.04	<1	2040	-	0.7	<1	-	<10	<10	191	-
North-east boundary of LNAR	D1	25/11/2020	422	<1	<1	52,300	40,800	<1	23,000	22,600	<0.04	<1	2010	1980	0.4	<1	3.02	<10	<10	188	174
North-east boundary of LNAR	D1	14/04/2021	374	<1	<1	55,800	48,700	<1	23,800	23,000	<0.04	<1	1790	1790	0.4	<1	2.73	<10	<10	163	176
North-east boundary of LNAR	D1	23/06/2021	365	<1	<1	49,900	47,800	<1	21,200	20,100	<0.04	<1	1820	1820	<0.2	<1	2.75	<10	<10	159	159
	Count Detects		**3**	**1**	**0**	**3**	**4**	**0**	**3**	**4**	**0**	**0**	**4**	**3**	**3**	**0**	**3**	**0**	**0**	**4**	**3**
	Average		**387.0**	**1.0**	**-**	**52666.7**	**43350.0**	**-**	**22666.7**	**22950.0**	**-**	**-**	**1915.0**	**1863.3**	**0.5**	**-**	**2.8**	**-**	**-**	**175.3**	**169.7**
	50th Percentile		**374.0**	**1.0**	**-**	**52300.0**	**44300.0**	**-**	**23000.0**	**22800.0**	**-**	**-**	**1915.0**	**1820.0**	**0.4**	**-**	**2.8**	**-**	**-**	**175.5**	**174.0**
	90th Percentile		**412.4**	**1.0**	**-**	**55100.0**	**48430.0**	**-**	**23640.0**	**25170.0**	**-**	**-**	**2031.0**	**1948.0**	**0.6**	**-**	**3.0**	**-**	**-**	**190.1**	**175.6**
	Minimum		**365**	**1**	**-**	**49900**	**36100**	**-**	**21200**	**20100**	**-**	**-**	**1790**	**1790**	**0.4**	**-**	**2.73**	**-**	**-**	**159**	**159**
	Maximum		**422**	**1**	**-**	**55800**	**48700**	**-**	**23800**	**26100**	**-**	**-**	**2040**	**1980**	**0.7**	**-**	**3.02**	**-**	**-**	**191**	**176**
Statistical Summary																					
Number of Results			87	97	87	87	97	97	87	97	97	97	97	87	97	97	87	97	97	97	87
Number of Detects			81	76	63	87	94	73	87	97	64	72	97	87	79	60	87	60	60	95	86
Minimum Concentration			0	0	0	1	2	0	1	2	0	0	2	1	0	0	0.074	0	0	2	1
Minimum Detect			1	1	2	1	2	2	1	2	0.06	1	2	1	0.2	ND	0.074	ND	ND	2	1
Maximum Concentration			544	11	3	102000	83100	32	23800	26100	3	17	2040	1980	4	<1	3.32	<10	<10	1300	1190
Maximum Detect			544	11	3	102000	83100	32	23800	26100	3	17	2040	1980	4	ND	3.32	ND	ND	1300	1190
Average Concentration			150	2.5	0.74	25611	18929	4.8	5875	6044	0.16	3.2	539	521	0.59	0.39	1.6	3.9	3.9	214	167
Median Concentration			134	1	0.5	16000	13400	3	2533.333333	2570	0.02	1	394	372	0.4	0.5	1.18	5	5	71	65.66666667
Standard Deviation			168	2.7	0.77	29511	20597	6.5	7778	7994	0.45	3.7	642	645	0.76	0.21	1.1	2.1	2.1	330	286
Number of Guideline Exceedances			0	58	9	65	74	37	22	25	16	48	33	27	6	37	0	0	0	8	7
Number of Guideline Exceedances(Detects Only)			0	58	9	65	74	37	22	25	16	48	33	27	6	0	0	0	0	8	7

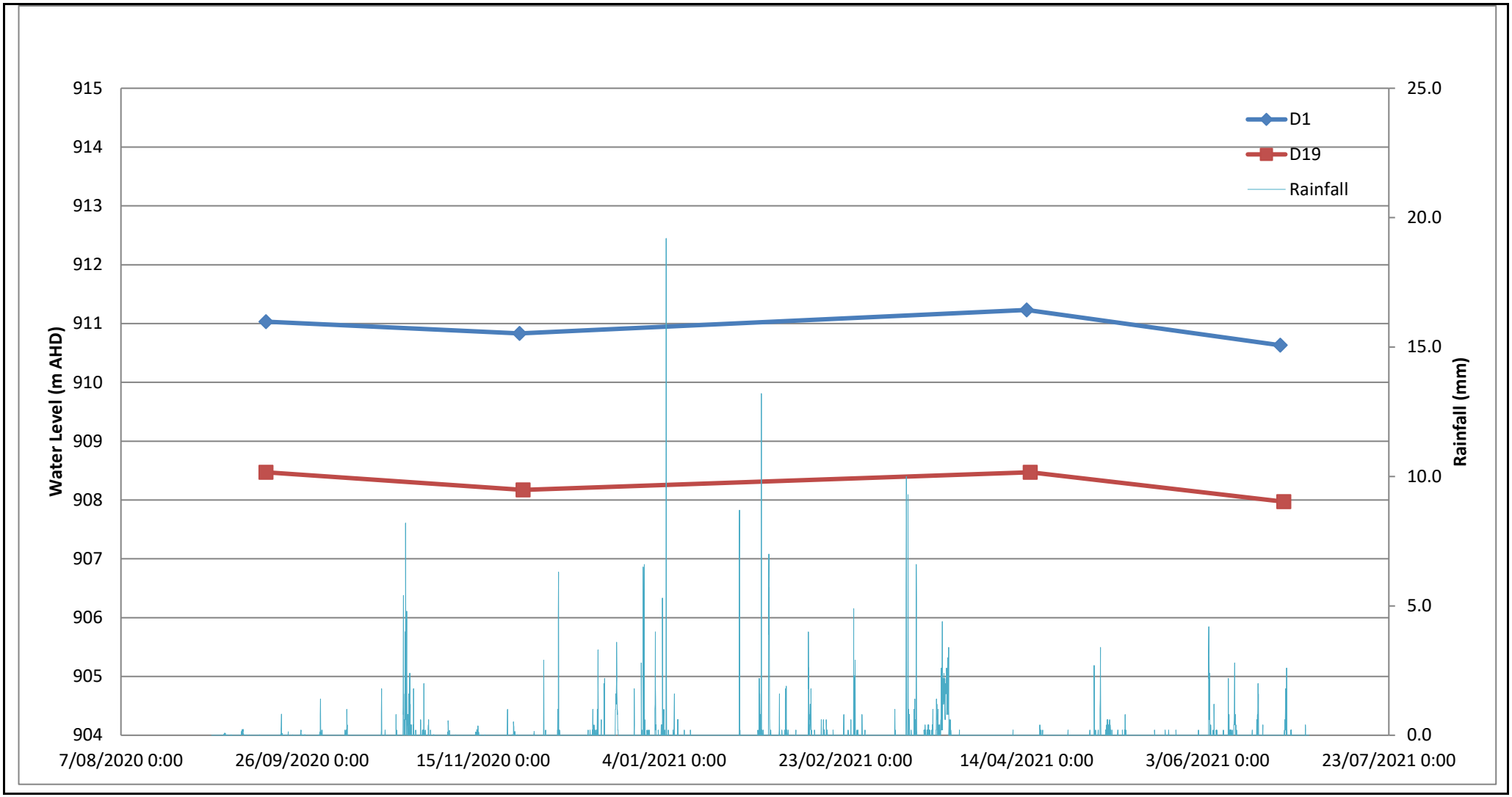
Env Stds Comments
#1:2000 mg/L TDS/0.77

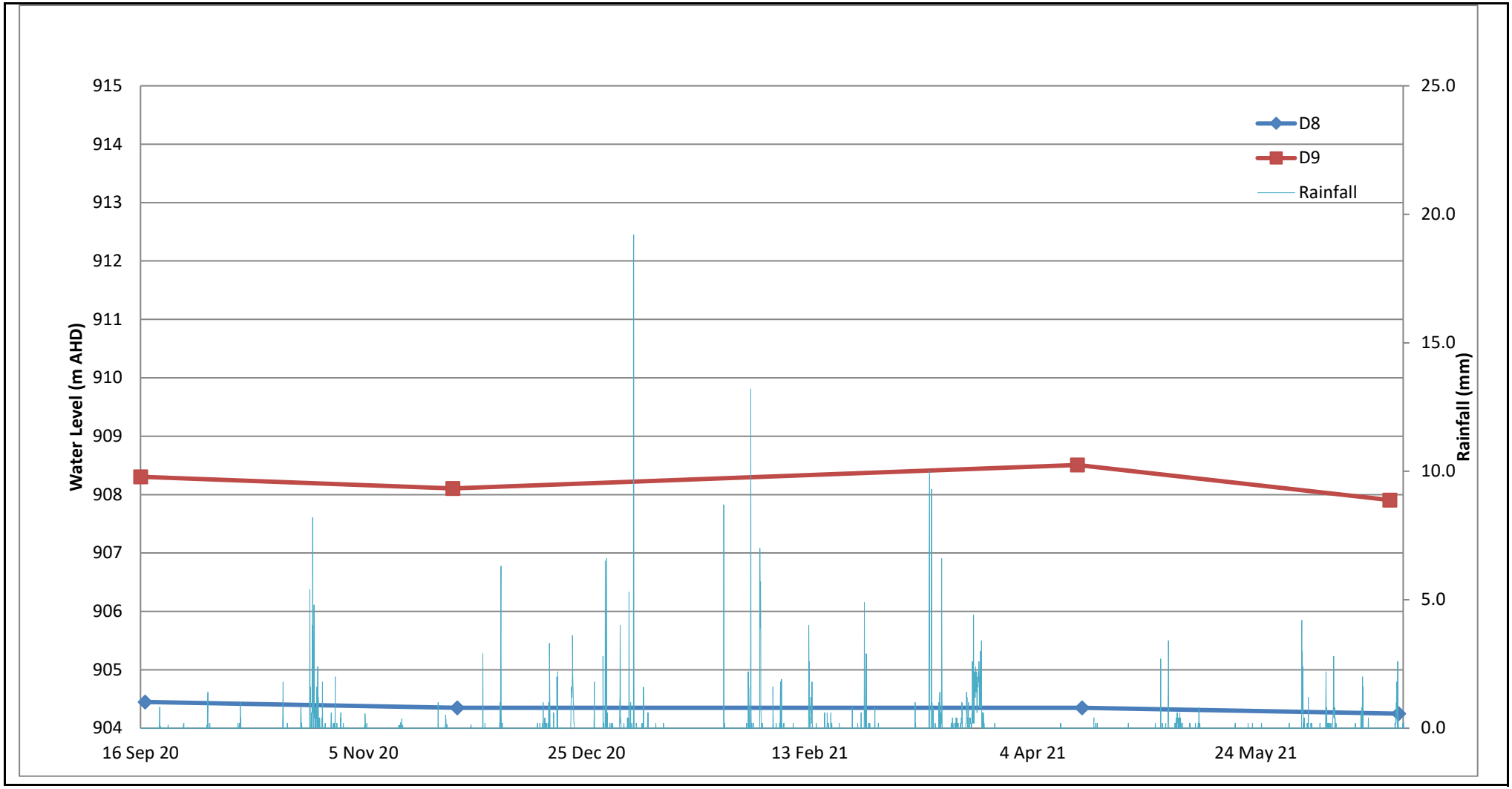
APPENDIX D HYDROGRAPHS

Figure D-1. Water Levels Over Time - Cross Gradient
Lamberts North Ash Placement Water Quality Monitoring
Annual Water Quality Monitoring Report 2020/21
553983

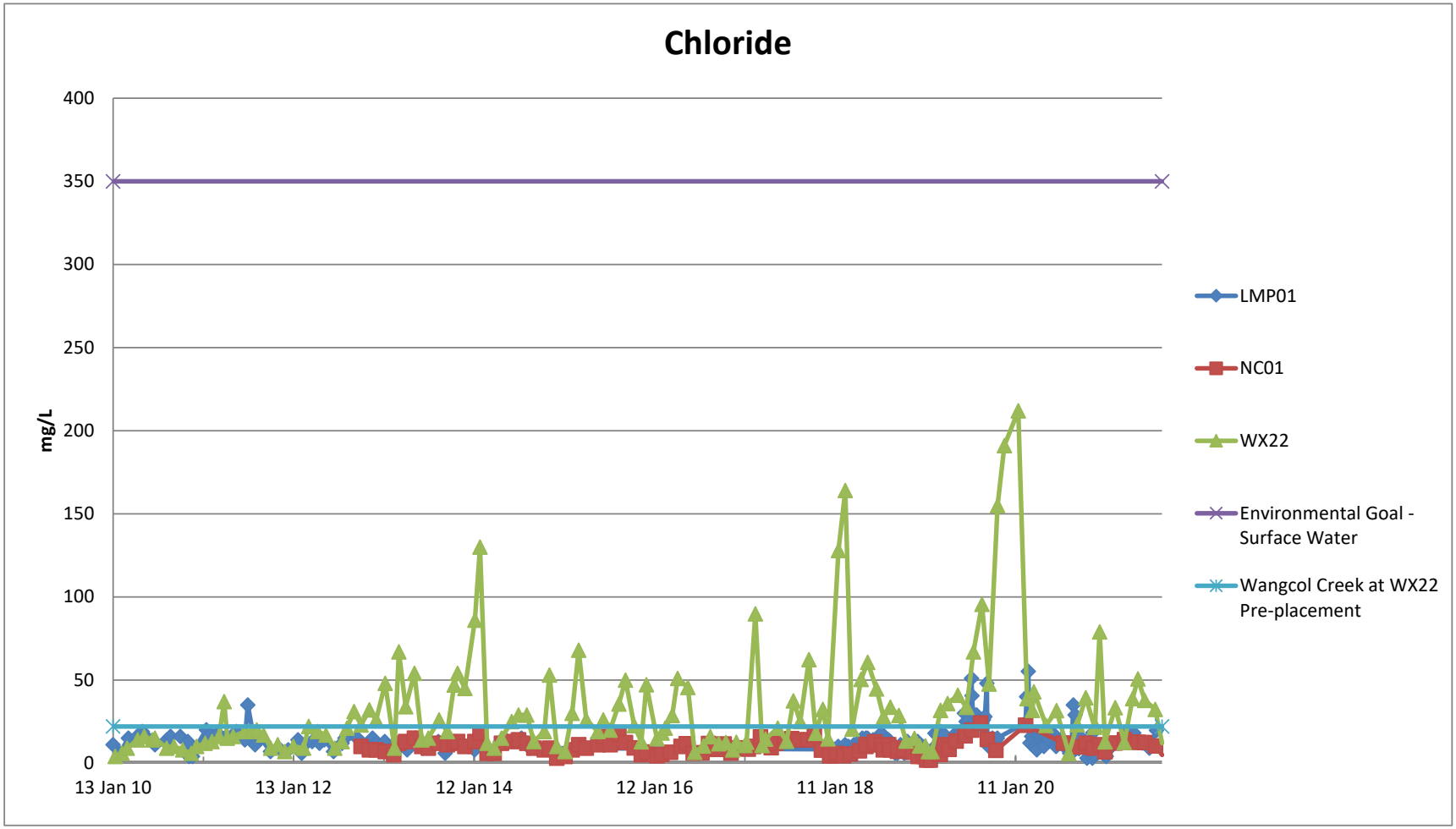


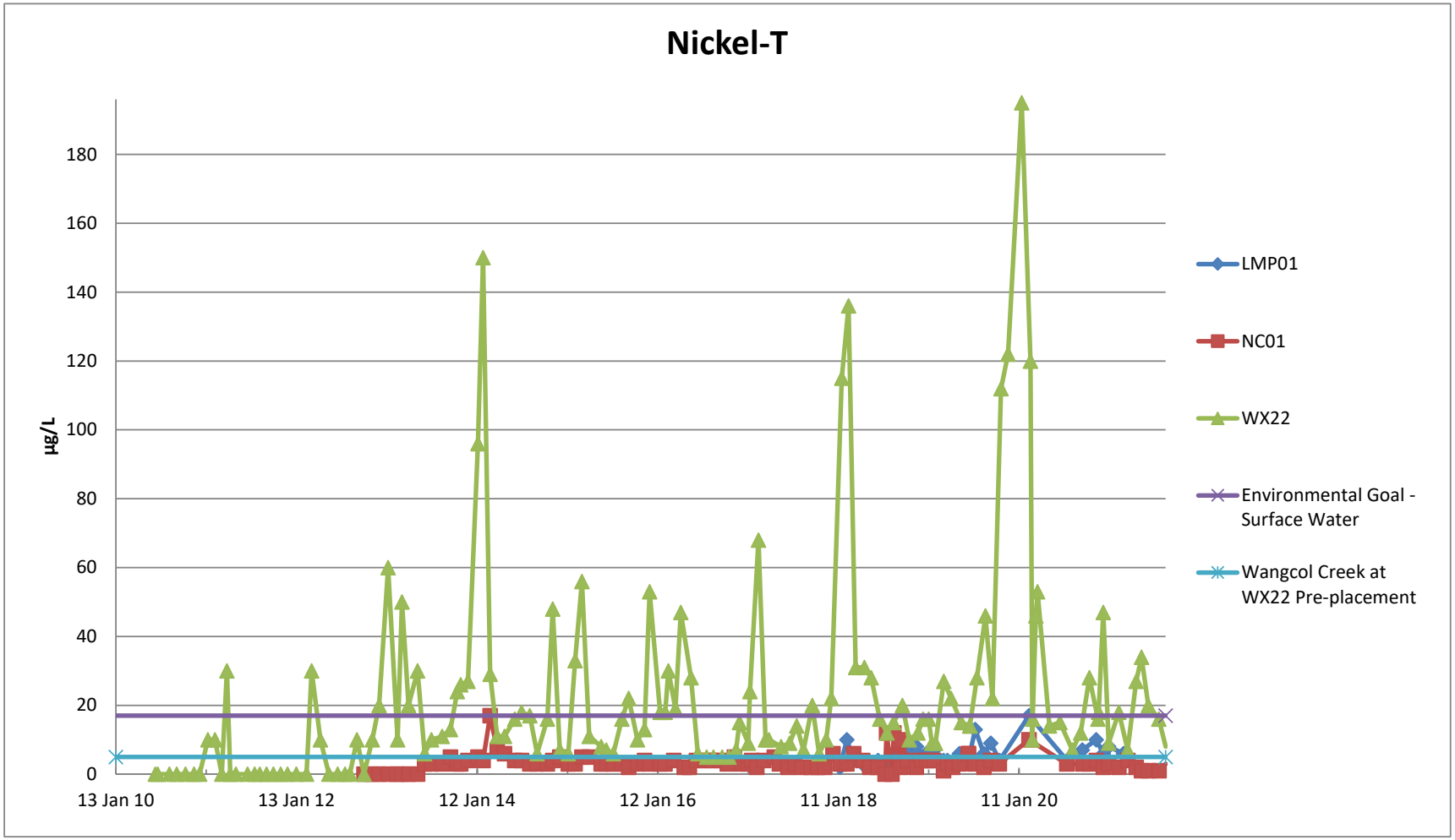

915
914
913
912
911
910
909
908
907
906
905
904
Water Level (m AHD)
25.0
20.0
15.0
10.0
5.0
0.0
Rainfall (mm)
D10
D11
Rainfall
17 Sep 20
6 Nov 20
26 Dec 20
14 Feb 21
5 Apr 21
25 May 21

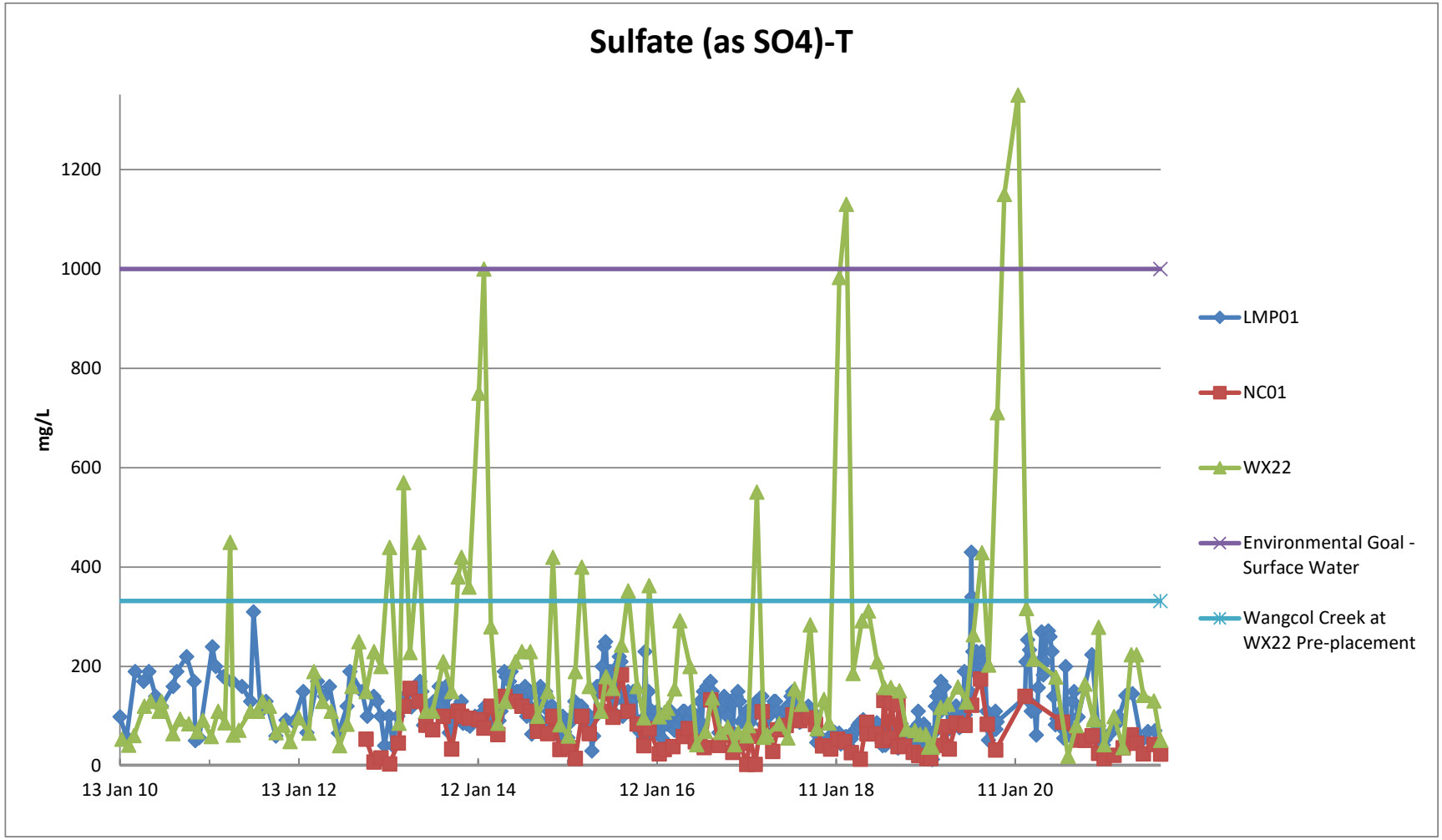

915
914
913
912
911
910
909
908
907
906
905
904
Water Level (m AHD)
25.0
20.0
15.0
10.0
5.0
0.0
Rainfall (mm)
D1
D19
Rainfall
7/08/2020 0:00
26/09/2020 0:00
15/11/2020 0:00
4/01/2021 0:00
23/02/2021 0:00
14/04/2021 0:00
3/06/2021 0:00
23/07/2021 0:00

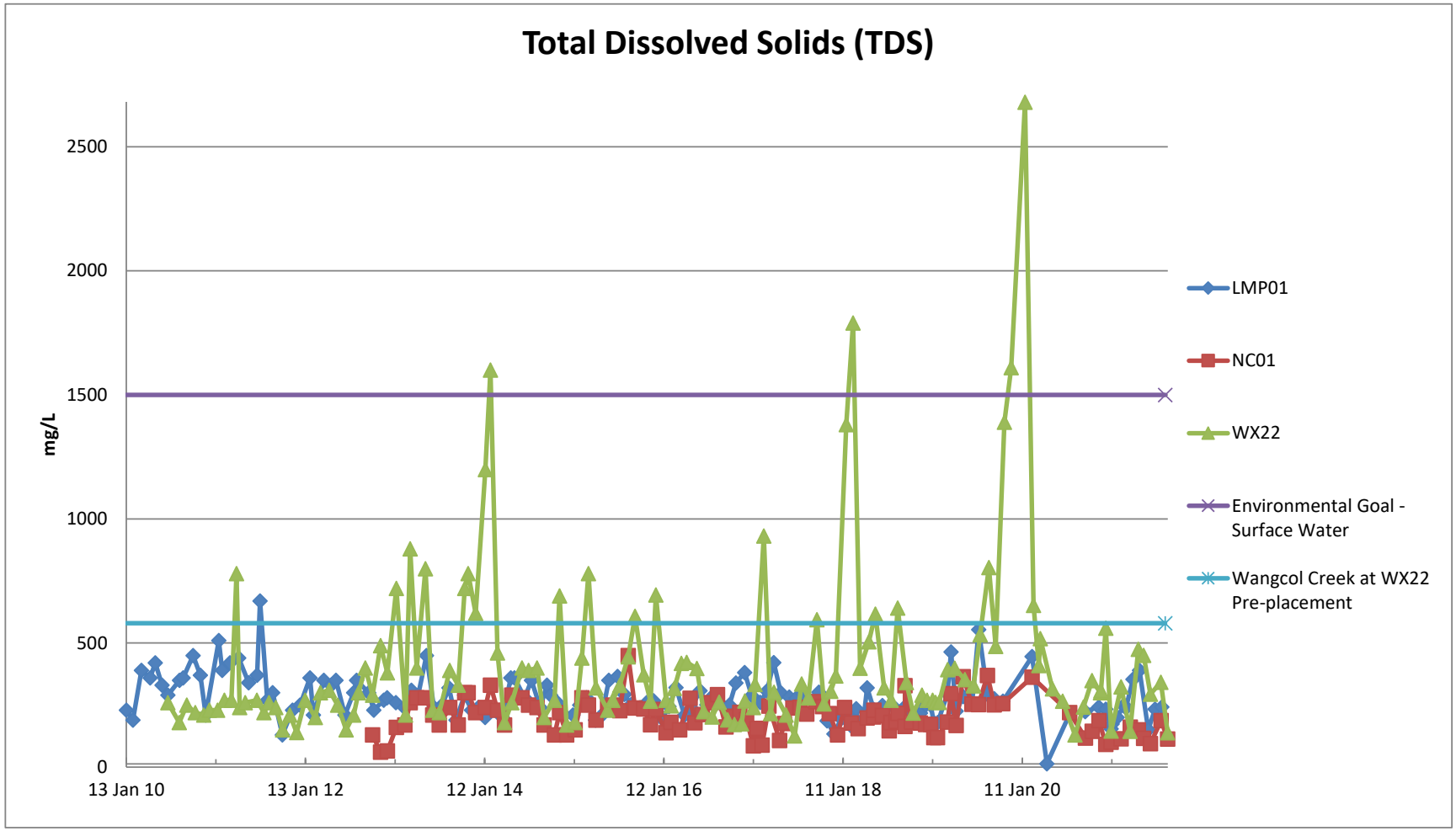

915
914
913
912
911
910
909
908
907
906
905
904
Water Level (m AHD)
25.0
20.0
15.0
10.0
5.0
0.0
Rainfall (mm)
D8
D9
Rainfall
16 Sep 20
5 Nov 20
25 Dec 20
13 Feb 21
4 Apr 21
24 May 21

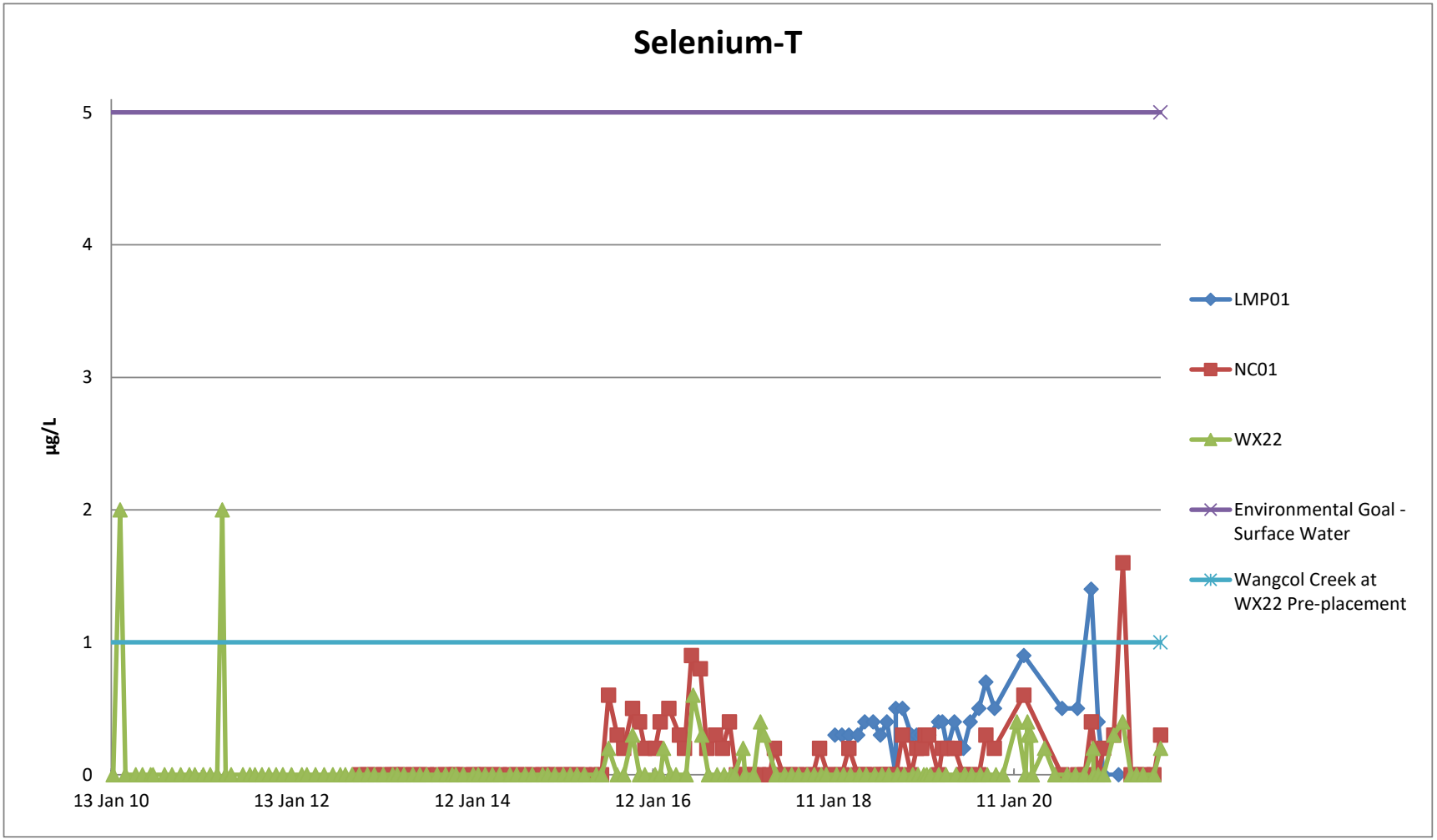
APPENDIX E TREND GRAPHS – SURFACE WATER

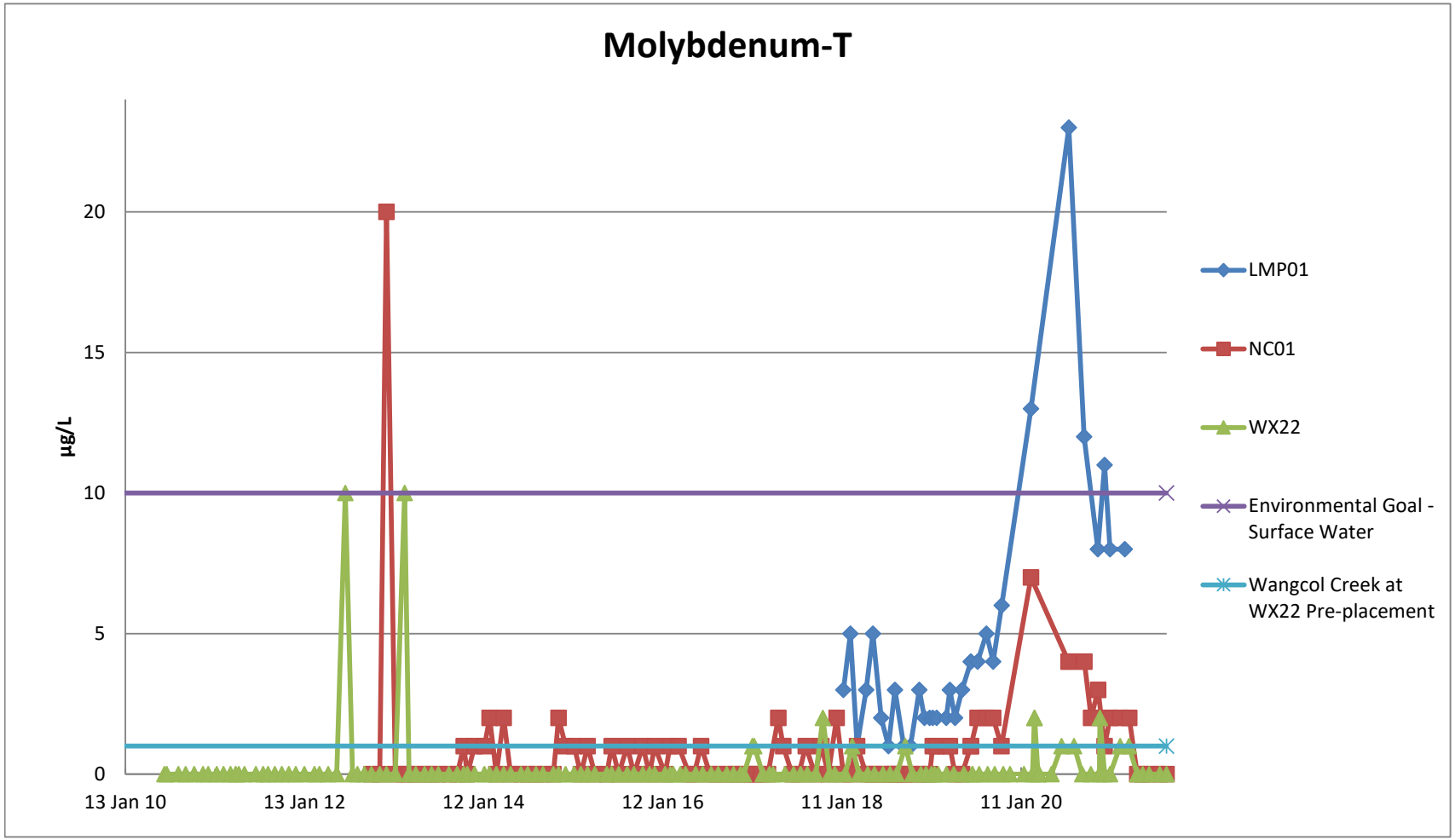

Chloride
400
350
300
250
200
150
100
50
0
mg/L
13 Jan 10
13 Jan 12
12 Jan 14
12 Jan 16
11 Jan 18
11 Jan 20
LMP01
NC01
WX22
Environmental Goal - Surface Water
Wangcol Creek at WX22 Pre-placement


Nickel-T
µg/l
180
160
140
120
100
80
60
40
20
0
13 Jan 10
13 Jan 12
12 Jan 14
12 Jan 16
11 Jan 18
11 Jan 20
LMP01
NC01
WX22
Environmental Goal - Surface Water
Wangcol Creek at WX22 Pre-placement

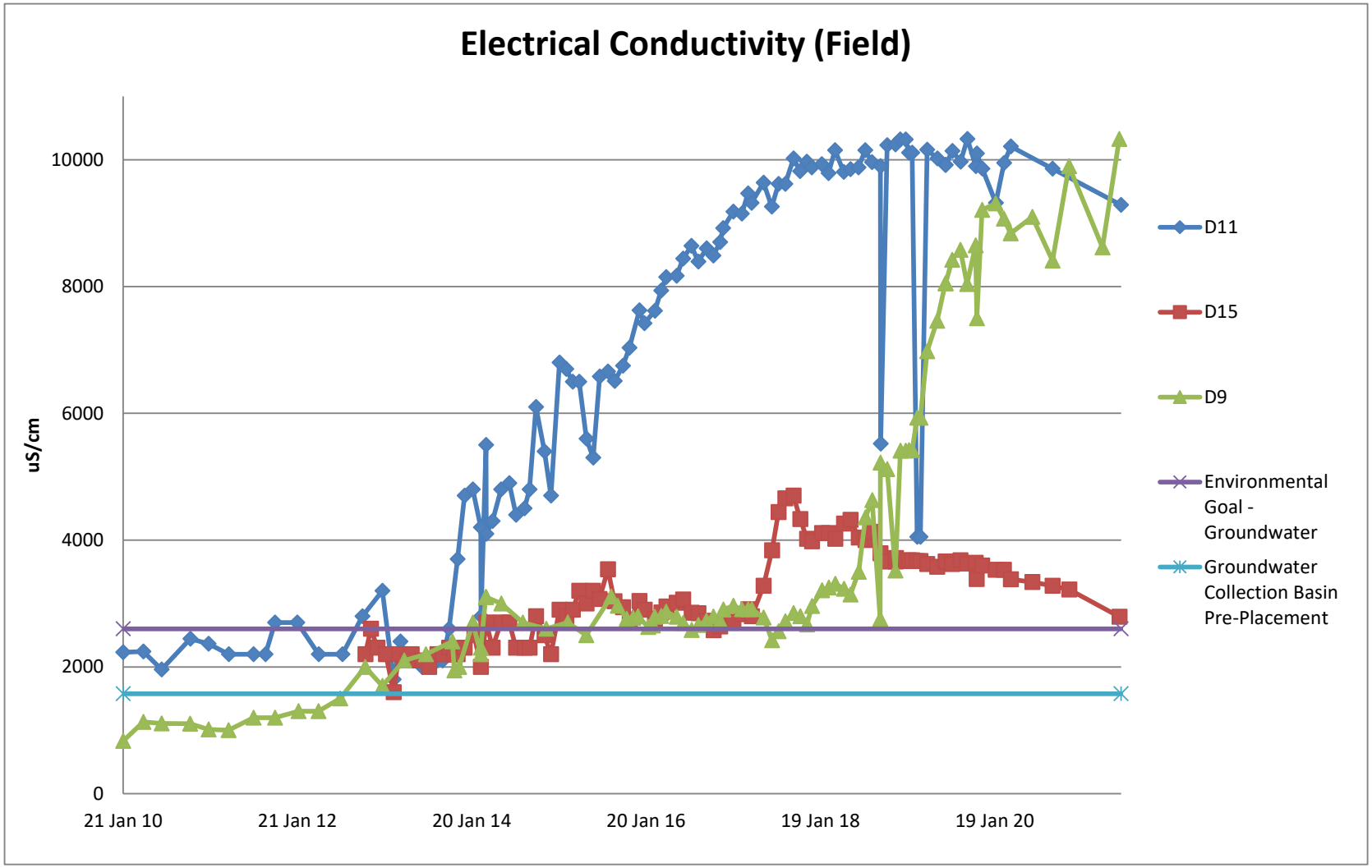

Sulfate (as SO4)-T
mg/L
1200
1000
800
600
400
200
0
13 Jan 10
13 Jan 12
12 Jan 14
12 Jan 16
11 Jan 18
11 Jan 20
LMP01
NC01
WX22
Environmental Goal - Surface Water
Wangcol Creek at WX22 Pre-placement

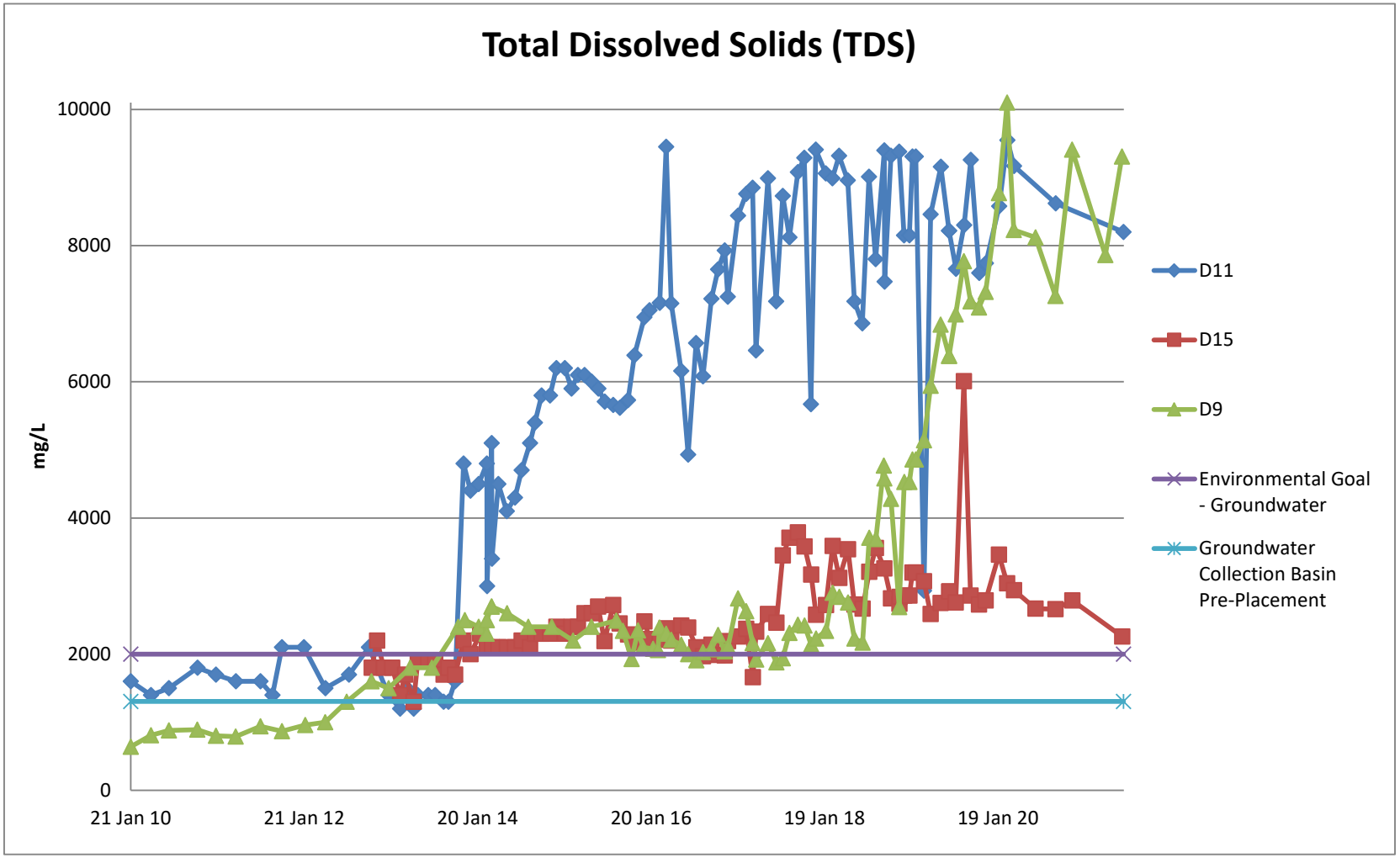

Total Dissolved Solids (TDS)
mg/L
2500
2000
1500
1000
500
0
13 Jan 10
13 Jan 12
12 Jan 14
12 Jan 16
11 Jan 18
11 Jan 20
LMP01
NC01
WX22
Environmental Goal - Surface Water
Wangcol Creek at WX22 Pre-placement

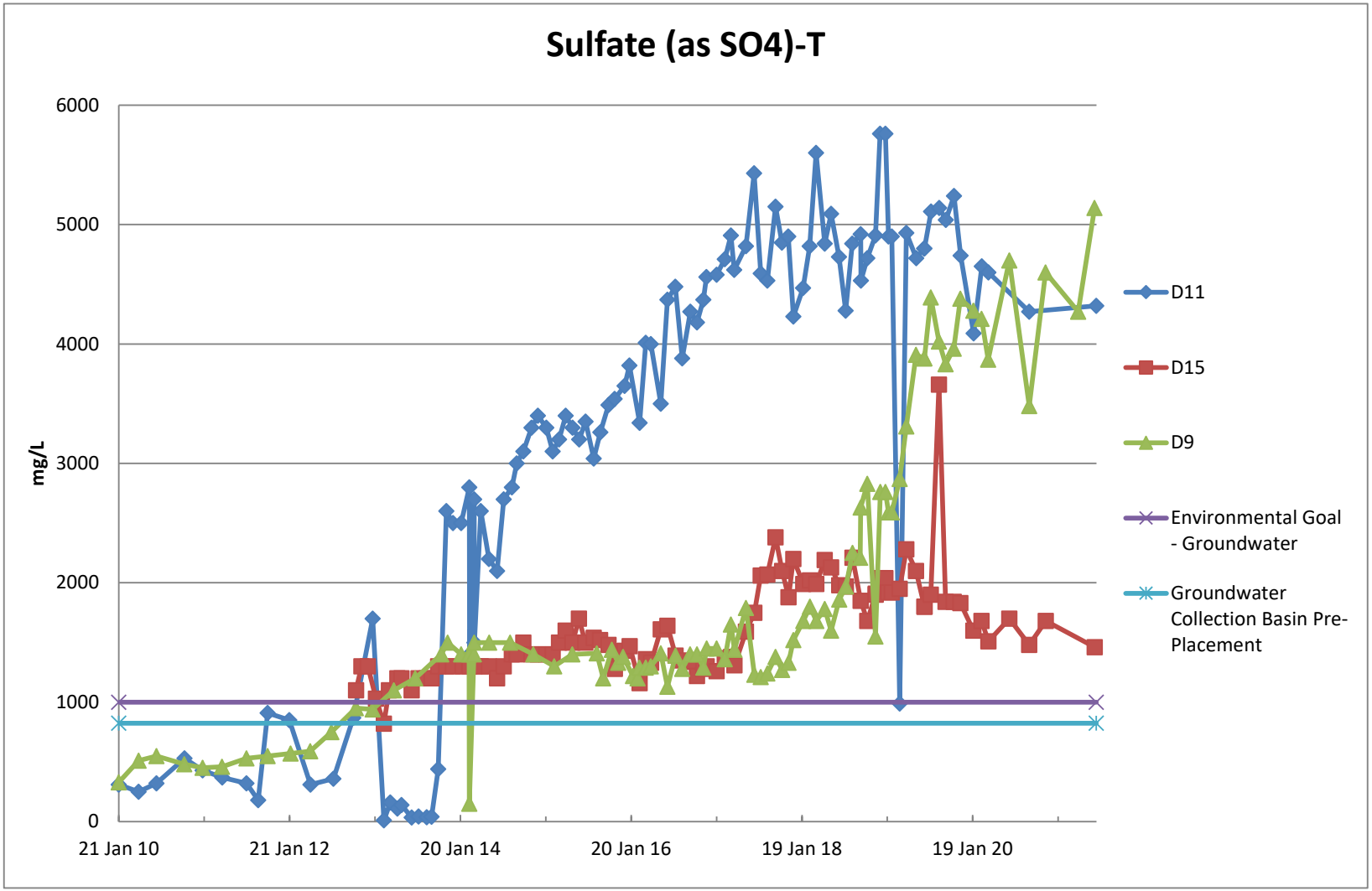

Selenium-T
µg/L
5
4
3
2
1
0
13 Jan 10
13 Jan 12
12 Jan 14
12 Jan 16
11 Jan 18
11 Jan 20
LMP01
NC01
WX22
Environmental Goal - Surface Water
Wangcol Creek at WX22 Pre-placement

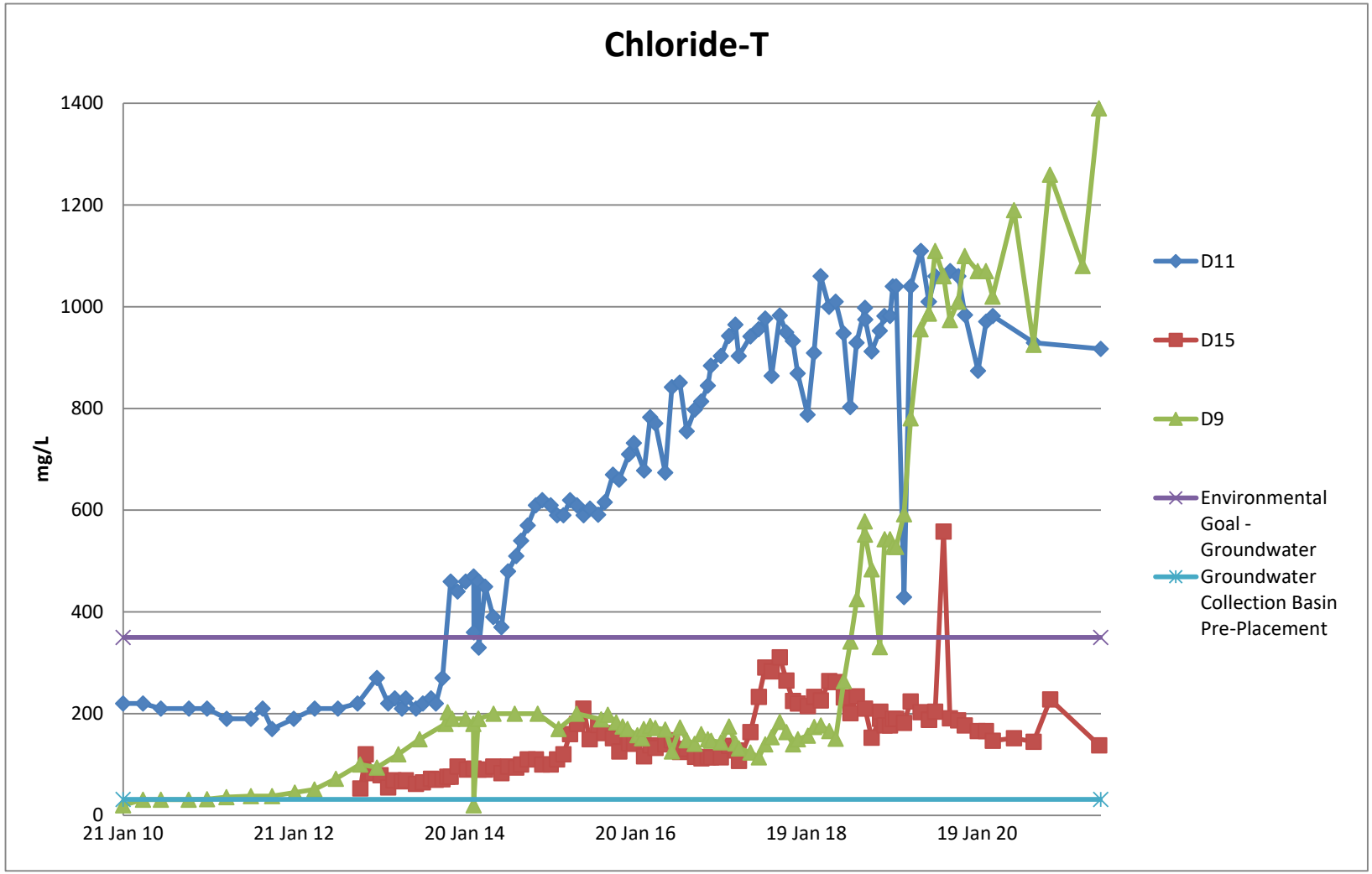

Molybdenum-T
µg/l
20
15
10
5
0
13 Jan 10
13 Jan 12
12 Jan 14
12 Jan 16
11 Jan 18
11 Jan 20
LMP01
NC01
WX22
Environmental Goal - Surface Water
Wangcol Creek at WX22 Pre-placement

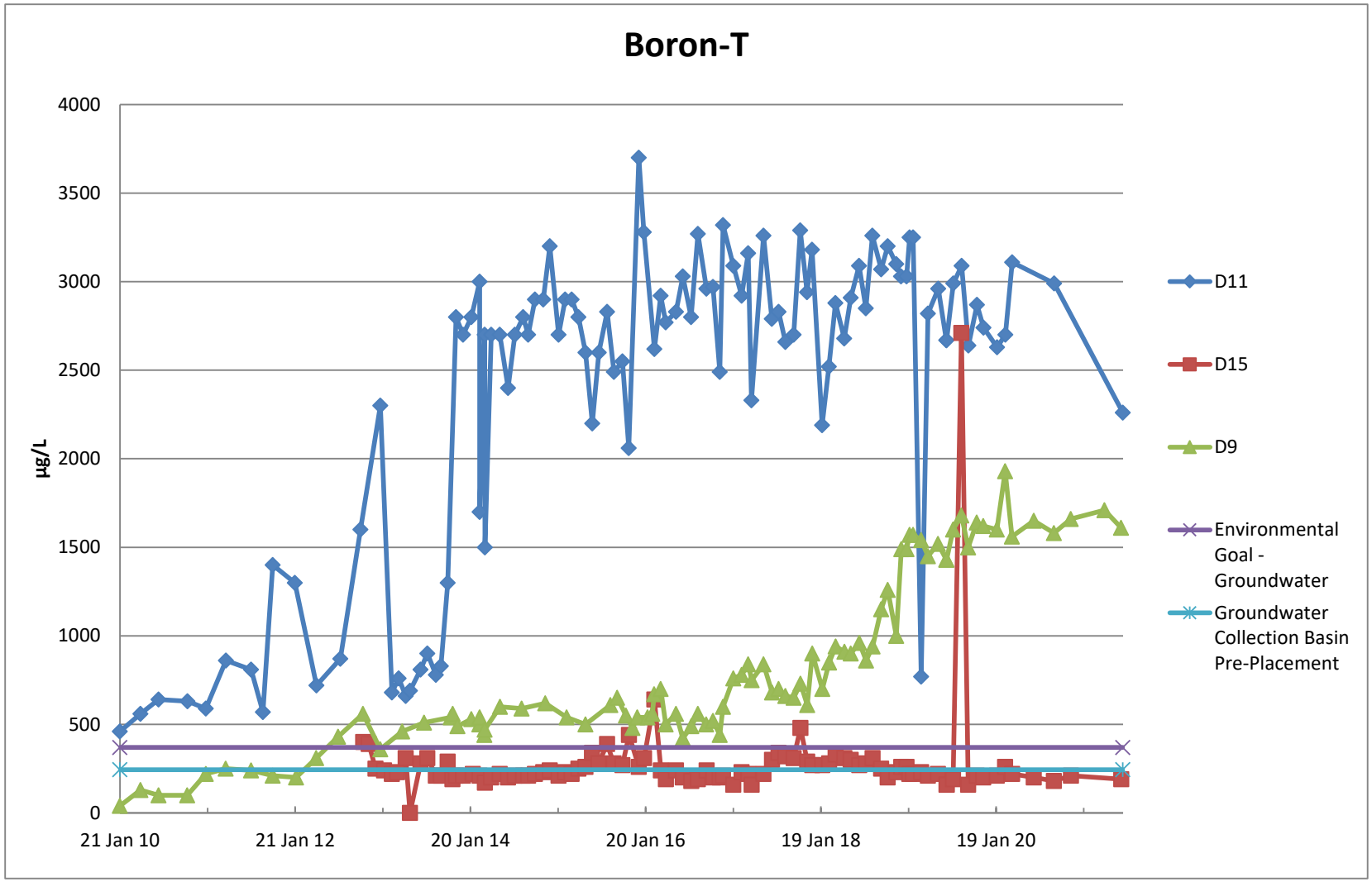
APPENDIX F TREND GRAPHS - GROUNDWATER

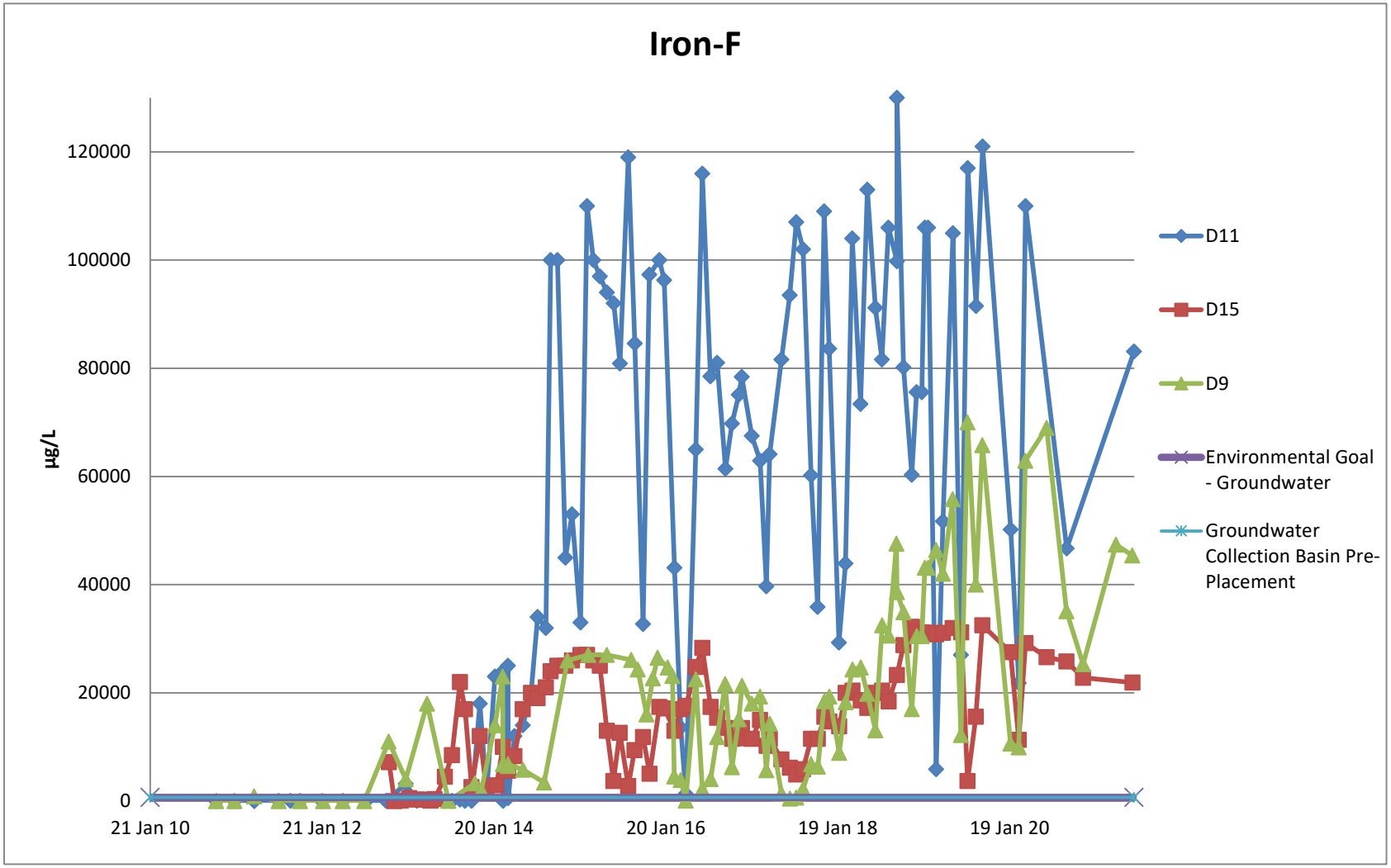

Electrical Conductivity (Field)
uS/cm
10000
8000
6000
4000
2000
0
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement

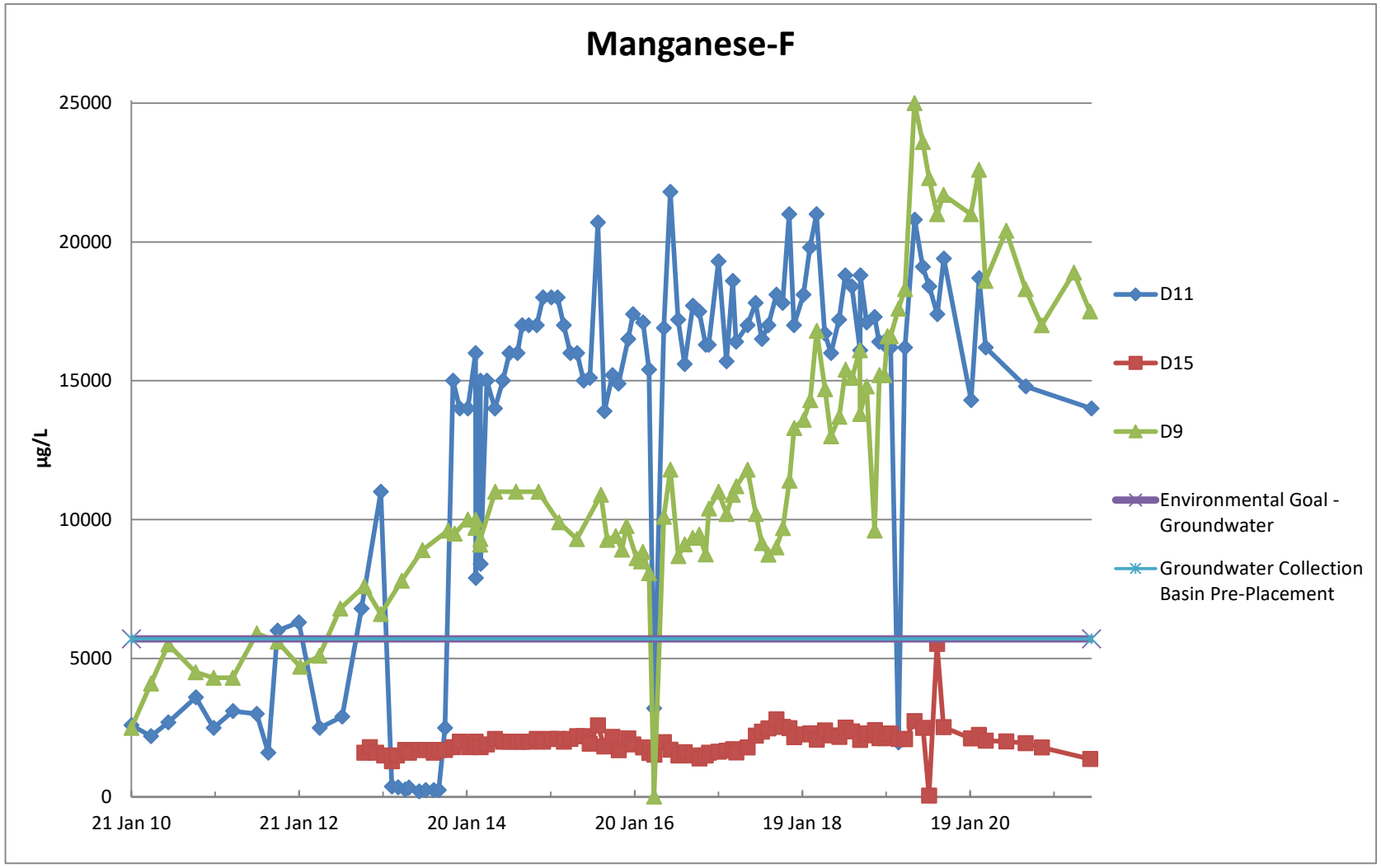

Total Dissolved Solids (TDS)
mg/L
10000
8000
6000
4000
2000
0
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement

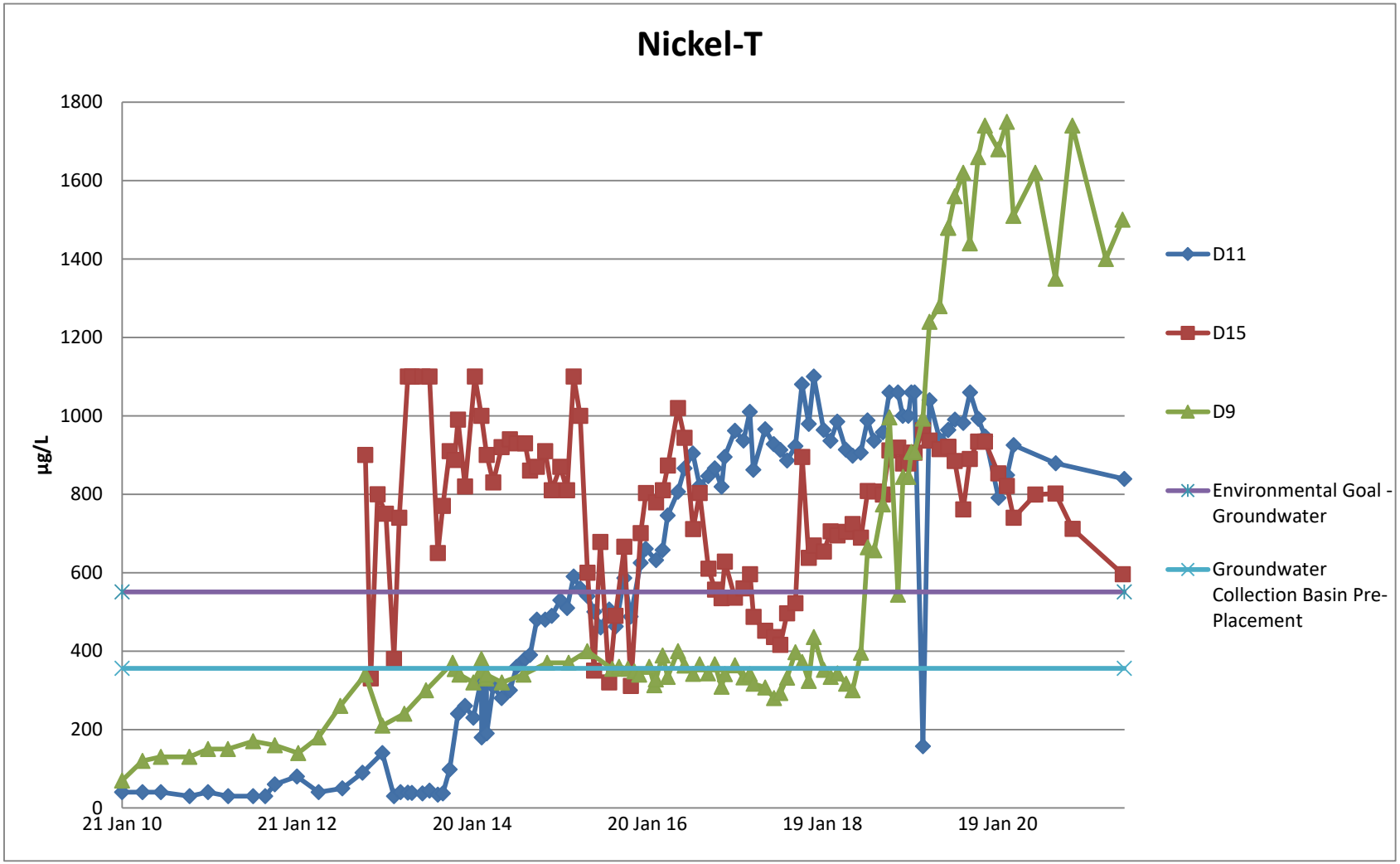

Sulfate (as SO4)-T
mg/L
6000
5000
4000
3000
2000
1000
0
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement


Chloride-T
mg/L
1400
1200
1000
800
600
400
200
0
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement


Boron-T
µg/l
4000
3500
3000
2500
2000
1500
1000
500
0
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement


Iron-F
µg/L
120000
100000
80000
60000
40000
20000
0
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement


Manganese-F
25000
20000
15000
10000
5000
0
µg/l
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement


Nickel-T
µg/l
1800
1600
1400
1200
1000
800
600
400
200
0
21 Jan 10
21 Jan 12
20 Jan 14
20 Jan 16
19 Jan 18
19 Jan 20
D11
D15
D9
Environmental Goal - Groundwater
Groundwater Collection Basin Pre-Placement

APPENDIX G MT PIPER CLIMATE DATA

Month	Sep-20			Oct-20			Nov-20			Dec-20			Jan-21		
Measurement	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain
Date	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm
1	1.0	14.0	0.0	3.0	15.0	2.6	6.0	16.0	0.0	13.0	35.0	3.3	11.0	13.0	10.2
2	-1.0	17.0	0.0	1.0	21.0	0.0	7.0	18.0	0.0	13.0	26.0	0.2	11.0	17.0	0.2
3	6.0	21.0	0.0	3.0	24.0	0.0	6.0	22.0	0.0	14.0	25.0	0.0	15.0	22.0	8.7
4	10.0	15.0	0.4	6.0	24.0	0.0	5.0	25.0	0.0	12.0	28.0	0.0	14.0	22.0	40.8
5	1.0	14.0	0.0	10.0	25.0	0.0	8.0	17.0	1.5	7.0	23.0	14.4	11.0	25.0	0.2
6	1.0	14.0	0.0	9.0	22.0	0.0	6.0	18.0	0.0	10.0	20.0	0.2	12.0	22.0	2.6
7	5.0	19.0	0.0	13.0	18.0	0.2	4.0	19.0	0.0	8.0	20.0	0.0	11.0	18.0	1.2
8	2.0	20.0	0.0	9.0	16.0	2.2	7.0	17.0	0.0	6.0	17.0	0.0	10.0	15.0	0.0
9	6.0	12.0	1.6	7.0	13.0	0.0	7.0	19.0	0.0	4.0	25.0	0.0	10.0	20.0	0.2
10	6.0	10.0	0.0	4.0	17.0	0.0	4.0	23.0	0.0	9.0	25.0	0.0	7.0	24.0	0.0
11	4.0	14.0	0.0	2.0	19.0	0.0	7.0	25.0	0.0	10.0	14.0	0.0	9.0	26.0	0.2
12	4.0	17.0	0.0	6.0	20.0	0.0	11.0	23.0	0.3	10.0	16.0	0.0	9.0	30.0	0.0
13	4.0	16.0	0.0	4.0	23.0	0.0	8.0	18.0	1.2	11.0	19.0	0.2	13.0	28.0	0.0
14	3.0	19.0	0.0	6.0	21.0	0.0	7.0	20.0	0.0	13.0	21.0	0.2	14.0	30.0	0.0
15	5.0	19.0	0.0	11.0	23.0	0.0	6.0	28.0	0.0	14.0	22.0	2.4	10.0	27.0	0.0
16	5.0	19.0	0.0	10.0	20.0	0.0	10.0	29.0	0.0	17.0	25.0	8.1	8.0	21.0	0.0
17	7.0	22.0	0.0	11.0	24.0	2.8	10.0	25.0	0.0	17.0	27.0	0.6	7.0	25.0	0.0
18	9.0	14.0	0.0	10.0	18.0	0.2	13.0	22.0	0.0	13.0	24.0	4.4	10.0	28.0	0.0
19	12.0	18.0	0.0	9.0	19.0	0.0	7.0	28.0	0.0	15.0	16.0	0.0	9.0	24.0	0.0
20	10.0	15.0	1.7	10.0	19.0	0.0	13.0	31.0	0.0	13.0	21.0	0.0	12.0	19.0	0.0
21	11.0	22.0	0.0	7.0	21.0	1.6	11.0	31.0	0.0	13.0	18.0	21.0	8.0	27.0	0.0
22	6.0	17.0	0.0	12.0	22.0	0.4	13.0	28.0	0.0	11.0	19.0	3.2	12.0	29.0	0.0
23	3.0	13.0	0.0	9.0	25.0	6.9	11.0	21.0	1.5	10.0	21.0	0.0	13.0	31.0	0.0
24	4.0	11.0	0.0	12.0	17.0	34.1	9.0	22.0	0.0	12.0	23.0	0.0	15.0	33.0	15.6
25	1.0	12.0	0.6	8.0	12.0	12.2	11.0	23.0	0.0	13.0	19.0	0.0	17.0	33.0	0.0
26	1.0	6.0	0.0	7.0	11.0	5.4	10.0	28.0	0.0	13.0	21.0	0.0	15.0	30.0	0.0
27	2.0	11.0	0.0	7.0	13.0	0.2	14.0	30.0	0.0	11.0	27.0	0.0	15.0	22.0	0.0
28	-2.0	14.0	0.0	7.0	17.0	1.0	15.0	33.0	0.1	14.0	27.0	3.0	14.0	18.0	0.0
29	2.0	15.0	0.0	7.0	18.0	2.4	14.0	30.0	0.4	14.0	17.0	24.6	13.0	19.0	0.2
30	4.0	12.0	0.2	5.0	18.0	1.4	12.0	19.0	0.0	13.0	18.0	0.8	15.0	25.0	20.6
31				6.0	17.0	0.2				13.0	20.0	0.0	13.0	21.0	0.4
Min	-2	6	0	1	11	0	4	16	0	4	14	0	7	13	0
Max	12	22	1.7	13	25	34.1	15	33	1.5	17	35	24.6	17	33	40.8
Average	4.40	15.40		7.45	19.10		9.07	23.60		11.81	21.90		11.71	24.00	
Total			4.50			73.80			5.00			86.60			101.10

Month	Feb-21			Mar-21			Apr-21			May-21			Jun-21		
Measurement	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain
Date	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm
1	14	26	26.8	12	28	0	4	21	0	6	19	0.2	-1	13	0
2	12	23	5.2	8	24	0	8	23	0	6	19	2.7	0	16	0
3	10	22	0	12	20	0	6	24	0	5	20	0.6	5	10	18.7
4	12	25	2.4	10	23	0	8	27	0	9	11	9	4	10	1.4
5	14	27	0.2	13	24	0	8	25	0	9	12	0.4	-2	11	0.4
6	12	20	5.7	12	22	0	12	21	0	11	16	4.6	0	13	0
7	10	25	0.2	13	24	0	13	19	0	9	17	1.2	-3	14	0.2
8	15	21	0	13	25	1.4	12	21	0	7	18	0	3	13	3
9	13	18	0.2	10	26	0	9	22	0	9	16	0.8	-1	4	1
10	9	21	0	14	25	0	6	15	0	5	16	0.2	0	2	10.4
11	13	26	0	16	23	25	5	9	0	7	13	1.6	1	6	0
12	12	26	9.6	15	21	18.8	-1	16	0	7	15	0	4	9	0
13	13	21	9	13	25	1.2	-1	18	0	6	15	0	-2	8	0
14	11	19	0.2	9	17	18.6	5	19	0	7	11	0	-3	12	0
15	11	19	0	8	19	0	8	18	0	2	7	0	0	12	0.2
16	14	21	1.6	10	16	1.2	8	18	0	-4	10	0	-2	15	7.8
17	13	18	2	11	15	2	7	14	0.4	-1	11	0	1	7	1.6
18	12	18	0	13	18	1.4	3	17	0.4	-2	13	0	5	9	0
19	14	22	0.2	13	17	2.4	0	17	0	-3	14	0	5	11	0
20	14	26	0	14	17	7.4	2	15	0	-2	16	0	6	10	0
21	13	27	0	12	16	19.8	1	15	0	-1	13	0	2	11	0
22	11	27	0	13	14	40.8	-1	11	0	1	16	0.2	1	12	0
23	11	18	0.2	14	18	25	1	14	0	-1	16	0.2	4	12	0
24	11	16	0.6	13	18	0.2	0	16	0	7	13	0	9	10	10.6
25	11	21	11.9	10	19	0	1	18	0.2	4	15	0.2	3	10	0.2
26	11	25	0.4	6	19	0.2	0	18	0	6	13	0	4	8	0.2
27	16	24	0.8	6	19	0	1	18	0	3	11	0	0	10	0
28	12	27	0.2	7	19	0	5	18	0	-1	11	0	-2	10	0
29				6	21	0	4	18	0	-2	11	0	6	11	0.2
30				7	20	0	1	18	0	-2	11	0	6	12	0.4
31				4	20	0				-4	15	0.2			
Min	9	16	0	4	14	0	-1	9	0	-4	7	0	-3	2	0
Max	16	27	26.8	16	28	40.8	13	27	0.4	11	20	9	9	16	18.7
Average	12.29	22.46		10.87	20.39		4.50	18.10		3.32	14.00		1.77	10.37	
Total			77.40			165.40			1.00			22.10			56.30

Month	Jul-21			Aug-21		
Measurement	Min	Max	Rain	Min	Max	Rain
Date	°C	°C	mm	°C	°C	mm
1	5	12	9	3.0	17.0	1.6
2	1	12	1	-2.0	11.0	2.4
3	-1	11	0	3.0	10.0	10.0
4	-3	11	0.0	2.0	5.0	1.0
5	0	8	0.0	4.0	9.0	0.0
6	-6	10	0.0	-1.0	10.0	0.0
7	-6	10	0.0	-3.0	10.0	0.2
8	-2	11	0.0	-2.0	10.0	0.0
9	3	8	1.0	2.0	13.0	0.2
10	3	11	0.0	0.0	14.0	0.0
11	1	11	0.0	2.0	15.0	0.4
12	-1	12	0.0	-2.0	12.0	4.4
13	-1	11	0.0	-4.0	12.0	0.2
14	0	10	2.0	-4.0	15.0	0.0
15	5	13	2.0	-3.0	14.0	0.2
16	4	9	11.0	4.0	12.0	0.0
17	1	6	14.0	-2.0	12.0	0.0
18	3	9	0.0	-4.0	13.0	0.0
19	-2	6	0.0	-3.0	15.0	0.2
20	3	6	2.0	-1.0	15.0	0.0
21	-4	8	1.0	2.0	16.0	0.2
22	-6	10	0.0	2.0	20.0	0.0
23	2	7	2.0	5.0	18.0	13.2
24	4	8	3.0	2.0	6.0	45.8
25	1	5	6.0	2.0	9.0	0.2
26	4	10	0.0	-2.0	12.0	0.0
27	5	13	0.0	2.0	8.0	0.0
28	4	15	4.0	-2.0	11.0	0.0
29	-3	9	0.0	-3.0	13.0	0.6
30	-7	13	0.0	0.0	14.0	0.0
31	1	17	0.0	-2.0	17.0	0.0
Min	-7	5	0	-4	5	0
Max	5	17	14	5	20	45.8
Average	0.26	10.06		-0.16	12.52	
Total			58.00			80.80

APPENDIX H ASH REPOSITORY SURVEY AND PLACEMENT PLANS

CEH SURVEY
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
"Astrolabe" 1 Rutherford Lane,
LITHGOW 2790
ABN: 68 056 544 551 Office: (02) 6351 2281
Email: survey@ceh.com.au Website: www.ceh.com.au

DATE	09-08-2021
AMENDED	
SURVEYOR	TH/BN
DRAWN	TH
CHECKED	

LEND LEASE SERVICES PTY. LTD.

MOUNT PIPER - ASH PLACEMENT
SURVEY : 9th AUGUST 2021

SCALE - 1:3500 (A3) DATUM: MGA (ZONE 56)

DRAWING No:

MPA0821
(as surveyed)

CCAD6 JOB & DWG:
MPA0821 - MPA0821 as survey

APPENDIX I PROJECT APPROVAL REQUIREMENTS

Appendix I Project Approval Requirement

Project Approval Document	Consent requirements	How addressed by this report
Project Approval 09_0186	E15. The Proponent shall prepare and implement a Groundwater Monitoring Program to monitor the impacts of ash placement activities on local groundwater quality and hydrology. The Program shall be developed in consultation with the Sydney Catchment Authority, and shall describe the location, frequency, rationale and procedures and protocols for collecting groundwater samples as well as the parameters analysed and methods of analysis. The monitoring program shall be ongoing for the operation of the project and for a minimum of 5 years following project completion and include, but not be limited to: a) monitoring at established bore sites (or replacement bore sites in the event that existing sites are damaged or lost) as described in the Groundwater Management Plan as per condition D3(b); and b) a schedule for periodic monitoring of groundwater quality, depth and flow at all monitoring sites, at an initial frequency of no less than once every month for the first 12 months of operation. The monitoring program shall form part of the Groundwater Management Plan referred to in condition D3(b) of this approval.	Refer to Section 6.4 of OEMP
Project Approval 09_0186	E16. The Proponent shall prepare and implement a surface water quality monitoring program to monitor the impacts of the ash placement activities on Neubecks Creek and Lamberts Gully. The Program shall be developed in consultation with the DPI (Fisheries) and the SCA, and shall describe the location, frequency, rationale and the procedures and protocols for collecting water samples as well as the parameters analysed and methods of analysis. The program shall include, but not necessarily be limited to: a) monitoring at the existing water quality monitoring sites as described in the document referred to under condition A1b); b) monitoring at surface water discharge points from Lamberts Gully Creek; c) monitoring at surface water discharge points into Neubecks Creek; d) wet weather monitoring with a minimum of two events recorded within the first 12 months operation of the project; and e) a schedule for periodic monitoring of surface quality at all sites throughout the life of the project, at an initial frequency of no less than once every month for the first 12 months and must include, but not be limited to, monitoring of dissolved oxygen, turbidity, sulfate, salinity, boron, manganese, iron chloride, total phosphorus and total nitrogen.	Refer to Section 6.5 of OEMP
Operational Environmental Management Plan	Section 6.4.3.1 Groundwater Monitoring Program - Guidelines	Refer to Section 4 of this report
	Section 6.4.3.2 Groundwater Monitoring Program – Water Quality Criteria	Refer to Appendix C and Section 6
	Section 6.4.4 Monitoring (Table 6-13 – Monitoring Schedule)	Refer to Sections 6.2
	Section 6.4.4 Monitoring (Table 6-14 Procedures and Protocols for Monitoring)	Refer to Appendix C and Sections 5.2 and 5.3
	Section 6.4.4 Monitoring (Table 6.15 Contingency plan for events at Lamberts North that have the potential to pollute or contaminate groundwater sources of water.)	Refer to Sections 6.6 and 6.7
	Section 6.4.4 Monitoring (Table 6-16 Investigating protocol)	Refer to Sections 6.6, 6.7 and 7
	Section 6.4.4 Monitoring (Table 6-17 Reporting Requirements, Item 2)	This report
	Section 6.5.5 (Table 6-21 Monitoring measures – regarding Surface Water Quality Monitoring)	Refer to Section 5 and Appendix B of this report
	Section 6.5.5 (Table 6-22 Reporting, Item 5)	This report

APPENDIX J NALCO QAQC PROGRAM

CA12119 Total Suspended Solids

1. SCOPE & APPLICATION

This document describes determination of total suspended solids in water samples. It is applicable to the Global Analytical and Microbiological (GAM) Services laboratory, Mount Piper site.

2. REFERENCES

a) APHA Standard Methods, for the Examination of Water and Waste Water - Method 2540D

3. DEFINITIONS

Suspended Solids: The particulate material retained on a glass fibre filter and dried to constant weight at a specified temperature. Suspended solids may also be called "Non-Filtrable Residues", or "NFR".

Type 1 water: Ultrapure Milli-Q Water as per ASTM D1193-6.

D.I. Water: De-Ionised Water

Blank sample: D.I water sample

4. THEORY

The method for total suspended solids is based on Standard Methods, for the Examination of Water and Waste Water.

A well mixed sample is filtered through a weighed standard glass-fibre filter, the residue is collected on the filter and dried to a constant weight at 103 - 105 °C. The increase in weight of the filter represents the total suspended solids.

5. INTERFERENCES

- Exclude large floating particles or submerged agglomerates of non-homogeneous materials from the sample if it is determined that their inclusion is not representative.
- Limit sample size to no greater than 200 mg residue as excessive residue on the filter may form a water-entrapping crust. In samples where this is the case, reduce the volume filtered.
- Samples with high total dissolved solids need to be thoroughly washed to ensure removal of dissolved material.
- Prolonged filtration times resulting from filter clogging may produce high results owing to increased colloidal materials captured on the clogged filter.

6. SAFETY NOTES

- General PPE - Labcoat, safety glasses, gloves, protective footwear.

7. EQUIPMENT

- Whatman GF/C filter paper 47mm / 47mm No. 393 Glass Microfiber Filter papers or equivalent
- Tweezers
- Drying oven at 103 - 105 °C
- Filtration apparatus
- Vacuum source
- Desiccator
- Analytical balance capable of weighing 0.1mg
- Pipette with 10mL or 5mL volume capacity and wide bore pipette tips. CAUTION: 1 mL pipette tips are not to be used.
- Baking trays
- Magnetic Stirrer
- Measuring Cylinder "A grade": 50mL, 100mL, 250 mL, 500mL capacity

8. INSTRUMENT SETTINGS

None.

9. REAGENTS

- Type 1 water
- D.I Water

10. STANDARDS

None.

11. SAMPLE PRESERVATION

- Use resistant glass or plastic bottle, provided that the material in suspension does not adhere to container walls.
- Begin analysis as soon as possible, preferably within 24hrs of sampling and no more than 7 days.

12. PROCEDURE

12.1 Preparation of Filter Papers

The glass fibre filter papers shall be prepared as follows:

a) Set up filtration apparatus.
b) Turn vacuum pump on.
c) Place filter paper on filtration apparatus wrinkle side up.
d) Apply vacuum and wash with a minimum of 3 successive 20 mL portions of type 1 water; Continue applying vacuum until all traces of water is removed.
e) Discard washings.
f) Remove filter paper from filtration apparatus and transfer to a baking tray.
g) Dry in an oven at 103 – 105°C for a minimum of 2 hours.
h) Cool in desiccator for a minimum of one hour.
i) Store in desiccator until needed.

Note: Study conducted has shown that the use of a wash bottle to distribute the Type 1 water to prepare the filter papers, is delivering sufficient volumes of Type 1 water as directed in the APHA.

12.2 Sample Analysis

a) Check the spirit level of the balance (ensure that the bubble is within the circle) before proceeding. Refer to A-6.10 if adjustment is required.
b) Place filter paper on balance pan.
c) Record the initial weight of filter paper.
d) Place filter paper in allocated position of numbered grid template (typically made of cardboard) in sample site order.
e) Set up filtration apparatus.
f) Turn vacuum pump on.
g) Place filter paper on filtration apparatus wrinkle side up and apply vacuum.
h) Select sample volume according to Table 1. Mount Piper site typically filters large volumes e.g. 250mL and 500mL.

Table 1

Visual Appearance	Sample Volume (mL)
Clear – low turbidity	200-500
Hazy – medium turbidity	100-150
Very Hazy – high turbidity	10-50
Opaque – very high turbidity	<10

i) If sample bottle contains no air gap, invert the bottle several times and remove 5 mL to create an air gap to allow for more thorough mixing;
   I. For sample volumes > 10 mL:

i. Vigorously shake the sample and sub-sample a suitable aliquot into a measuring cylinder and transfer it into the filtration apparatus.
ii. Thoroughly rinse the measuring cylinder and filter paper with with a minimum of three successive 10 mL volumes of D.I water.

II. For sample volumes < 10 mL or samples with rapidly settling solids:

i. Vigorously shake the sample and with continuous stirring using a magnetic stirrer, sub-sample a suitable aliquot using a pipette or automatic pipette.
ii. Wash the filter paper with a minimum of three successive 10 mL volumes of D.I water.

j) Samples with high total dissolved solids require additional washing to ensure removal of dissolved material. Allow for complete drainage between washings.
k) Check the cups to ensure they are clean before moving on to next sample. Extra washing of cups is necessary when previous samples have had ash in them.
l) Record the aliquot.
m) Remove filter paper with sample residue carefully and place back on allocated position of labelled grid template.
n) A blank sample is to prepared using D.I water.
o) Dry the filter papers in a 103 – 105°C oven for minimum of one hour.
p) Cool in a desiccator for a minimum of one hour.
q) Place filter paper on balance pan.
r) Record the final weight of filter paper. As some evaporation residues readily absorb water rapid weighing is essential.
s) Perform duplicates according to Quality Control (Table 1 in Section 14).
t) Once the result has been calculated, reported and authorised, the filter paper may be discarded.

Note: The 1 hour drying period has been validated and shown to achieve constant weight after 1 hour of drying. The repeated drying and cooling of the glass fiber filters as described in Reference (a) is not necessary.

13. TROUBLESHOOTING

Refer to Quality control section and A-2.24 Control of non-conforming test and calibration work. It may be necessary to record an additional comment via addition of a WAT_COMM test code. If unsure, consult senior chemist.

13.1 Sample Matrix Interferences

In the case where a sample matrix is difficult to filter, the following actions shall be taken as necessary:

a) A lesser volume shall be chosen based on the filterability of the sample if the limit of reporting is raised for the result above < 2 mg/L. The following WAT_COMM and test comment shall be added: "Limit of reporting raised for Suspended Solids due to sample matrix."

b) If the sample cannot be tested because of the sample matrix:

   I. The test shall be cancelled.

   II. The following WAT_COMM and test comment shall be added: "Suspended Solids could not be determined due to sample matrix.".

14. QUALITY CONTROL

The following quality control is carried out, as outlined in Table 2.

Table 2: Quality Control

QC Parameter	Frequency	Limits	Action QC Criteria Not Satisfied
Blank	One per batch	< 1 mg/L (LOR)	a) Consult senior staff
Duplicate	Every 10 samples or per batch	Results ≤ LOR, allowed RPD between duplicates is 200%. Results ≤5 times LOR, allowed RPD between duplicates is 100%. Results 5-10 times LOR allowed RPD between duplicates is 50%. Results >10 times LOR allowed RPD between duplicates is 20%.	a) Refer to interference section. b) Consult senior staff.

15. CALCULATIONS

15.1 Total Suspended Solids

Calculate the result as milligrams per litre, as follows:

$$\text{Suspended solids mg/L} = \frac{((W_2 - W_1) \times 1000)}{V}$$

Where:

W_1 = Weight of filter (in grams)

W_2 = Weight of filter plus dried residue (in grams)

V = Sample Volume (L)

15.2 Relative Percent Difference (RPD %)

Relative Percent Difference (RPD %) is calculated using the following formula:

$$\frac{(D_1 - D_2) \times 100}{((D_1 + D_2)/2)}$$

Where:

D_1 = First Sample Value (mg/L)

D_2 = Duplicate Value (mg/L)

16. REPORTING

The limit of reporting is 1 mg/L.

The results shall be entered directly into LIMS wherever possible. If this is not possible for any reason, the data shall be recorded on the electronic worksheet (Attachment 1) which is saved on the shared network drive.

The results shall be entered in LIMS as follows:

a) Log into LIMS and select the "Workstation Backlog" workflow.
a) Select "GRAVIMTRC" in the workstation column of the table.
b) Under "Template Name" select SS_MP. This will now generate a new Suspended Solids batch. Record this batch number if using Attachment 1.
c) Open the selected batch by selecting the batch name.
d) Save the batch.
e) Select the "Samples" tab and add a QC sample duplicate (RPD) every 10 samples.
f) Save the batch.
g) Select the "Results" tab and fill out all the information required. Once completed, each field must be authorized by clicking on the "Authorized" button (on bottom right of results tab).
h) Save the batch.
i) Select the "Samples" tab and the "Options" menu.
j) Select "Result Entry by Sample" and select "SS" from the drop-down box.
k) Record data for samples and save.
l) Calculate all duplicates and save.
m) The results and QC samples will be authorized by a staff member who is approved to do so and they will close the batch.

17. UNCERTAINTY OF MEASUREMENT

The following uncertainty of measurement has been calculated for total suspended solids analysis:

Total Suspended Solids	U = ± 24.886 %

18. ATTACHMENTS

- Attachment 1 - Suspended Solids Record Sheet

19. APPENDIX

None

Unit 12, 2 Eden Park Drive
Macquarie Park 2113
Phone: +61 (0) 2 8870 8434

ABN: 41 000 424 788

Ecolab/Nalco Global Analytical & Microbiological Services

Quality assurance/quality control program (2021)

The laboratory's Quality assurance/quality control program ensures that sampling activities and analytical data is accurate, reliable and acceptable.

The Quality assurance/quality control program consists of both internal and external measures.

Internal

- Laboratory instrumentation and field equipment are calibrated at the correct intervals, as prescribed in the relevant NATA 'General equipment table'.
- Regular preventative maintenance is carried out on all key laboratory instrumentation and field equipment.
- Trip blanks (where appropriate) are supplied to monitor contamination.
- Certified reference materials are analysed routinely.
- Duplicate analysis is conducted to check precision.
- Laboratory blanks are analysed to monitor contamination.
- Quality control checks on media are performed.
- All records and subsequent reports are systematically checked.
- Quality control charts are used to statistically monitor trends in data.
- The laboratory is regularly internally audited.

External

- Ecolab Global Analytical & Microbiological Services participates in regular chemical and microbiological external proficiency testing programs as well as NATA audits as per their surveillance program.

Sampling and data collection

- All sampling is performed by trained personnel in accordance with procedure A-2.18 and relevant parts of Australian Standard 5667, for which NATA accreditation is held.
- Site measurements (DO, pH, turbidity, temperature and conductivity) and sampling observations (water depth) are recorded and reported in accordance with procedure CA12125.

Sample bottles

- Pre-labeled sample containers are used for routine sampling and testing.
- The sample bottles are prepared so that samples are preserved in accordance with Australian Standard 5667.1:1998 and Standard Methods for the Examination of Water and Wastewater, 22nd Edition (APHA).

Delivery of samples

- Eskies and freezer packs are used to maintain the integrity of the samples during transport from the sampling sites to our Global Analytical & Microbiological Services Laboratory.

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UAE
UK
US
Vietnam

ERM's Newcastle Office
Level1 45 Watt Street
NEWCASTLE NSW 2300

T: +61 2 49035500

www.erm.com

The business of sustainability

ERM