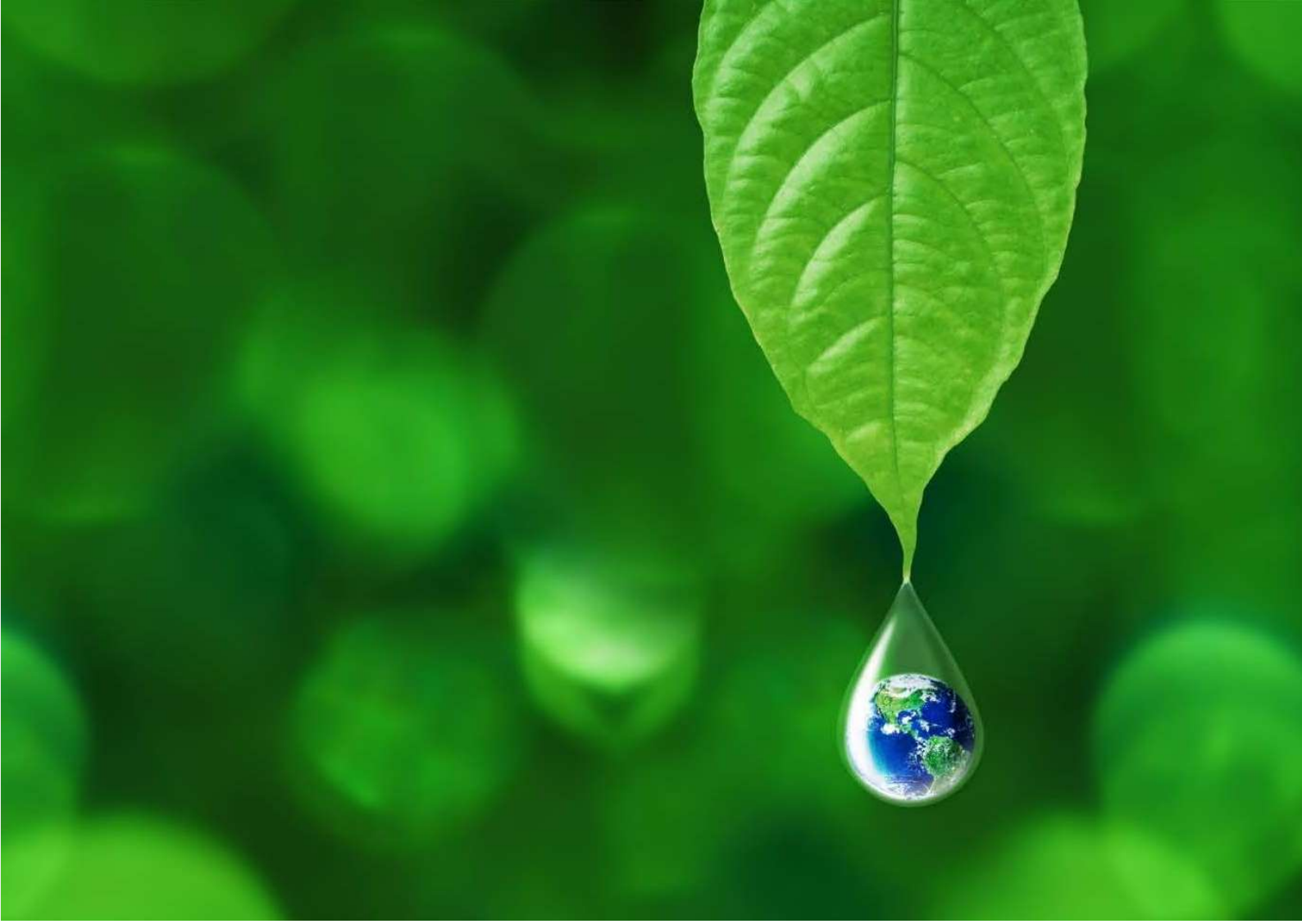
APPENDIX B WATER ASSESSMENT



EnergyAustralia
LIGHT THE WAY

Mt Piper Ash Placement Project (PA 09_0186), Lamberts North Ash Repository, Modification 1

Water Assessment

30 April 2021

Project No.: 0581248

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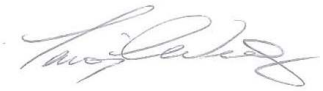

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1. INTRODUCTION

Environmental Resources Australia Pty Ltd (ERM) was engaged by EnergyAustralia NSW Pty Ltd (EnergyAustralia) to conduct a water assessment relating to a modification to the Mt Piper Ash Placement Project (Project Approval [PA] 09_0186).

The Mt Piper Ash Placement Project was approved on 16 February 2012, permitting the construction and operation of the Lamberts North Ash Repository (LNAR) and Lamberts South Ash Repository (LSAR) at the Mt Piper Power Station (MPPS). EnergyAustralia is seeking to modify PA 09_0186 as it relates to the LNAR, hereafter referred to as 'the Modification'.

1.1 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 (Figure 1 (Appendix A)).

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:

- Mt Piper Ash Repository (MPAR), approved under the MPPS development consent (80-10060), as modified. The majority of the ash produced at MPPS has been and still is placed within the MPAR in accordance with the conditions of development consent (80-10060). The MPAR is reaching its approved operational capacity.
- Mt Piper Ash Placement Project consists of two ash placement repository areas, LNAR and LSAR, approved in February 2012 under PA 09_0186. Ash placement is currently occurring within the northern portion of the LNAR. Ash placement within the southern portion of LNAR is anticipated to commence in around October 2021. LSAR is currently not available as it is being used by Springvale Coal Pty Ltd (Centennial) for approved coal mining and processing activities and does not form part of this Modification.

The MPAR and the LNAR are collectively referred to as the 'Ash Repositories'. Figure 2 (Appendix A) presents the location of the Ash Repositories, along with other 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 MPPS development consent (80-10060); 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 MPPS development consent (80-10060) allows the placement of WCA generally within the approved MPAR footprint and sets out defined areas where BCA can be placed.

Under the Mt Piper Ash Placement Project (PA 09_0186), the placement of WCA can generally occur within the approved LNAR footprint. The placement of BCA within the LNAR can only occur above Relative Level (RL) 946 m Australian Height Datum (AHD). The LNAR has received only WCA to date and has not yet reached RL 946 m AHD.

The SWTP produces both liquid and solid waste brine streams. As noted above, the liquid brine stream is disposed of through the conditioning of fly ash as BCA. A proportion of the liquid brine stream is further refined to solid crystal form through the brine crystallisers; this is referred to as Mixed Salts. The other solid brine by-product from the desalination process is Lime Salts. Together, the Mixed Salts and Lime Salts are referred to as Solid Mixed Salts. The Solid Mixed Salts are currently co-placed with BCA in MPAR and are restricted to areas that are approved to receive BCA.

The SWTP authorises the placement of these Solid Mixed Salts within the Ash Repositories in accordance with existing approved BCA placement practices. The MPPS Environment Protection Licence ([EPL] - 13007) and the SWTP Brine and Residual Waste Management Plan (with attached Management Plans for the Ash Repositories) describe and authorise the existing practices.

The conditioning of fly ash as WCA or BCA occurs at the Ash Conditioning Plant 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. The conditioned fly ash is wetted again in the silos with water. This additional wetting allows for final conditioning so that the ash contains the correct moisture content. From the silos, the conditioned ash is loaded into trucks and transported to approved placement areas. The Solid Mixed Salts produced at the SWTP are trickle fed onto the same overland conveyor at Transfer Point 2 when BCA is produced. From time to time, the Solid Mixed Salts are delivered directly to the MPAR when the conveyor feed at Transfer Point 2 is out of service. Figure 2 presents the location of the ash conditioning and transfer infrastructure.

The BCA delivery and placement activities as described above are approved for both MPAR and LNAR.

1.2 Proposed Modification

The Modification consists of a leachate barrier system[1] to facilitate:

- staged installation of a single high-density polyethylene (HDPE) liner, geocomposite or equivalent (liner) to predominantly encapsulate the BCA, Solid Mixed Salts and other authorised wastes (as per EPL 13007) within the currently approved LNAR, including:
  - preparation of geotechnically suitable areas for liner installation utilising mine spoil that is currently available within the LNAR, including leachate barrier support systems in areas of mine subsidence risk as required;
  - placement of a geotechnical base layer using WCA (WCA is already approved for placement in LNAR);
  - installation of the liner to suitable design specifications based on NSW Environment Protection Authority (EPA) (2016) Solid Waste Landfill Guidelines; and
  - placement of drainage aggregate (sourced from mine spoil, if available, or bottom furnace ash, if suitable, within the LNAR or imported from a local supplier), followed by geotextile or other equivalent infrastructure material for leachate management.

[1] The liner and leachate collection system form the leachate barrier system. “Leachate barrier system” and the term “liner” are used interchangeably throughout the report.

- placement of BCA and Solid Mixed Salts and other authorised wastes (as per EPL 13007) from the surface of the liner up to the maximum approved LNAR height of RL 966-980 m AHD, including a capping liner;
- replacement of the currently approved 1 m thick WCA perimeter layer with a suitable capping liner to encapsulate the BCA and Solid Mixed Salts;
- staged installation of double HDPE lined multipurpose storage ponds to manage leachate from BCA placement as well as water intercepted from other areas of the LNAR. These new ponds will be adequately sized and installed so as to provide suitable storage volume for long-term management of leachate derived from the BCA and Solid Mixed Salts lined areas. Where possible, leachate will be recycled for dust suppression within the lined areas or transferred to MPPS for treatment and use in electricity generation; and
- minor amendments to the approved LNAR boundary in the context of the existing and proposed surrounding activities and interactions, including excising the Centennial coal washery infrastructure. Overall, the modified footprint of the LNAR is not anticipated to materially influence the operational lifespan of the LNAR.

The Concept Design (GHD, 2021) for the Modification outlines that the staged installation of the liner would be progressive throughout the life of the LNAR, which is estimated to be at least approximately 7.5 years. This time period assumes minimal reuse of ash generated, with all conditioned fly ash being placed in the LNAR. The Concept Design outlines that the initial installation of liners and leachate management controls would be limited to that required for the first stage of development (Stage 1) and be augmented at appropriate intervals in line with future development stages (Stage 2 and Stage 3), subject to detailed design and site operational requirements. The existing double HDPE lined multipurpose storage ponds, Pond BWA, Pond BWB and Pond BWC, will be used to manage leachate generated during the initial stages of the Modification. Staging drawings from the Concept Design (Stage 1 to Stage 3[2]) are included in Appendix B.

The Concept Design indicates that WCA may be utilised as a geotechnical base layer for the lined areas due to its favourable physical properties. The liner will be placed directly on top of this base layer. It is intended that the co-placement of BCA and Solid Mixed Salts will occur within lined areas. As and when required, WCA may also be placed within lined areas, noting that the volumes of WCA are likely to be limited. BCA and Solid Mixed Salts may also be placed separately from each other in defined lined areas.

Figure 2 presents the location of the MPPS and the Ash Repositories, including the approved LNAR boundary and modifications to the LNAR footprint, and existing water management features. Figure 3 presents an overview of the land parcels and land ownership within and around the LNAR.

1.3 The Modification Area

With reference to Figure 2, the Modification Area as described in this report is limited to the modified LNAR footprint. This Modification Area is in general accordance with the Project Approval Area for LNAR as documented in the original Environmental Assessment for the Mt Piper Ash Placement Project (SKM, 2010), and as refined in the Consistency Report (SKM, 2012).

1.4 Justification

1.4.1 Leachate Control

EnergyAustralia is seeking to modify approved practices at the LNAR to strengthen the environmental controls around intercepting, capturing and treating leachate from BCA placement activities. In accordance with management plans approved under the conditions of relevant planning approvals, EnergyAustralia has been investigating groundwater and surface water conditions in the vicinity of the Ash Repositories, including identifying and assessing potential management and mitigation options. These investigations indicate that the current practice at MPAR of encapsulating BCA and Solid

[2] The Modification stages will be subject to detailed design.

Mixed Salts within an outer perimeter of WCA may not be successful in terms of restricting the escape of leachate into the surrounding environment.

To avoid a similar circumstance resulting from BCA placement at the LNAR, EnergyAustralia is seeking to install a leachate barrier system (using very low permeability liners) within LNAR to capture and subsequently treat leachate moving through the ash placed above the liner. The installation of a liner, associated water management systems and capping liner seeks to limit the risk of vertical and lateral movement of BCA leachate migrating into the surrounding environment, providing for improved environmental outcomes from that currently approved for LNAR PA 09_0186.

1.4.2 Beneficial Reuse of WCA and increased Longevity of LNAR

PA 09_0186 currently limits the placement of BCA to RL 946 m AHD and above. The current level of the northern portion of the LNAR varies between RL 941 – 944 m AHD and the commencing ash placement level within the southern portion of the LNAR varies between approximately RL 930 – 945 AHD. Therefore, as is currently approved, WCA placement would need to occur to achieve the RL 946 m AHD height prior to the co-placement of BCA and Solid Mixed Salts.

The Modification seeks approval for the co-placement of BCA and Solid Mixed Salts below RL 946 m AHD, but above the liner, removing the need to use WCA to achieve the currently approved height. This may provide increased future opportunity for maximising the longevity of LNAR and increased opportunities for reuse of WCA through removal of the need to build the LNAR to RL 946 m AHD with WCA, enabling the WCA to be available for other uses.

The Modification also seeks to remove the 1 m thick WCA perimeter encapsulating the BCA and replace it with a liner. This will free up the WCA for beneficial reuse and provide more capacity to store BCA and Solid Mixed Salts. This is likely to provide increased future opportunity for maximising the longevity of LNAR.

1.4.3 Reduced Water Demand

The Modification provides the following opportunities to reduce water demand at MPPS and the Ash Repositories through:

- leachate management that will provide a localised source of water suitable for irrigation of the BCA placement areas within the LNAR, thereby reducing the demand on the fresh water supply from the MPPS; and
- transfer of the leachate to MPPS for treatment (if of a suitable quality) that may provide an alternative source of water for inclusion in the MPPS water management system, further reducing the demand from off-site water sources.

1.4.4 MPAR is Reaching Capacity

In the second half of 2021, the MPAR will reach its approved final landform height for ash placement in accordance with the MPPS development consent (80-10060). The LNAR has received only WCA to date as PA 09_0186 restricts BCA placement to heights above RL 946 m AHD. The LNAR operational face has yet to achieve this height.

EnergyAustralia has not placed BCA in the LNAR to date. The disposal of brine to condition the fly ash is currently the only approved method available to manage the brine and Solid Mixed Salts at MPPS. The placement of BCA and Solid Mixed Salts will need to occur within the LNAR from around the second half of 2021 in order to maintain continuity of BCA placement activities and to maintain the current power generation capacity of the MPPS as well as the ongoing operation of the SWTP.

1.4.5 Brine Management

Both the MPPS Brine Concentrators and the SWTP generate brine. The brine is either stored in purpose built double high-density polyethylene (HDPE) lined dams or used to condition ash (as BCA).

As MPPS is generally a zero-liquid discharge (with the exception of the Coal Settling Pond discharge point), the current arrangements prioritise the disposal of brine to condition fly ash to limit the potential for an uncontrolled brine release. The BCA is then co-placed with Solid Mixed Salts within the MPAR.

Without the BCA placement process, brine would have to be progressively stored in ponds and the Solid Mixed Salts would have to be stockpiled until an alternative disposal method was identified. The disposal of brine to condition the fly ash and its co-placement with Solid Mixed Salts is currently the only approved method available to manage brine (both liquid and solid) at the MPPS; this approach will continue as part of ongoing operations at the MPPS, hence the importance of BCA placement continuity.

1.5 Objectives

1.5.1 Modification Objectives

The intention of the Modification is to strengthen the environmental controls to avoid the potential escape of leachate from BCA placement activities into the surrounding environment. Therefore, EnergyAustralia is seeking to improve the design, construction and operation of the LNAR, to achieve the following objectives:

- to minimise and manage the potential environmental or social impacts which may result from the ongoing use of the LNAR;
- to limit the risk of leachate from BCA migrating into the surrounding environment through the installation of a liner with very low permeability for BCA placement within LNAR;
- to update the capping strategy associated with LNAR to limit the vertical and lateral movement of BCA leachate through the ash to the surrounding environment;
- to maximise opportunities for reuse of WCA through improved placement strategies within the LNAR; and
- to update the LNAR footprint in the context of the existing and proposed surrounding activities and interactions.

1.5.2 Report Objectives

Installation of a liner, the placement of BCA and Solid Mixed Salts within lined areas beneath RL 946 m AHD and associated leachate management are the key aspects of the Modification that warrant technical assessment. The proposed boundary amendments associated with the Modification will result in a reduced footprint in an already disturbed area. All other site operational processes and controls will generally remain unchanged.

The objective of this report is to assess the Modification with respect to the potential impacts to the local surface water and groundwater resource (the ‘Assessment’). The Assessment has been prepared to support the Modification Report.

1.6 Scope of Work

In order to meet the objectives of this report, the following scope of work has been completed:

- review of the site environmental setting relevant to water management for the Modification;
- review of the Concept Design associated with the Modification (GHD, 2021 and Appendix B);
- assessment of potential impacts to the local surface water and groundwater resource that may result from implementation of the Modification;

- discussion of water management, monitoring and contingency mitigations relevant to the development and operation of the LNAR in light of the Modification; and
- review of the Modification against the aims and requirements of State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 (the Sydney Drinking Water SEPP), including an assessment of how the Modification would have a neutral or beneficial effect (NorBE) on water quality during installation and operation of the Modification.

The water assessment does not assess aspects of the existing PA 09_0186 that are not subject to modification. The scope of work was developed in accordance with relevant legislation and guidance documents, and via consultation with key regulatory stakeholders, including the NSW Department of Planning, Industry and Environment (DPIE), WaterNSW and the Environment Protection Authority (EPA).

1.7 Report Structure

The following summarises the general structure of the report:

- Section 2 presents information pertaining to the environmental setting of the LNAR;
- Section 3 presents an overview of current water management at the LNAR and water management pertaining to the Modification;
- Section 4 provides a water balance discussion relevant to the Modification;
- Section 5 presents an assessment of the Modification in relation to the local surface water and groundwater resource; and
- Section 6 presents the NorBE assessment and conclusion of this Assessment.

All figures are presented in Appendix A. Conceptual staging of the LNAR from the Concept Design are presented in Appendix B, noting that detailed design will confirm the LNAR staging.

2. ENVIRONMENTAL SETTING

The following subsections provide a summary of the site history and environmental setting relevant to this assessment of the Modification.

2.1 Site History

The LNAR and adjacent land are located in an area of long-term coal mining activity. Open cut mining began in the vicinity of the LNAR in 1940 along the former Huons Gully alignment,and continued until 2010 (at Lamberts Gully Open Cut). During open cut operations, the Bunnyong Sandstone (part of the Illawarra Coal Measures) overburden was removed (SKM, 2010) and mining targeted the Lidsdale and Lithgow Coal Seams. An overview of the historical mining disturbance in the vicinity of the LNAR is presented in Figure 4.

Underground mining in the vicinity of the LNAR began in 1942 and continued until the 1990s; however, details regarding the timing and progression of underground mining in this area are not clear (RPS, 2014). The underground mining used bord and pillar techniques. These techniques result in two possible scenarios at the cessation of mining:

- Uncollapsed pillar rooms – the walls and roof remain intact after mining, leaving behind interconnected room-sized voids; or
- 'Goaf' – the roof of the mine collapses into the worked area, with the potential to cause subsidence resulting in fissures and cracks in the lithology above the worked area, and also potentially causing overlying aquifers or surface water bodies to connect to the goaf and possibly causing dewatering.

Figure 4 indicates that in the immediate vicinity of the LNAR, with the exception of the land beneath the Castlereagh Highway, underground workings extended across most of the area to the south of Wangcol Creek. Figure 4 also shows the extent of open cut mining areas, including in the vicinity of the LNAR. Figure 5 presents a historical aerial from 2008, which indicates the level of ground disturbance present in and around the LNAR prior to its construction in 2012-2013.

The historical mining and related activities have resulted in significant variation to pre-existing natural hydrology, geology and hydrogeology in and around the LNAR. Specifically, the majority of the LNAR has been subject to open cut mining activities and subsequent backfill. There is a small area near the western boundary of the LNAR that retains some remnant pillars from historic underground mining activities.

2.2 Climate

The LNAR is located midway between two long-term Bureau of Meteorology (BOM) rainfall gauging stations:

- Portland (Jamieson St, Station Number 63071), approximately 3 km west of the LNAR, elevation 925 metres Australian Height Datum (m AHD). The rainfall record spans 1923 to current (some gaps in late 1990/early 2000s); and
- Lidsdale (Maddox Lane, Station Number 63132), approximately 3 km south-east of the LNAR, elevation 890 m AHD. The rainfall record spans 1959 to current.

These climate records were accessed from BOM (2020a). In addition to these, temperature and rainfall data is available from:

- The Lithgow BOM weather station (Cooerwull, Station Number 63226) which is located approximately 18 km south-east of the LNAR, elevation 900 m AHD. The weather record spans 1878 to current; and
- The MPPS weather station which is located approximately 956 m AHD, has available rainfall and temperature data for the period 2006 to current (data to 2018 is used in the summary presented below).

Based on the long-term records for these four rainfall gauge locations, the highest rainfall in the vicinity of the LNAR occurs in Spring and Summer (particularly November to February), while the lowest rainfall occurs in Autumn (particularly April and May).

Based on the long-term records for the two available temperature records (Lithgow and MPPS), the highest temperatures are in summer (December to February), while the lowest temperatures are typically in winter (June to August).

2.3 Topography and Hydrology

With reference to Figure 6, the LNAR is located at elevations of between 900 and 1000 m AHD within the Huons Gully catchment. Huons Gully is a part of the Wangcol Creek catchment, which is part of the upper Coxs River Catchment. The downstream portion of Huons Gully formerly flowed directly to Wangcol Creek, beneath the current LNAR footprint. However, surface water flow in the former Huons Gully was altered due to historical mining and ash placement activities. Huons Gully Sediment Pond (SHG1) to the south-west of the LNAR is the termination of the former Huons Gully surface water flow.

Currently, flow from the Ben Bullen State Forest in the upstream portion of the Huon Gully is diverted around the Ash Repositories via two clean water diversions. One diversion flows west around the MPAR and into Wangcol Creek Catchment via the Final Holding Pond at the MPPS. The second diversion manages flow to the Lamberts Gully catchment and into Wangcol Creek downstream via the Centennial water management system and Centennial's licenced discharge point (GHD, 2019). The diversion drains have been designed to convey the 100 year average recurrence interval (ARI) flood event from the external catchments (SKM, 2012).

The northern portion of the LNAR is bounded to the west by the MPAR, which rises to the west from approximately RL 940 m AHD to approximately RL 975 m AHD. Stormwater runoff from the external batters of the Ash Repositories is managed by the existing stormwater holding ponds CWP01, CWP02 (both unlined) and LN Pond 2 (double HDPE lined). Stormwater within the active Ash Repositories is managed internally through surface contouring at around a 1 % slope toward internal detention basins, which are developed to accommodate operational needs as and when required.

Other notable surface water management features in the vicinity of the LNAR include H-Pit West, H-Pit East, Council Pit, DML Dam and Cooks Dam which are an unlined series of voids that were formed from former open cut mining activities (refer to Figure 2). H-Pit East, Council Pit provide contingency storage for LN Pond 2 in the case of an extreme weather event. DML Dam and Cooks Dam are managed by the neighbouring Centennial operation, with water from Cooks Dam being discharged periodically to Wangcol Creek via Centennial's licenced discharge point. Each of these features capture localised surface water flows from outside the active LNAR ash placement area.

The boundary adjustments proposed by the Modification are negligible in terms of potential impact to existing and approved topography and hydrology, and are not considered further in this assessment.

2.3.1 Surface Water Quality

Surface water in Wangcol Creek is characterised by elevated concentrations of sulfate, iron and manganese. This reflects the nature of the local geology, which includes out cropping coal seams, many of which were mined. Concentrations of other constituents, including chloride, boron and nickel, have been recorded in surface water at the Wangcol Creek surface water monitoring location WX22 (refer to Figure 7) and have been reported as elevated relative to background since approximately 2010 (ERM, 2019).

2.3.2 Surface Water Use

The Coxs River makes up part of the Warragamba water catchment, the largest of Sydney's five drinking water catchments (WaterNSW, 2020a). The Coxs River catchment supports cattle and sheep grazing as its primary land use; however, consistent with the prior history of the site, extractive industries such as coal mining are also present. The LNAR is located in the Upper Nepean and Upstream Warragamba Water Source, Wywandy Water Management Area (Figure 6).

The Modification does not propose to access additional surface water resources during operation and as such will not impact surface water available for use in the downstream catchment areas.

2.4 Regional 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 2-1.

Table 2-1: 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 pillars remain. The Concept Design outlines that the detailed design for the LNAR staging will require geotechnical investigation and assessment to develop a mine subsidence strategy and allow for the development of relevant risk mitigation measures. EnergyAustralia do not intend to use any areas identified to be at high risk of mine subsidence until late in the filling of the LNAR and only then after additional intrusive geotechnical investigations have been conducted and the risks have been given due consideration.

The modified extent of the LNAR (i.e. height, depth, width) will remain generally unchanged from existing approvals. The Modification will not adversely impact upon the native or modified geology in and around the LNAR.

2.4.1 Soil Landscapes

Consistent with the historical mining activities, the LNAR has been disturbed by the historical mining activities and is mapped as disturbed terrain (NSW DPIE, 2020).

2.5 Hydrogeology

Groundwater beneath the LNAR is present within the Illawarra Coal Measures, and the regional groundwater flow direction is generally to the east (see Figure 8). 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.

Long-term groundwater monitoring near the Ash Repositories indicates that the water table occurs variably in the former below ground mined out areas and open cuts and, away from the Ash Repositories, predominantly in the overlying Bunnyong Sandstone. The water table elevation range is approximately 907 m AHD to 915 m AHD in the vicinity of the LNAR. Groundwater elevation contours are presented as Figure 8.

The activities associated with the Modification will not intersect groundwater.

2.5.1 Groundwater Quality

As a result of historical mining, ash placement and regional background conditions, groundwater in the vicinity of the LNAR is typically elevated in salts and metals, including sulfate, chloride, nickel, and manganese as well as some trace elements such as zinc and boron (ERM, 2020a).

2.5.2 Groundwater Use

Figure 9 presents the location of registered bores in the region, most of which are used for groundwater monitoring purposes. There are no registered users of groundwater within a 2 km radius of the LNAR. The nearest registered groundwater users are present approximately 2.5 km north-east (industrial use) and south-east (domestic use) from the LNAR (BOM, 2020b).

The Modification will not require specific access to the groundwater resource during operation and will not have a material impact on groundwater available for use in the local groundwater catchment.

2.5.3 Groundwater Dependent Ecosystems

There are no Aquatic Groundwater Dependent Ecosystems (GDEs) identified within 2 km of the LNAR (Figure 9). Wangcol Creek is not an identified GDE, although it is known to receive groundwater. The Coxs River is identified as having a moderate potential to receive groundwater and is the receptor of surface water flow from Wangcol Creek.

Terrestrial GDEs with a high potential for groundwater interaction have not been identified within 0.5 km of the LNAR. There is an area mapped with a low potential for terrestrial GDEs in the vicinity of the LNAR however, this area is known to be free of any vegetation species and lies within the footprint of historical open cut mining activities. Where present, the mapped terrestrial GDEs (BOM, 2020c) primarily relate to vegetation in elevated areas, mostly within the Ben Bullen State Forest (see Figure 9) and other forested areas.

Activities associated with the Modification will not intersect groundwater noting that the Modification has been designed to protect groundwater through minimising the potential for leachate to escape into the surrounding environment. Regardless, the mapped potential terrestrial GDEs are not considered likely to be influenced by the Modification due to their distance from the LNAR, their relative location (i.e. upgradient) and their higher elevation relative to the LNAR.

3. WATER CYCLE MANAGEMENT

3.1 MPPS Water Supply

The MPPS is supplied with water primarily from the SWTP, which has the capacity to transfer up to 42 ML/day of water from existing coal mine dewatering facilities on the Newnes Plateau to a water treatment plant located at the MPPS. The water supply to the MPPS is supplemented with water from Lake Lyell and Thompsons Creek Reservoir (maximum 23,000 ML/y), which form part of the Coxs River catchment, under the conditions approved on its Water Access Licence (WAL – 10AL116411). Via a separate Water Access Licence MPPS also has some access to supplementary water (maximum 8,184 ML/y) from the Oberon Dam, which forms part of the Fish River Scheme.

The Modification will not result in any changes to the existing water supplies.

3.2 MPPS Water Management System

The LNAR is supplied with water from the MPPS water management system, as described in the following subsections.

With the exception of leachate management associated with the Modification (see Section 4.1.4), there will be no other changes to the MPPS water management system.

3.2.1 Fresh (non-potable) Water

Fresh (non-potable) water at the MPPS includes fresh water stored in multiuse storage ponds, Settling Pond A to Settling Pond D, which receive inputs from wash down water from within the power generation units, treated water from the SWTP, and inputs from the Coal Settling Pond, which receives runoff from the coal stockpile area.

The Modification will not change the fresh (non-potable) water supply at the MPPS.

3.2.2 Stormwater

As described in Section 2, stormwater runoff from the external batters of the Ash Repositories is managed by the existing stormwater holding ponds CWP01, CWP02 and LN Pond 2, while stormwater from the internal ash placement areas is managed via internal holding ponds. The location of the internal holding ponds changes in relation to operational requirements of the Ash Repositories, and all sediment pond sizes are designed on the basis of catchment areas and where possible sized to a target of minimum 50-year ARI event. Where possible, stormwater from upslope non-operational areas, including the upper Huon Gully flow, is diverted around the operational areas of the MPPS and the Ash Repositories, reporting to Wangcol Creek via the Final Holding Pond.

As outlined in the Concept Design (Section 10 and Appendix C), the changes to the existing water management at the LNAR will include use of SHG1, H-Pit East and H-Pit West to store runoff from external batters from the conceptual LNAR Stage 2. Filling of LN Pond 2 and H-Pit West will occur during the completion of the conceptual LNAR Stage 3, with CWP01, CWP02, SHG1 and H-Pit East remaining as storage for runoff from external batters to the cessation of operations and closure of the LNAR. There are no changes to stormwater management proposed during LNAR Stage 1.

The Concept Design outlines that pumping will be required to dewater SHG1 during the conceptual LNAR Stage 2 and LNAR Stage 3 development. It is assumed that the dewatering would only occur as necessary and in line with the existing approved water management practices for the LNAR.

The landform presented by the Concept Design is in general accordance with the existing approved landform and changes to the current stormwater management will occur in line with the existing approvals as necessary to accommodate the staged development of the LNAR. Stormwater management will be confirmed during the detailed design stages.

3.2.3 Brine

As described in Section 1, brine is produced at the MPPS and the SWTP, which also produces Solid Mixed Salts. The production of brine and Solid Mixed Salts is planned to continue in line with existing approved practices, and there are no changes proposed to the brine production in relation to the Modification. Furthermore, fly ash will continue to be conditioned with brine (as BCA) and co-placed with Solid Mixed Salts within the modified LNAR as is currently approved. This is the only approved disposal method for the brine and the Solid Mixed Salts.

A change of operational practice regarding where the BCA and Solid Mixed Salts are emplaced is the subject of this Modification. The change is limited to placement of BCA and Solid Mixed Salts within lined areas, with leachate collection from above the base liner up to the base of the capping system, rather than co-placement of BCA and Solid Mixed Salts in unlined areas.

4. WATER BALANCE

4.1.1 Current LNAR Water Demand

The current water demands for the LNAR include conditioning of ash (WCA), irrigation of the WCA placement area, and dust suppression on the associated haulage roads.

EnergyAustralia provided details regarding typical monthly water demand at the Ash Repositories. Table 4-1 provides an overview of the average monthly water demand at the Ash Repositories through the 2018, 2019 and 2020 calendar years. Since the Ash Repositories are managed as a single operation, the water usage in Table 4-1 is not differentiated between the MPAR and the LNAR; however, as noted previously BCA placement currently occurs only within the MPAR. Different sources of water used to irrigate the BCA placement areas within the MPAR and the WCA placement areas in the MPAR and LNAR, are described in the following subsection.

Table 4-1: Water Usage at the Ash Repositories (2018 – 2020)

Month	Water Cart Total (mL)	Irrigation (mm)	Water Ash Conditioning (ML)	Brine Ash Conditioning (plant) (ML)	Ash Conditioning (silos) (ML)	Total Usage (ML)	Rainfall (mm)	Evaporation (mm)
Jan	5.39	5.80	11.50	18.40	12.99	61.17	93.40	148.33
Feb	6.63	5.30	7.27	4.30	9.56	43.50	78.47	109.37
Mar	6.70	2.47	3.47	7.43	7.60	33.07	82.73	90.70
Apr	8.65	2.93	3.10	5.93	9.77	35.94	39.67	68.73
May	7.51	2.30	5.10	2.87	10.46	23.84	31.53	44.63
Jun	6.68	2.40	6.60	2.72	13.26	21.77	32.20	29.00
Jul	9.57	1.80	3.83	3.17	11.07	24.70	27.27	36.13
Aug	7.10	3.80	5.40	2.17	10.50	26.47	54.60	51.83
Sep	7.07	3.77	3.57	3.63	6.40	27.30	62.67	74.67
Oct	6.87	4.60	5.81	6.44	5.67	35.10	30.60	68.27
Nov	10.57	5.47	5.57	6.83	7.47	44.37	74.40	132.13
Dec	9.53	5.33	6.07	10.17	9.47	30.77	51.13	143.13

A negligible volume of water is used for wash-down of plant and equipment, and also for potable supply related to worker amenities. Demand for wash-down water and potable supply will remain unchanged during the implementation of the Modification and is not considered further in this assessment.

4.1.2 Current LNAR Water Supply

WCA is conditioned with fresh (non-potable) water sourced from various storages (Section 3.2.1). The active WCA placement area in the LNAR is irrigated with fresh (non-potable) water, external stormwater (i.e. from CWP01, CWP02, LN Pond 2), or stormwater sourced from the internal WCA placement areas as part of the MPPS water management system.

The haul roads at the Ash Repositories are primarily irrigated via the water cart using water sourced from the external stormwater holding ponds.

The MPPS water management system provides sufficient volume to meet the current water demand for the Ash Repositories, and there is no water sourced from off-site surface water or groundwater resources. Implementation of the Modification does not require any changes to existing water supplies to the MPPS or the LNAR.

4.1.3 Future LNAR Water Demands

In accordance with existing approvals and practices, the water demands for the Modification will be generally unchanged from the current water demands at the Ash Repositories, being limited to conditioning of ash, irrigation of ash and haul roads for the purpose of dust suppression. The installation of leachate holding ponds or placement fill if required for the Modification may require use of the fresh (non-potable) water supply; however, this volume is anticipated to be negligible relative to the existing available supply at the MPPS.

As outlined in Section 1.4, the MPAR is approaching its approved final landform height for ash placement. Therefore, the demand for water or brine (for BCA) that was previously utilised for operation of the MPAR will transition, as necessary, to the operation of the LNAR (as modified). The transition of water/brine demand from MPAR to LNAR operations will be progressive as the LNAR expands in accordance with existing approvals to meet the ash placement requirements previously satisfied by the MPAR.

The BCA placement area within the MPAR is irrigated with fresh (non-potable) water or stormwater sourced from the internal BCA placement areas as part of the MPPS water management system. As with other water use, this will transition to the LNAR BCA placement areas over time. The BCA placement areas associated with the Modification would be irrigated with brine, captured leachate and/or fresh (non-potable) water on an as needs basis.

4.1.4 Future LNAR Water Supply

Access to the existing water supply from the MPPS water management system or stormwater captured from the Ash Repositories will remain unchanged following implementation of the Modification, and there will be no additional demand from off-site surface water or groundwater resources. WCA and BCA placement areas associated with the Modification will continue to be irrigated in accordance with the existing approved practices. Captured leachate would be an additional water source for irrigation dust suppression as required.

Implementation of the Modification will result in a change in the available water supply to the LNAR. The change will occur in relation to the interception of leachate, and the capacity to capture, store and utilise recycled leachate collected from the lined BCA and Solid Mixed Salts placement areas. It is proposed that leachate will be stored in purpose built double HDPE lined holding ponds and, where possible, this leachate will be recycled for dust suppression within the lined areas, or transferred to MPPS for treatment and use in electricity generation. The existing double HDPE lined multipurpose storage Pond BWA (20 ML), Pond BWB (20 ML) and Pond BWC (20 ML) will be used to manage leachate generated. The detailed design phase will determine the need and location of additional lined storage ponds throughout each of the stages depending on operational requirements.

The Concept Design estimates that potential leachate volumes of up to 9.25 ML/per month may be intercepted and captured. This maximum estimated volume for leachate generation is based on the largest conceptual stage of the future ash placement in LNAR, assumes a 90th-percentile rainfall year, and is likely to represent January, which historically has the highest average monthly rainfall. Based on the average water usage of the Ash Repositories in January (61.7 ML), the peak leachate generation will be readily utilised via irrigation or conditioning of ash placed in lined areas at the LNAR, or may be transferred to the MPPS water management system for treatment prior to use in electricity generation as needed.

The MPPS water management system along with the intercepted and captured leachate resulting from the Modification will provide a sufficient volume of water for operation of the LNAR (as modified). The Modification will also provide a supply of leachate to the MPPS for treatment and use in power generation as needed.

5. WATER ASSESSMENT

Based on review of the Concept Design, environmental setting, water cycle management and the water balance, the following items represent a change in the existing approved processes or practices and are subject to further review in the following subsections:

- placement of BCA and Solid Mixed Salts in lined areas, with leachate collection from above the base liner up to the base of the capping system, rather than placement of BCA and Solid Mixed Salts in unlined areas.
- capture, storage and transfer of leachate from the leachate collection system in the lined BCA and Solid Mixed Salts placement areas to lined leachate holding ponds in the LNAR (as modified);
- transfer of the collected leachate to the MPPS water management system or use of the collected leachate for dust suppression in the BCA placement areas of LNAR; and
- the installation of additional leachate holding ponds within the LNAR.

5.1 Placement of BCA and Solid Mixed Salts

The placement of BCA and Solid Mixed Salts in lined areas with leachate collection from above the base liner up to the base of the capping system, rather than placement of BCA and Solid Mixed Salts in unlined areas, represents a change in the existing approved practices for the LNAR. In accordance with the Concept Design, the proposed change in placement method will be designed and implemented in accordance with the minimum standards presented by NSW EPA (2016) including:

- assessment of the BCA and Solid Mixed Salts by the Concept Design as being suitable for placement as General Solid Waste in accordance with NSW Waste Classification Guidelines (NSW EPA, 2014);
- a base liner which nominally includes (from bottom up) a suitably prepared subgrade (WCA), geosynthetic liner (GL), geomembrane (HDPE or similar), protection geotextile, leachate drainage layer (gravel, aggregate, bottom furnace ash (if suitable) and/or geocomposite material), collection pipework and separation geotextile layer;
- a sidewall liner profile which nominally includes (from bottom up) a suitable prepared subgrade (WCA), GCL, geomembrane (HDPE or similar), and leachate drainage layer (geocomposite material);
- the design, installation, management, operation and monitoring of the lined areas and leachate collection system will be in accordance with principles presented by NSW EPA (2016) including requirements for a compacted sub-base (WCA or coal wash reject) and a leachate barrier system (using a very low permeability liner) that will be formed via a suitably installed HDPE layer (or similar). The placement of WCA as the compacted sub-base is in accordance with existing approved practices;
- NSW EPA (2016) requirements pertaining to stormwater management, leachate management, installation quality assurance (QA) requirements (including a QA Plan), aesthetics, capping and closure requirements will also be addressed by the detailed design for the LNAR (as modified);
- the installation of the low-permeability cap will minimise the ongoing generation of leachate at the completion of each planned stage of the LNAR (as modified);
- all liner materials, including for leachate ponds, geotextile layers, base liner or capping liner, will be of suitable resistance to hypersaline environments for the life of the LNAR, including post-closure. The material properties and specifications for the leachate barrier system will be determined during detailed design and shall be to a standard that will not be compromised by the BCA and Solid Mixed Salts; and

- the arrangement of the liner system layers, layer types and capping layers presented in the Concept Design was selected to conform to the minimum standards outlined by NSW EPA (2016), including the ability to capture and manage leachate. The volume of leachate that may be generated via implementation of the project is presented in Section 4.1.4, and leachate management for the LNAR (as modified) is assessed in the following subsection.

Potential changes to the existing water management at the LNAR as part of the conceptual LNAR Stage 2 and Stage 3 are described in Section 3.2.2. These potential changes do not represent changes to the existing approved practices as stormwater from external batters will continue to be directed to existing water management features and stormwater from internal ash placement areas will continue to be directed to internal basins. There are no changes proposed to the existing approved WCA and BCA placement volumes.

Implementation of the proposed change in BCA and Solid Mixed Salts placement method in accordance with the minimum standards presented by NSW EPA (2016) will mitigate the potential for adverse impacts to surrounding surface water or groundwater resulting from the Modification.

5.2 Leachate Management

A leachate management system will be developed for the LNAR (as modified) and this represents a change in the existing approved practices for the LNAR. The Concept Design provides an assessment of potential leachate volumes using the Hydrologic Evaluation of Landfill Performance (HELP) Model software package. The leachate management system will capture, store and transfer leachate generated from the lined BCA and Solid Mixed Salts placement areas. The design and implementation of the leachate management system will be in accordance with the minimum standards presented by NSW EPA (2016), including:

- a leachate extraction and level control system installed in all lined areas that is suitable to maintain leachate in the base of lined areas no more than 300 mm above the upper surface of the base liner;
- to reduce potential leachate generation before lined cells are capped, an intermediate cover may be placed over areas that are not currently active;
- the leachate extraction and level control system will be designed to operate effectively until the capping layer is installed and the lined placement areas are considered stable;
- the storage of leachate will occur in suitably sized double HDPE lined designed to prevent leakage of leachate from the LNAR (as modified) into underlying fill or soil. The size and layout of the new leachate management ponds will be informed by the detailed design for the LNAR (as modified) using HELP Model (or similar) outcomes. The existing double HDPE lined multipurpose storage Pond BWA, Pond BWB and Pond BWC will be used to manage leachate generated during the implementation of the Modification (total 60 ML of storage) as required;
- the volume of stored leachate will be managed via recycling of leachate over the lined ash placement areas, or by transferring leachate to the MPPS water management system for treatment prior to use in electricity generation as needed; and
- to minimise the consequence of mine subsidence the Concept Design includes a leachate barrier support system consisting of additional liner layers installed beneath the basal liner in areas of mine subsidence risk. These additional controls will be refined during the detailed design and before ash placement occurs in these areas.

Implementation of the proposed leachate management system will include installation of leachate holding ponds and transfer pipelines. The installation of leachate holding ponds and transfer pipelines represents a change in the existing approved practices for the LNAR. The proposed leachate management system will be implemented in accordance with existing approved practices and NSW EPA (2016).

Implementation of the proposed leachate management system in accordance with the minimum standards presented by NSW EPA (2016) will mitigate the potential for adverse impacts to the surrounding surface water or groundwater resulting from the Modification.

5.3 Water Quality Management and Monitoring

The water quality performance targets for the Lamberts North Operational Environment Management Plan (the OEMP) (EnergyAustralia, 2019) require that the quality of water in Wangcol Creek or groundwater in the vicinity of the LNAR is not impacted by the Lamberts North Ash Placement operations. The water quality performance targets are assessed via a long-term groundwater and surface water monitoring program designed to measure long-term variation in water quality from historical baseline values that are attributable to ash placement operations at the LNAR.

The OEMP will be revised to account for the Modification, and water quality performance targets will be developed with respect to the specific context of the Modification objectives and operations. The revised OEMP will document groundwater and surface water management and monitoring requirements associated with implementing the Modification, including the following items:

- Frequency and schedule of inspections and maintenance, including visual inspections of the Project infrastructure (pumps, pipe work, ponds) for leaks etc. including
  - reporting and response regarding any identified interruptions to operations, including pump operation, pipeline leak or liner leak;
- Roles and responsibilities;
- Leachate management control
  - limiting the area of exposed ash above lined areas,
  - control of rainfall runoff away from lined ash placement areas,
  - adequate compaction of placed materials to maximise stability and limit the rate of infiltration, and
  - capping and progressive rehabilitation of capped areas as soon as practicable;
- Surface water runoff / soil and erosion controls
  - diversion of runoff from upslope / upper catchment areas,
  - internal runoff to internal holding basins,
  - external runoff around external batters to stormwater holding ponds; and
  - diverting runoff from the capped areas to the existing water management system.
- Emergency procedures to respond to potential infrastructure failures and leaks, as well as environmental events (bushfire, flood, etc.);
- Monitoring requirements for leachate, groundwater and surface water levels and water quality in the LNAR and surrounding area, including
  - monitoring network (i.e. for groundwater and surface water),
  - leachate monitoring (levels, quality, production and storage volumes),
  - leak detection bores (i.e. for leachate storage infrastructure),
  - frequency and schedule of monitoring,
  - monitoring methodologies (i.e. field methods, decontamination procedures, quality control / quality assurance procedures), and
  - monitoring parameters (i.e. water levels, flow rates, physical and chemical properties);
- Assessment criteria including Environmental Goals;
- Reporting in line with the existing reporting requirements; and
- Contingency measures.

Implementation of the Modification will result in the loss of some current LNAR groundwater monitoring infrastructure following bore decommissioning. Revision of the OEMP will include updates to the monitoring program that account for the decommissioned monitoring bores and water quality performance targets, along with design and operation of the LNAR (as modified).

5.4 Contingency Mitigation Measures

Contingency mitigation measures to maintain surface water and groundwater water quality that may be considered if necessary include:

- The revision to the OEMP will include Trigger, Action, Response Plans (TARPs) developed for the LNAR;
- The ability to change placement area or leachate storage infrastructure as needed;
- The installation of an alarm or data flagging system that is activated when the leachate level within the lined placement areas rises to more than 300 mm;
- The ability to install additional monitoring infrastructure as part of contingency investigations;
- The multipurpose double lined storage infrastructure at the MPPS may also provide ancillary storage in the event that leachate generation for the LNAR (as modified) exceeds the storage capacity at LNAR, or the MPPS is unable to recycle the leachate for a period. Multipurpose double lined storage infrastructure at the MPPS includes, Settling Pond A (60 ML), Brine Waste Pond A (20 ML) and Brine Waste Pond B (20 ML);
- Should timely recycling or treatment of leachate not be available at the LNAR or MPPS then excess leachate would require treatment and disposal off site to a facility, which can lawfully accept it, with appropriate documentation and approval; and
- Should monitoring identify the potential for a leak in the leachate barrier system, leachate storage ponds or pipelines, all relevant groundwater bores and surface water locations may be re-sampled to re-confirm the changing conditions and to evaluate the cause:
  - If changes are considered to be associated with leachate storage ponds or pipelines, the pond liners or pipeline will be checked for leaks. Any leaks that are detected will be repaired. During the repair period, the leachate may be transferred to another double lined pond at the MPPS while the defective liner is repaired. Construction of an additional temporary storage feature could also be considered if the adjacent ponds were not suitable for brine storage; and
  - If changes are considered to be associated with the BCA liner barrier system, an investigation will be carried out to assess short-term and, if required, long-term mitigation measures and the relevant regulatory stakeholders will be notified and consulted regarding assessment requirements and mitigation options.

5.5 Water Assessment Summary

All future placement of BCA and Solid Mixed Salts within the LNAR is intended to occur within lined areas. While the placement of BCA and Solid Mixed Salts will occur below the currently approved RL 946 m AHD placement limit, the Concept Design outlines that all materials will be placed above RL 922 m AHD, which is above the elevation of local groundwater immediately around the LNAR.

The presence of the liner, leachate management system and capping layer, which will be designed and implemented consistent with the requirements of NSW EPA (2016), will mitigate the potential impacts of leachate migrating to groundwater and the potential for subsequent impacts to the surface water or groundwater in the vicinity of the LNAR. In addition, the existing approved stormwater management practices and controls are considered suitable to mitigate the potential surface water impacts from the Modification.

The OEMP will be revised to account for relevant aspects of the NSW EPA (2016) guidance required by the Modification. However, the majority of existing water management, monitoring and reporting requirements will remain unchanged. In the context of the Modification, and changes to existing approved practices, Table 5-1 presents a comparison of water management requirements against PA 09_0186.

Table 5-1: Comparison to Project Approval PA 09_0186

Key Project Element	LNAR (PA 09_0186)	Proposed Modification
LNAR Boundary	Approved boundary as defined in Figure 2.	■ Minor amendments to the approved LNAR boundary in the context of the existing and proposed surrounding activities and interactions, including excising the Western Coal Services washery infrastructure.
Final Ash Repository Landform Height	■ RL 980 m AHD LNAR ■ RL 1,000 m AHD LSAR	■ No change to the maximum heights
Disturbance footprint (approximate)	■ 50 ha LNAR ■ 61 ha LSAR	■ Reduction in the proposed footprint of LNAR by approximately 5 ha to excise Western Coal Services infrastructure
Total Approved Volumes (approximately)	■ LNAR: 8.25 M m^3 ■ LSAR: 15 M m^3	■ No change
Ash type permitted for placement	■ Bottom furnace ash ■ WCA ■ BCA	■ No change
Ash Placement Requirements	■ WCA and BCA placed separately ■ BCA must be placed above RL 946 m AHD on top of WCA	■ Installation of a single HDPE liner (or equivalent) prior to the placement of BCA ■ Placement of BCA and Solid Mixed Salts from the surface of the liner up to the maximum approved LNAR height of RL 966-980 m AHD, including a capping liner
Water Management	■ Surface runoff from the internal surfaces is directed by a slope of around 1% to unlined internal detention basins ■ Surface runoff from the external batters is directed away from the Ash via drains into sedimentation ponds. ■ Zero surface water discharge from LNAR premises	■ Installation of a leachate management system to collect leachate within the lined areas ■ Additional storage ponds to manage leachate collected from the lined areas ■ Reuse or transfer of leachate to MPPS for treatment and use in power generation ■ No other change

6. NORBE ASSESSMENT

6.1 State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

The *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* (Sydney Drinking Water SEPP) requires all proposed developments in the Sydney drinking water catchment to demonstrate a neutral or beneficial effect (NorBE).

A neutral or beneficial effect on water quality is satisfied if the development;

a) has no identifiable potential impact on water quality, or

b) will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site, or

c) will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority. (SCA, 2015).

The LNAR is located within the Sydney Drinking Water Catchment and therefore the Sydney Drinking Water SEPP is applicable to the assessment of the Modification.

The aims of the Sydney Drinking Water SEPP are:

- To provide for healthy water catchments that will deliver high quality water while permitting development that is compatible with that goal;
- To provide that a consent authority must not grant consent to a proposed development unless it is satisfied that the proposed development will have a neutral or beneficial effect on water quality; and
- To support the maintenance or achievement of the water quality objectives for the Sydney drinking water catchment.

Under Clause 11A of the Sydney Drinking Water SEPP, if:

a) development consent was granted for continuing development ("the existing development consent"), and

b) a development application is made for consent to extend or expand the carrying out of the development ("the proposed development"), and

c) the development application is made before the authority conferred by the existing development consent expires or is exhausted

the carrying out of the proposed development will have a neutral or beneficial effect on water quality if it will have the same or a lesser adverse impact on water quality when compared to the adverse impact that the continuing development would have if it were extended or expanded under similar conditions as the existing development consent.

Continuing development is defined as:

'*any development (such as mining) for which development consent was limited to the carrying out of the development for a particular time or to a particular area or intensity, but which was likely to be the subject of future applications for consent for its extension or expansion'*.

The Modification seeks to amend the LNAR approval to facilitate the installation of a liner and associated works to improve the environmental outcomes of the LNAR. The environmental impact associated with the Modification will mitigate adverse impact on water quality to that originally approved and will result in improved environmental outcomes for LNAR through the interception, capture and treatment/use of leachate from BCA placement activities.

6.2 NorBE Assessment

6.2.1 Soil and Surface Water Management

As detailed in Section 5.3, water quality management and monitoring for the LNAR (as modified) will focus on:

- Leachate management control;
- Surface water runoff controls; and
- Monitoring and reporting.

The Modification will strengthen surface water controls when compared to the existing approved practices at the LNAR by providing a leachate barrier and collection system that will mitigate the escape of leachate from lined BCA placement within the LNAR (as modified) into the surrounding environment.

Sydney Drinking Water SEPP requires that any development or activity proposed within the Sydney Drinking Water Catchment should incorporate WaterNSW current recommended practices (CRPs) and performance standards control of surface water flows, drainage and erosion. The Modification will be implemented in accordance with guidance principles presented by NSW EPA (2016), which is in line with the existing approved management as presented in the OEMP, and in general accordance with WaterNSW CRPs and performance standards.

6.3 Groundwater Management

The Modification will strengthen groundwater controls when compared to the existing approved practices at the LNAR by providing a leachate barrier and collection system that will mitigate the escape of leachate from lined BCA placement within the LNAR (as modified) into the underlying groundwater environment.

Groundwater management will continue in accordance with the OEMP, which will be revised to account for the Modification, including the management, monitoring and reporting requirements outlined in Section 5.3. Relative to the existing approved management practices for the LNAR, the presence of the liner, leachate management system and capping layer consistent with the requirements of NSW EPA (2016), will result in improved groundwater management resulting from the Modification when compared to the existing approved practices.

6.3.1 Contamination Management

If encountered, contaminated materials will be managed in accordance with the existing approved OEMP, which outlines protocols for management of a contamination or pollution event to surface water or groundwater, including prompt clean up, monitoring and appropriate reporting requirements.

6.4 Summation

Sydney Drinking Water SEPP requires an assessment of how the Modification would have a neutral or beneficial effect (NorBE) on water quality.

The Modification is seeking approval to install a leachate barrier system (using very low permeability liners) within the LNAR (as modified) to capture and subsequently treat/reuse leachate moving through the ash placed above the liner. The installation of a liner, associated water and leachate management systems and capping liner seeks to limit the risk of vertical and lateral movement of leachate from BCA migrating into the surrounding groundwater and surface water systems, providing for improved environmental outcomes from that currently approved for LNAR under Project Approval 09_0186. In addition, the existing approved stormwater management practices and controls are considered suitable to mitigate the potential surface water impacts from the LNAR (as modified).

Overall, the Modification will have a neutral or beneficial effect on water quality by providing the ability to capture, store, treat and reuse leachate from lined BCA placement areas, limiting the migration of leachate from the LNAR (as modified). Final capping and encapsulation of the BCA and Solid Mixed salts will further mitigate the risk of vertical and lateral movement of BCA leachate through the ash to the surrounding environment as the LNAR is progressively rehabilitated.

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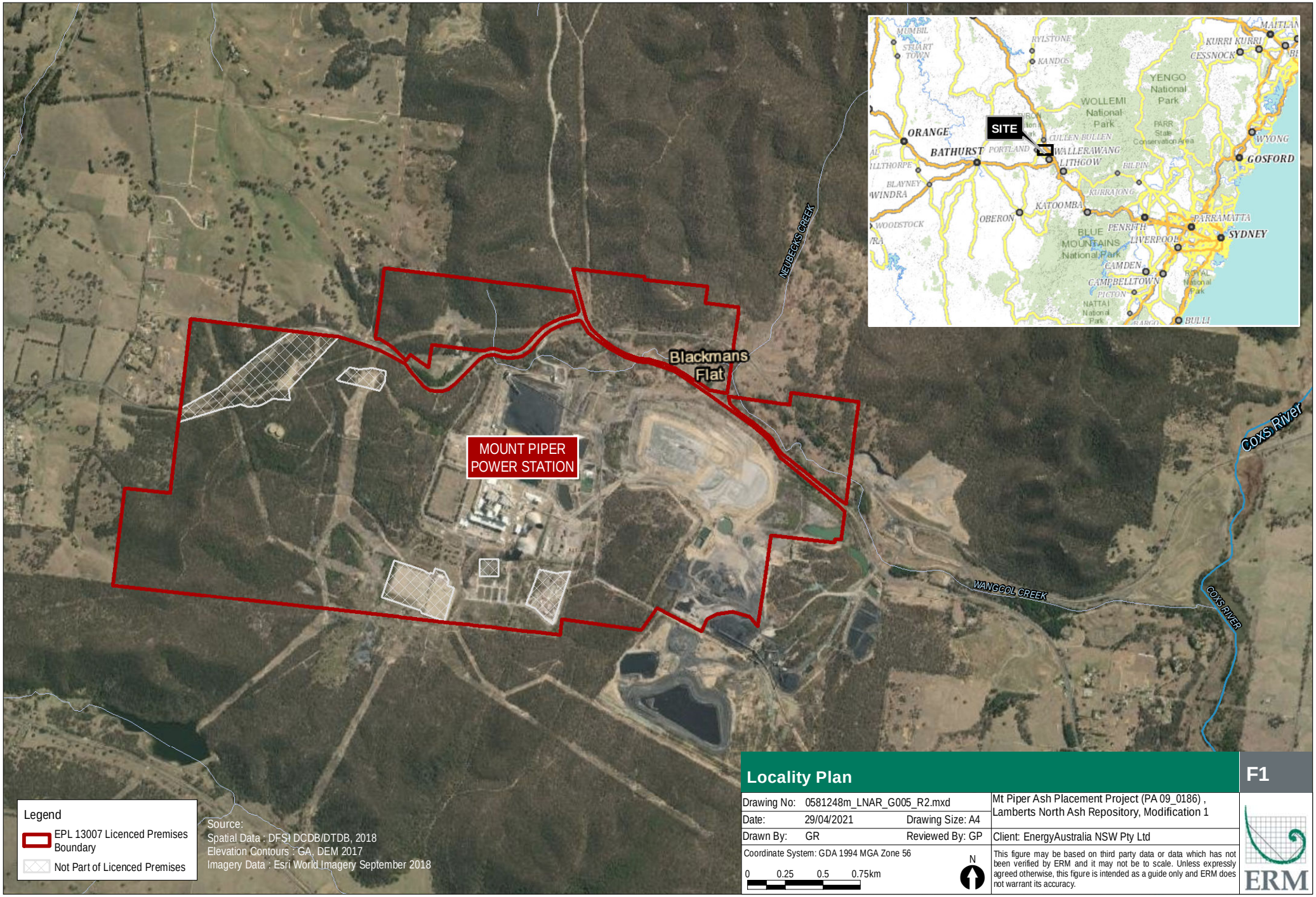
APPENDIX A FIGURES



Locality Plan

F1

Drawing No:	0581248m_LNAR_G005_R2.mxd		Mt Piper Ash Placement Project (PA 09_0186) , Lamberts North Ash Repository, Modification 1
Date:	29/04/2021	Drawing Size: A4	
Drawn By:	GR	Reviewed By: GP	Client: EnergyAustralia NSW Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

ERM

Final Holding Pond (LMP01)
Coal Settling Pond
Mine Water Buffer Pond
Settling Pond D
Blowdown Pond A
Brine Waste Pond B
Brine Waste Pond A
Clean Water Pond
MPPS Brine Concentrators
Ash Conditioning Plant
Transfer Point 2
Ash Conveyor
Settling Pond A
Settling Pond B
Settling Pond C
Contaminated Water Pond
Repository Silos
CWP02
CWP01
Pond BWA
Pond BWB
Pond BWC
Unlined Internal Detention Basin
LN Pond 2
DML Dam (Managed by Centennial)
WANGCOL CREEK
Council Pit
H-Pit East
Cooks Dam (Managed by Centennial)
CASTLEREAGH HIGHWAY
SHC1
LNAR Proposed Footprint
Springvale Water Treatment Project
H-Pit West

Notes:
Unlined water storages are denoted with blue labels ; all other water storages are lined

Legend

- Proposed modification to LNAR footprint
- Approved LNAR (Lamberts North Ash Repository)
- Approved LSAR (Lamberts South Ash Repository)
- Mt Piper Ash Repository
- EPL 13007 Licenced Premises Boundary
- Not Part of Licenced Premises
- Creek / River

Source:
Spatial Data : DFSI, DCDB/DTDB
Water Management : Western Coal Services, Water Management Plan, GHD, Sept 2017
Imagery: Nearmap Jan 2021

Site Layout

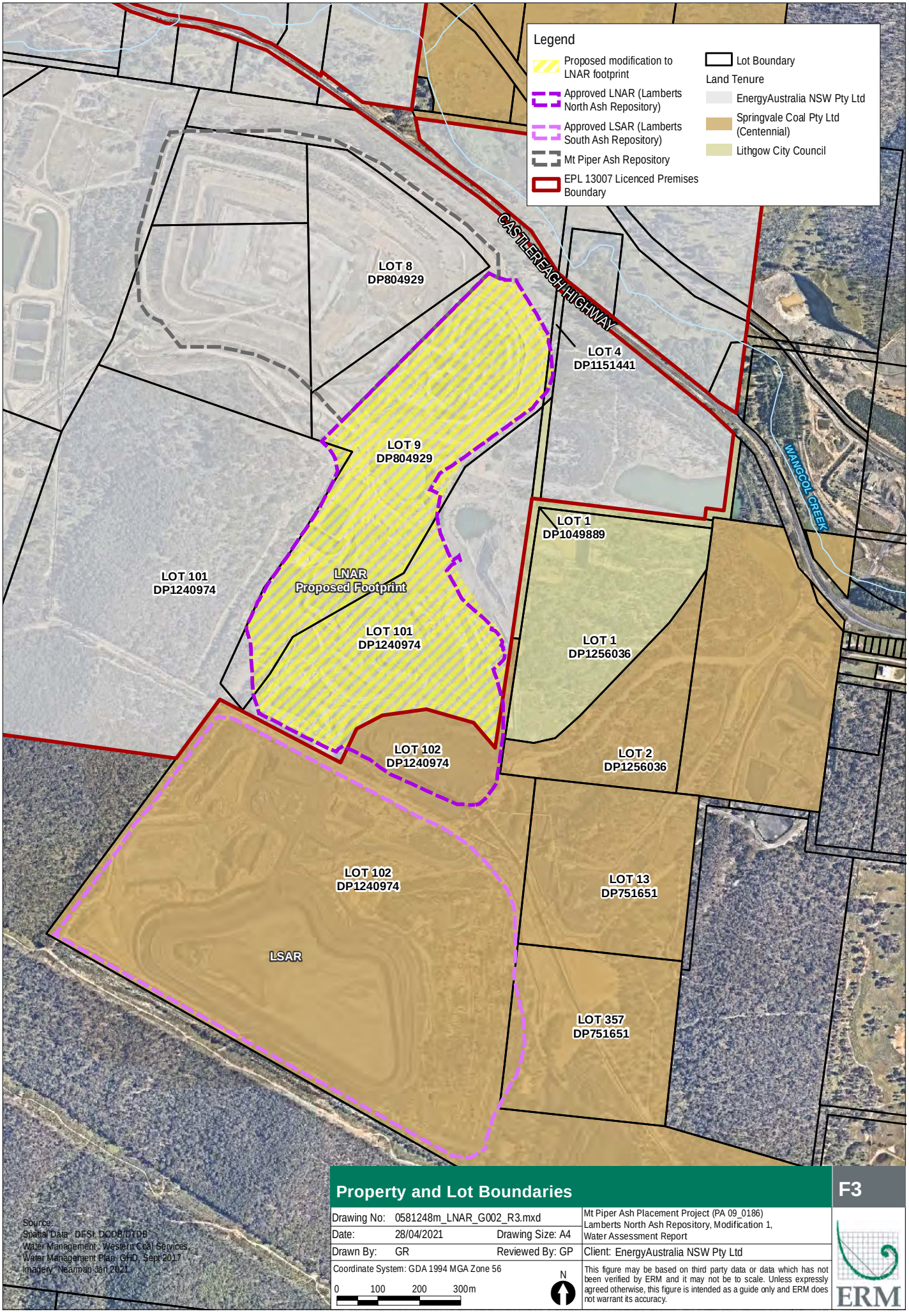
F2

Drawing No:	0581248m_LNAR_G001_R8.mxd		Mt Piper Ash Placement Project (PA 09_0186) Lamberts North Ash Repository, Modification 1, Water Assessment Report
Date:	29/04/2021	Drawing Size: A3	
Drawn By:	GR	Reviewed By: GP	Client: EnergyAustralia NSW Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56			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.

0 100 200 300m

N

ERM



Property and Lot Boundaries

F3

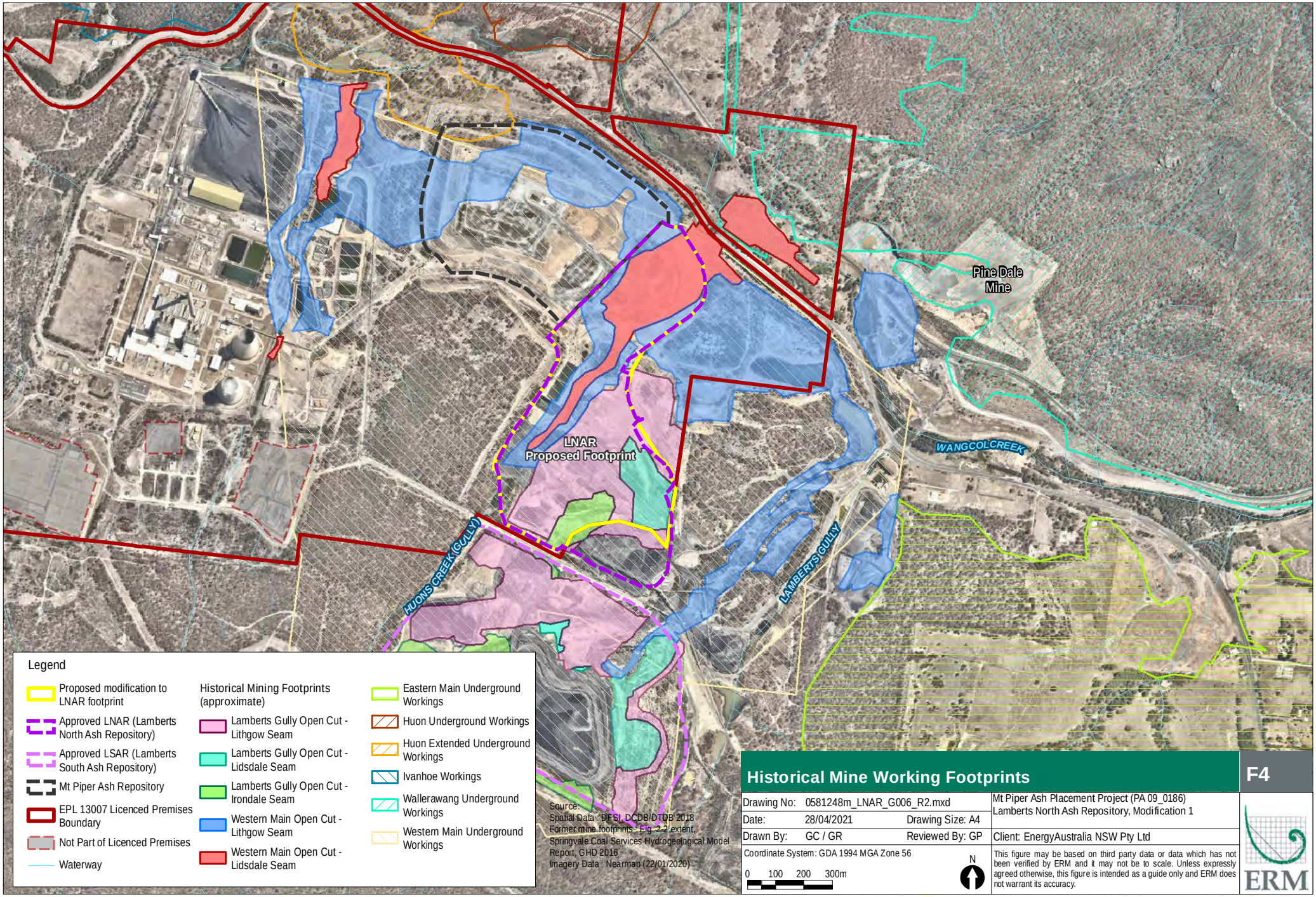
Drawing No:	0581248m_LNAR_G002_R3.mxd		Mt Piper Ash Placement Project (PA 09_0186) Lamberts North Ash Repository, Modification 1, Water Assessment Report
Date:	28/04/2021	Drawing Size: A4	
Drawn By:	GR	Reviewed By: GP	Client: EnergyAustralia NSW Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56			This 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.

0 100 200 300m

N

Source:
Spatial Data: DFSI, DODB/DTDB
Water Management: Western Coal Services, Water Management Plan, GHD, Sept 2017
Imagery: Nearmap Jan 2021

ERM


Pine Dale Mine
LNAR Proposed Footprint
WANGCOLCREEK
HUONS CREEK (GULLY)
LAMBERTS GULLY
Legend
Proposed modification to LNAR footprint
Approved LNAR (Lamberts North Ash Repository)
Approved LSAR (Lamberts South Ash Repository)
Mt Piper Ash Repository
EPL 13007 Licenced Premises Boundary
Not Part of Licenced Premises
Waterway
Historical Mining Footprints (approximate)
Lamberts Gully Open Cut - Lithgow Seam
Lamberts Gully Open Cut - Lidsdale Seam
Lamberts Gully Open Cut - Irondale Seam
Western Main Open Cut - Lithgow Seam
Western Main Open Cut - Lidsdale Seam
Eastern Main Underground Workings
Huon Underground Workings
Huon Extended Underground Workings
Ivanhoe Workings
Wallerawang Underground Workings
Western Main Underground Workings
Source:
Spatial Data : DFSI, DCDB/DTDB 2018
Former mine footprints : Fig. 2.2 extent, Springvale Coal Services Hydrogeological Model Report, GHD 2016
Imagery Data : Nearmap (22/01/2020)
Historical Mine Working Footprints
F4
Drawing No: 0581248m_LNAR_G006_R2.mxd
Mt Piper Ash Placement Project (PA 09_0186)
Lamberts North Ash Repository, Modification 1
Date: 28/04/2021
Drawing Size: A4
Drawn By: GC / GR
Reviewed By: GP
Client: EnergyAustralia NSW Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0 100 200 300m
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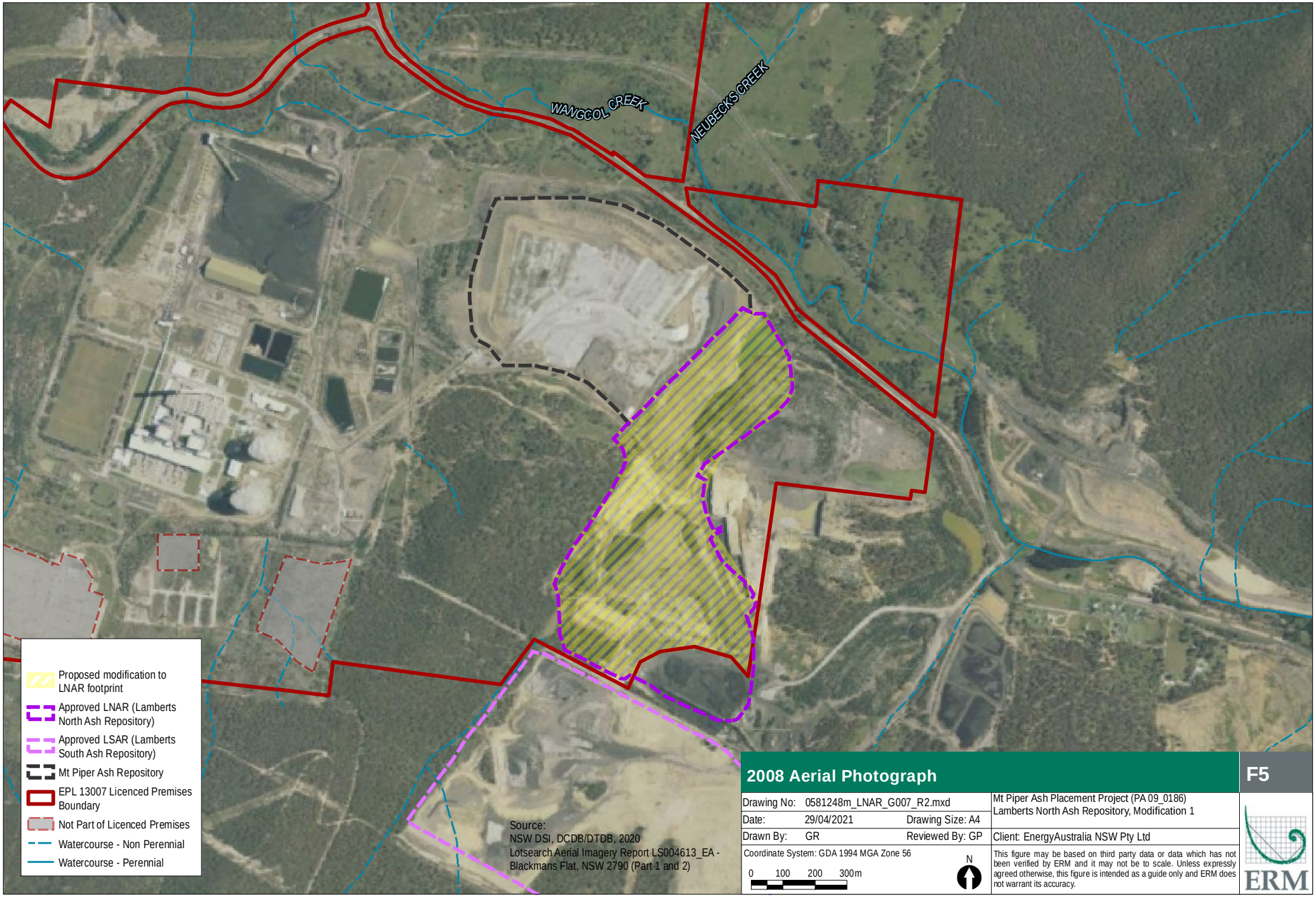
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



2008 Aerial Photograph

F5

Drawing No:	0581248m_LNAR_G007_R2.mxd		Mt Piper Ash Placement Project (PA 09_0186) Lamberts North Ash Repository, Modification 1
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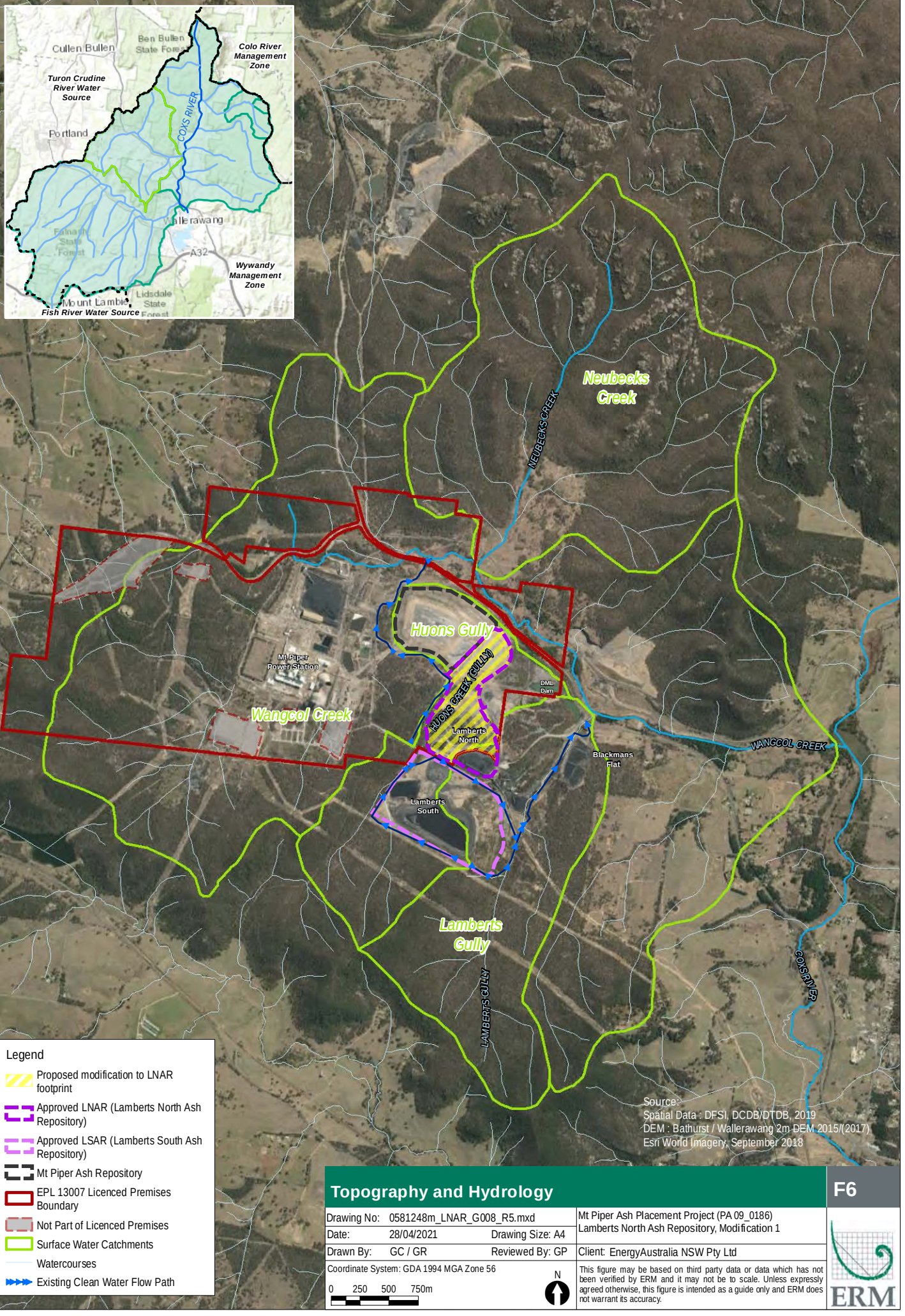
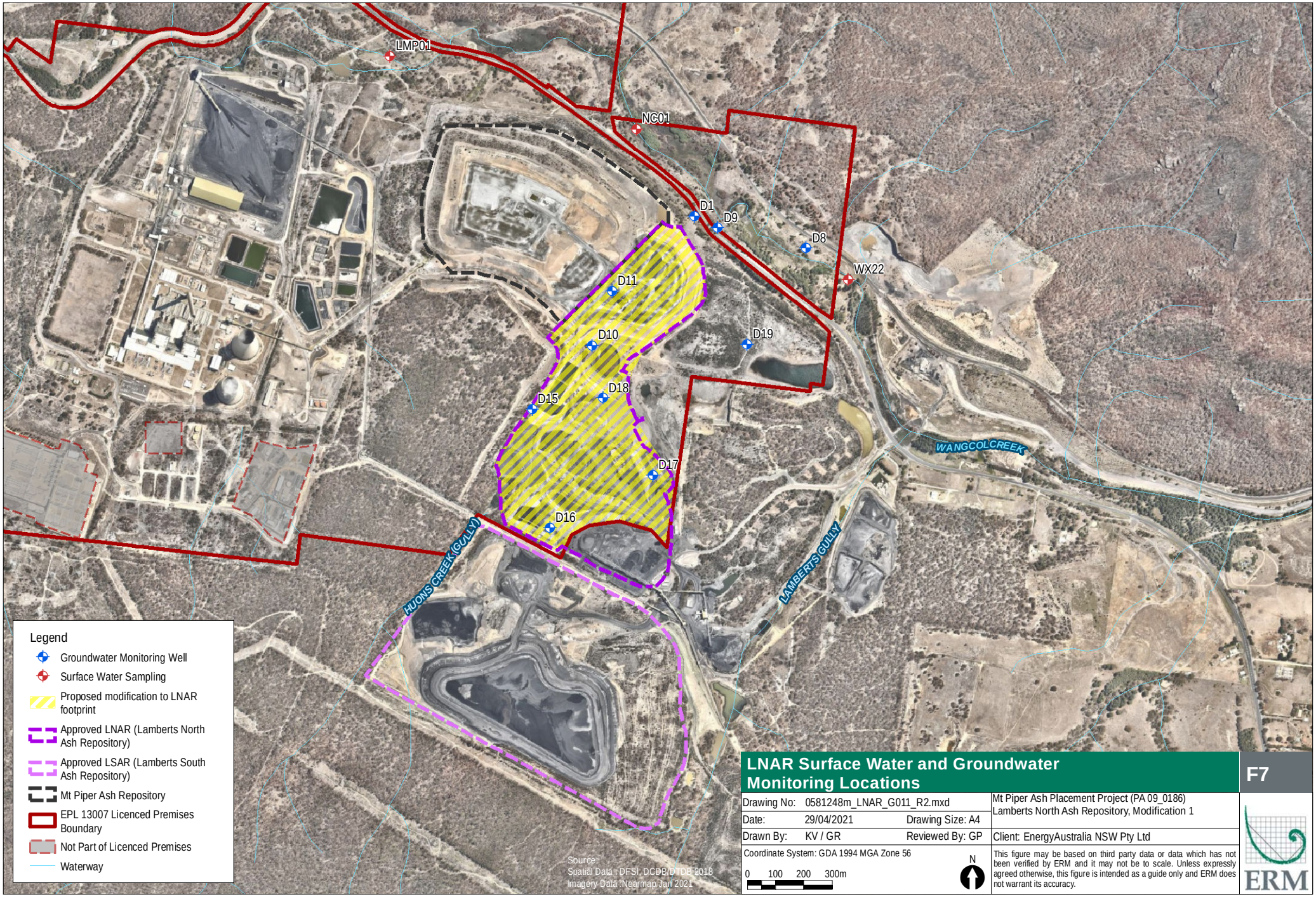
Drawn By:	GR	Reviewed By: GP	Client: EnergyAustralia NSW Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

ERM


Cullen Bullen
Ben Bullen State Forest
Colo River Management Zone
Turon Crudine River Water Source
COXS RIVER
Portland
Wallerawang
Falnash State Forest
A32
Wywandy Management Zone
Lidsdale State Forest
Mount Lambie
Fish River Water Source
Neubecks Creek
NEUBECKS CREEK
Huons Gully
HUONS CREEK (GULLY)
Mt Piper Power Station
DML Dam
Wangcol Creek
Lamberts North
Blackmans Flat
WANGCOL CREEK
Lamberts South
Lamberts Gully
LAMBERTS GULLY
COXS RIVER
Legend
Proposed modification to LNAR footprint
Approved LNAR (Lamberts North Ash Repository)
Approved LSAR (Lamberts South Ash Repository)
Mt Piper Ash Repository
EPL 13007 Licenced Premises Boundary
Not Part of Licenced Premises
Surface Water Catchments
Watercourses
Existing Clean Water Flow Path
Source:
Spatial Data : DFSI, DCDB/DTDB, 2019
DEM : Bathurst / Wallerawang 2m DEM 2015/(2017)
Esri World Imagery, September 2018
Topography and Hydrology
F6
Drawing No: 0581248m_LNAR_G008_R5.mxd
Date: 28/04/2021
Drawing Size: A4
Drawn By: GC / GR
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
0 250 500 750m
N
Mt Piper Ash Placement Project (PA 09_0186)
Lamberts North Ash Repository, Modification 1
Client: EnergyAustralia NSW Pty Ltd
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



LNAR Surface Water and Groundwater Monitoring Locations

F7

Drawing No:	0581248m_LNAR_G011_R2.mxd		Mt Piper Ash Placement Project (PA 09_0186) Lamberts North Ash Repository, Modification 1
Date:	29/04/2021	Drawing Size: A4	
Drawn By:	KV / GR	Reviewed By: GP	Client: EnergyAustralia NSW Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

ERM

Winter (August 2019)

Spring (October 2019)

Summer (January 2020)

Autumn (March 2020)

Legend

- Proposed modification to LNAR footprint
- Approved LNAR (Lamberts North Ash Repository)
- Approved LSAR (Lamberts South Ash Repository)
- Mt Piper Ash Repository
- EPL 13007 Licenced Premises Boundary
- Not Part of Licenced Premises
- Groundwater Monitoring Location
- Inferred Groundwater Contour (AHD)
- Inferred Groundwater Flow Direction
- (918.24) Corrected Groundwater Elevation (m AHD)

Source:
Spatial Data : DFSI, DCDB/DTDB 2019
Imagery Data : Nearmap January 2020

Groundwater Elevation Contours

F8

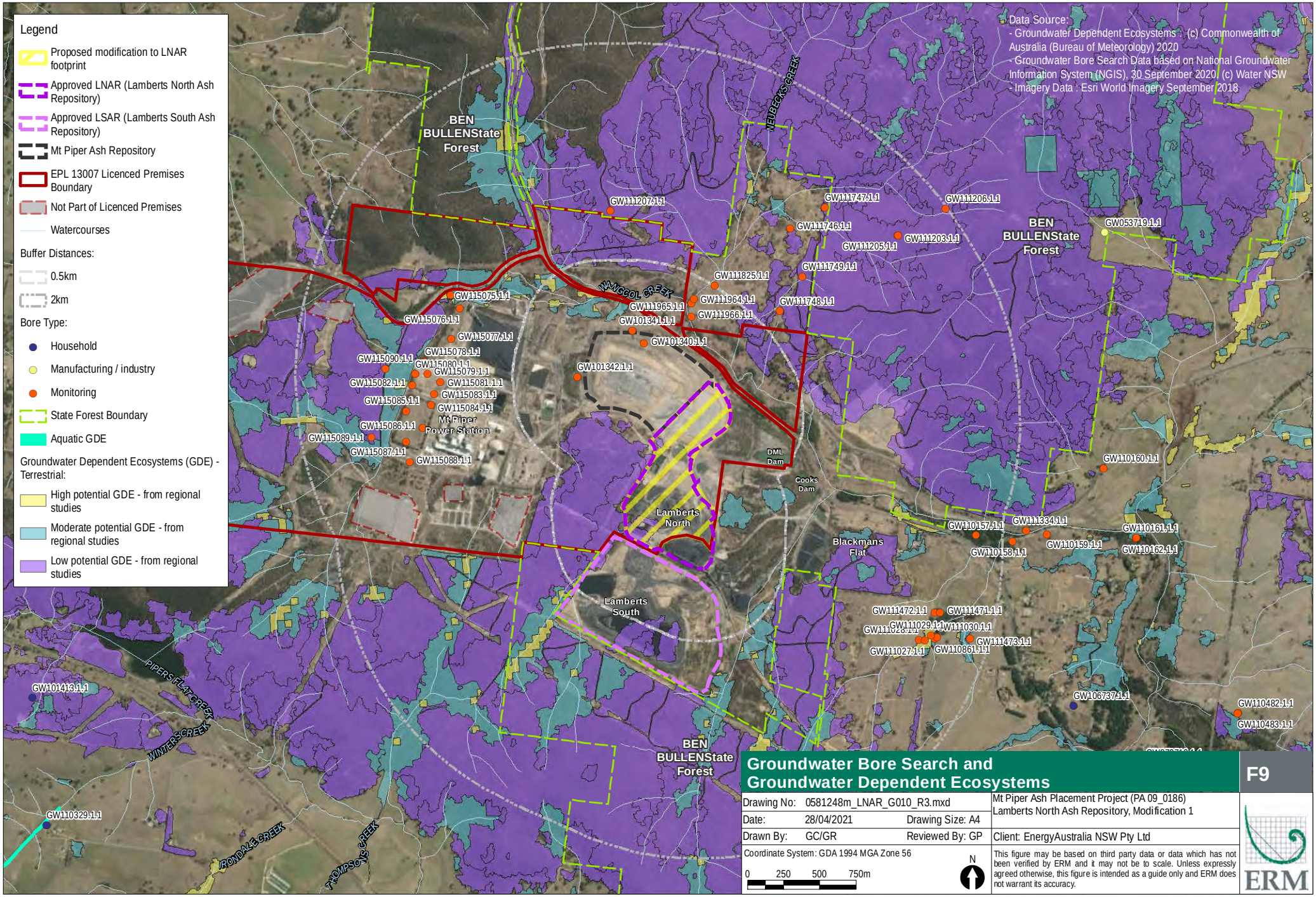
Drawing No:	0581248m_LNAR_G009_R3.mxd		Mt Piper Ash Placement Project (PA 09_0186) Lamberts North Ash Repository, Modification 1
Date:	28/04/2021	Drawing Size: A3	
Drawn By:	GC/GR	Reviewed By: GP	Client: EnergyAustralia NSW Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 100 200 300m

N

ERM


Legend
Proposed modification to LNAR footprint
Approved LNAR (Lamberts North Ash Repository)
Approved LSAR (Lamberts South Ash Repository)
Mt Piper Ash Repository
EPL 13007 Licenced Premises Boundary
Not Part of Licenced Premises
Watercourses
Buffer Distances:
0.5km
2km
Bore Type:
Household
Manufacturing / industry
Monitoring
State Forest Boundary
Aquatic GDE
Groundwater Dependent Ecosystems (GDE) - Terrestrial:
High potential GDE - from regional studies
Moderate potential GDE - from regional studies
Low potential GDE - from regional studies
Data Source:
- Groundwater Dependent Ecosystems : (c) Commonwealth of Australia (Bureau of Meteorology) 2020
- Groundwater Bore Search Data based on National Groundwater Information System (NGIS), 30 September 2020 (c) Water NSW
- Imagery Data : Esri World Imagery September 2018
BEN BULLENState Forest
NEUBECKS CREEK
WANGCOL CREEK
Mt Piper Power Station
DML Dam
Cooks Dam
Lamberts North
Lamberts South
Blackmans Flat
PIPERS FLAT CREEK
WINTERSCREEK
IRONDALE CREEK
THOMPSONS CREEK
GW111207.1.1
GW111747.1.1
GW111206.1.1
GW111746.1.1
GW111203.1.1
GW111205.1.1
GW053719.1.1
GW111749.1.1
GW111825.1.1
GW111964.1.1
GW111965.1.1
GW111966.1.1
GW111748.1.1
GW101341.1.1
GW101340.1.1
GW101342.1.1
GW115075.1.1
GW115076.1.1
GW115077.1.1
GW115078.1.1
GW115090.1.1
GW115080.1.1
GW115079.1.1
GW115082.1.1
GW115081.1.1
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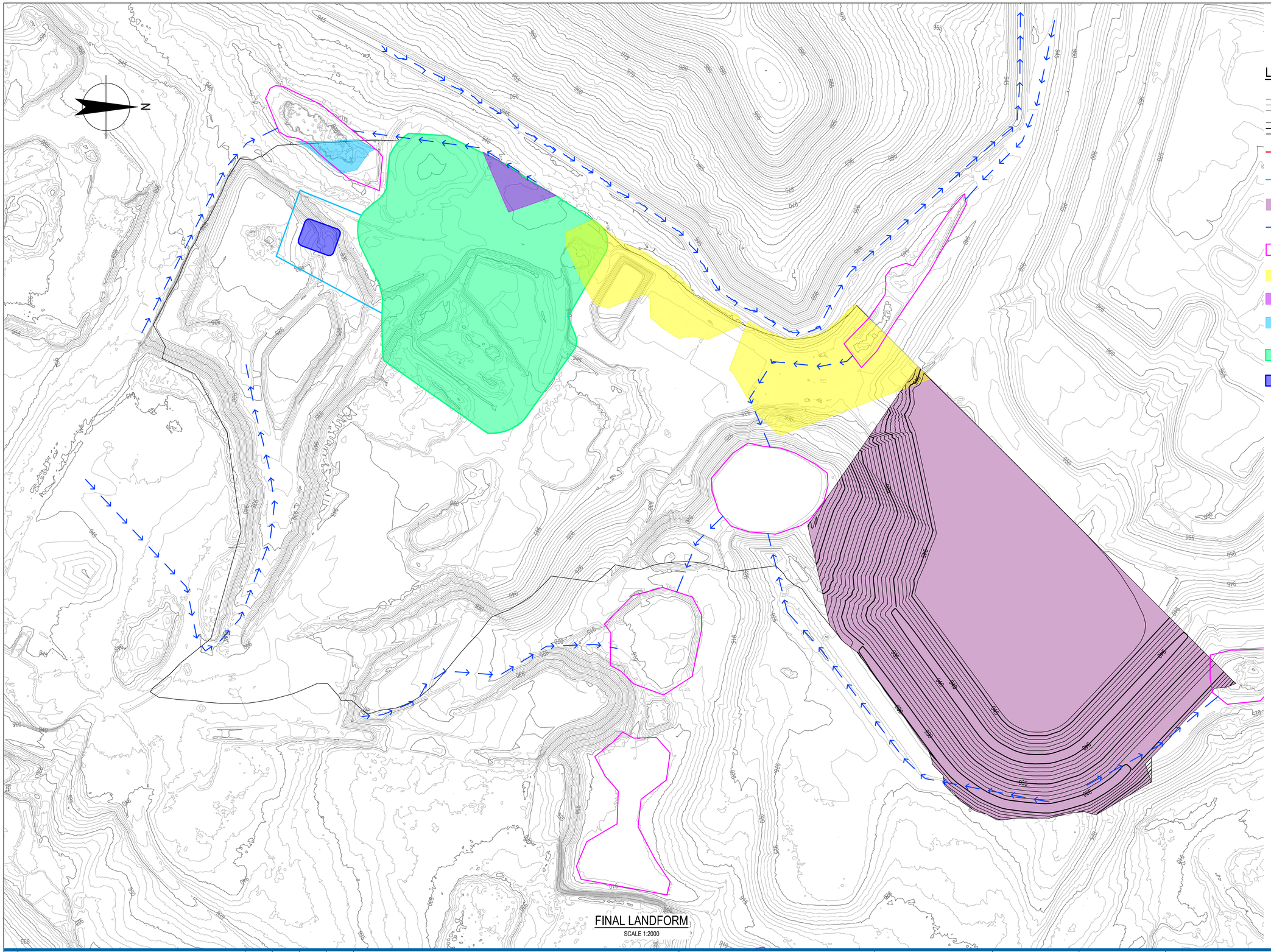
GW111027.1.1
GW110861.1.1
GW101413.1.1
GW106737.1.1
GW110482.1.1
GW110483.1.1
GW110329.1.1
Groundwater Bore Search and Groundwater Dependent Ecosystems
F9
Drawing No: 0581248m_LNAR_G010_R3.mxd
Date: 28/04/2021
Drawing Size: A4
Drawn By: GC/GR
Reviewed By: GP
Mt Piper Ash Placement Project (PA 09_0186)
Lamberts North Ash Repository, Modification 1
Client: EnergyAustralia NSW Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0 250 500 750m
N
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

APPENDIX B CONCEPT DESIGN STAGES



LEGEND

- EXISTING SITE CONTOURS
- 960 DESIGN CONTOURS
- INDICATIVE SITE AREA
- INDICATIVE SITE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- CAPPING SYSTEM
- SURFACE WATER MANAGEMENT DRAINAGE LINES
- SURFACE WATER MANAGEMENT WATER STORAGES
- TROUGH SUBSIDENCE HAZARD - MODERATE
- TROUGH SUBSIDENCE HAZARD - HIGH
- TROUGH SUBSIDENCE HAZARD - HIGH (FIRST WORKINGS, <15M COVER)
- INDICATIVE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- PROPOSED STORMWATER POND FOR REGROUP LINED ASH PLACEMENT FACILITY

NOTES:

1. EXISTING SITE CONTOURS BASED ON CEH SURVEY DATED 19 JULY 2019 (DRAWING TITLE: LEND LEASE SERVICES PTY. LTD. - MOUNT PIPER - ASH PLACEMENT SURVEY: 19TH JULY 2019, DRAWING NO. MPA0719 (AS SURVEYED)) AND ANZLIC COMIMITTEE OF SURVEYING & MAPPING (EXTRACTED ON 8 DECEMBER 2020).

FINAL LANDFORM

SCALE 1:2000

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	INITIAL ISSUE		LP			

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SCALE 1:2000 AT ORIGINAL SIZE

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E sydmail@ghd.com W www.ghd.com

Xref GHD_G_1032.dwg

DO NOT SCALE

Xref GHD_G_1031.dwg

Drawn	L. POSADAS	Designer	R. GREWAL
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale	1 : 2000	This Drawing must not be used for Construction unless signed as Approved	

Client ENERGYAUSTRALIA NSW AND RE.ENERGY

Project ASH PLACEMENT CELL CONCEPT DESIGN

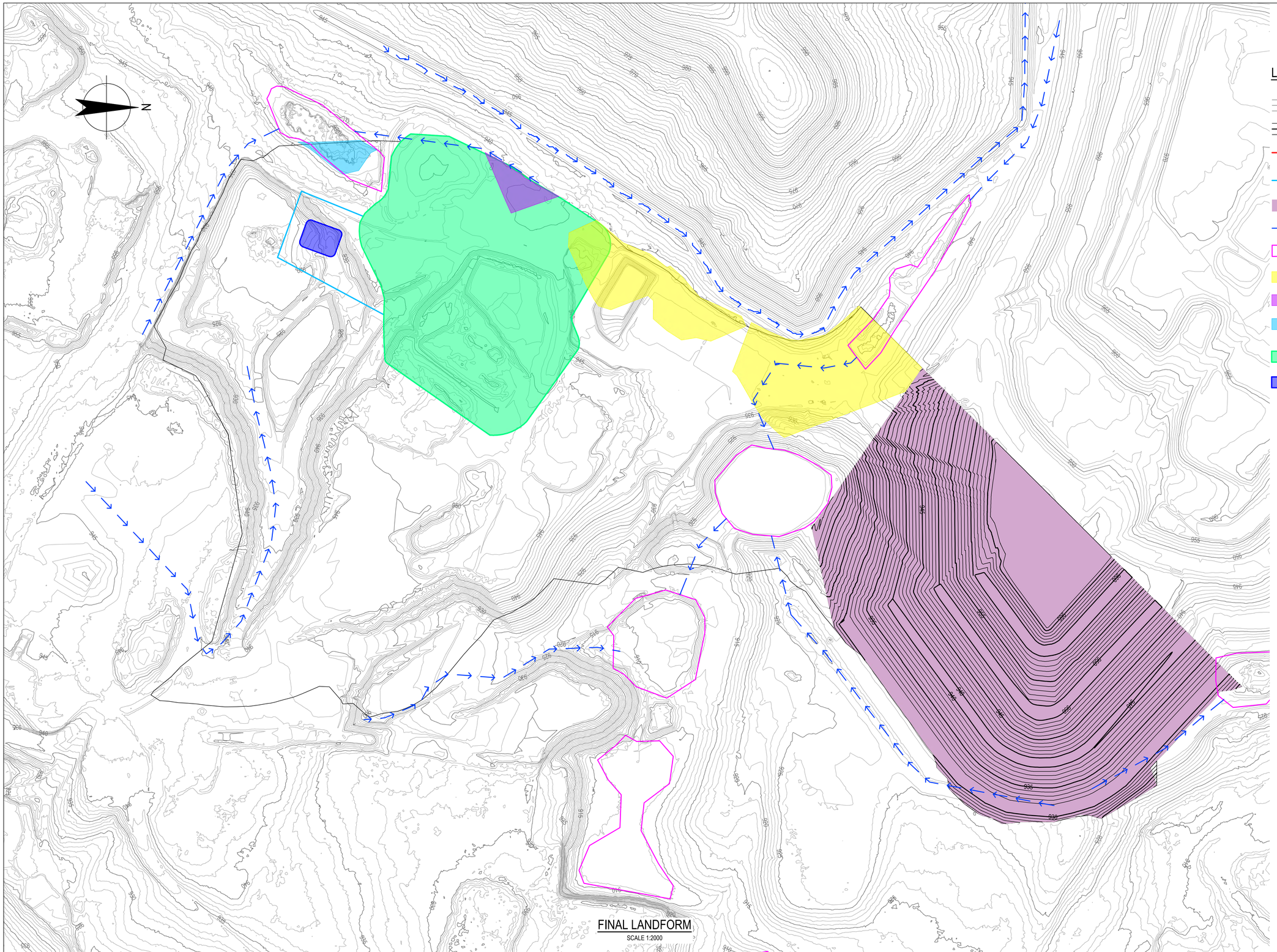
Title FILL STAGE 1A

Original Size A1

Drawing No: 12541487-C004

Rev: A

Plot Date: 16 February 2021 - 4:47 PM Plotted by: Rashnith Grewal Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C004.dwg



FINAL LANDFORM
SCALE 1:2000

NOTES:

1. EXISTING SITE CONTOURS BASED ON CEH SURVEY DATED 19 JULY 2019 (DRAWING TITLE: LEND LEASE SERVICES PTY. LTD. - MOUNT PIPER - ASH PLACEMENT SURVEY: 19TH JULY 2019, DRAWING NO. MPA0719 (AS SURVEYED)) AND ANZLIC COMIMITTEE OF SURVEYING & MAPPING (EXTRACTED ON 8 DECEMBER 2020).

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	INITIAL ISSUE		LP			

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SCALE 1:2000 AT ORIGINAL SIZE

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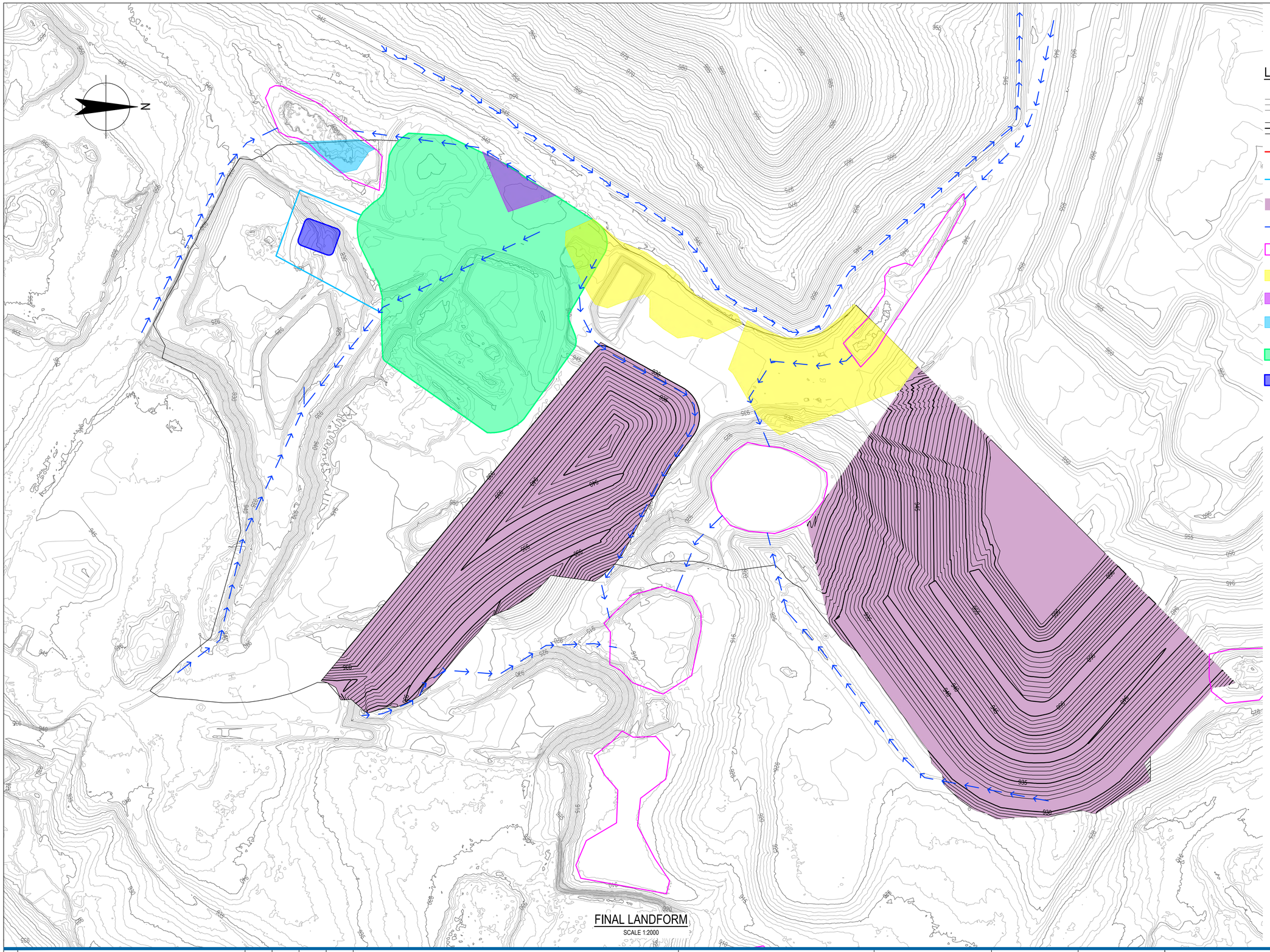
Xref GHD_G_1031.dwg

Drawn L. POSADAS	Designer R. GREWAL	
Drafting Check	Design Check	
Approved (Project Director)		
Date		
Scale 1 : 2000	This Drawing must not be used for Construction unless signed as Approved	

Client ENERGYAUSTRALIA NSW AND RE.ENERGY
Project ASH PLACEMENT CELL CONCEPT DESIGN
Title FILL STAGE 1B

Original Size A1 Drawing No: 12541487-C005 Rev: A

Plot Date: 16 February 2021 - 4:49 PM Plotted by: Rashnith Grewal Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C005.dwg



FINAL LANDFORM
SCALE 1:2000

NOTES:

1. EXISTING SITE CONTOURS BASED ON CEH SURVEY DATED 19 JULY 2019 (DRAWING TITLE: LEND LEASE SERVICES PTY. LTD. - MOUNT PIPER - ASH PLACEMENT SURVEY: 19TH JULY 2019, DRAWING NO. MPA0719 (AS SURVEYED)) AND ANZLIC COMMITTEE OF SURVEYING & MAPPING (EXTRACTED ON 8 DECEMBER 2020).

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	INITIAL ISSUE		LP			

0 20 40 60 80 100m
SCALE 1:2000 AT ORIGINAL SIZE

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Drawn L. POSADAS		Designer R. GREWAL
Drafting Check		Design Check
Approved (Project Director)		
Date		
Scale 1 : 2000	This Drawing must not be used for Construction unless signed as Approved	

Client ENERGYAUSTRALIA NSW AND RE.ENERGY
Project ASH PLACEMENT CELL CONCEPT DESIGN
Title FILL STAGE 2A

Original Size A1
Drawing No: 12541487-C006
Rev: A

Plot Date: 16 February 2021 - 4:55 PM Plotted by: Rashnith Grewal Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C006.dwg

N

LEGEND

- EXISTING SITE CONTOURS
- DESIGN CONTOURS
- INDICATIVE SITE AREA
- INDICATIVE SITE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- CAPPING SYSTEM
- SURFACE WATER MANAGEMENT DRAINAGE LINES
- SURFACE WATER MANAGEMENT WATER STORAGES
- TROUGH SUBSIDENCE HAZARD - MODERATE
- TROUGH SUBSIDENCE HAZARD - HIGH
- TROUGH SUBSIDENCE HAZARD - HIGH (FIRST WORKINGS, <15M COVER)
- INDICATIVE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- PROPOSED STORMWATER POND FOR REGROUP LINED ASH PLACEMENT FACILITY

NOTES:

1. EXISTING SITE CONTOURS BASED ON CEH SURVEY DATED 19 JULY 2019 (DRAWING TITLE: LEND LEASE SERVICES PTY. LTD. - MOUNT PIPER - ASH PLACEMENT SURVEY: 19TH JULY 2019, DRAWING NO. MPA0719 (AS SURVEYED)) AND ANZLIC COMIMITTEE OF SURVEYING & MAPPING (EXTRACTED ON 8 DECEMBER 2020).

FINAL LANDFORM

SCALE 1:2000

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	INITIAL ISSUE		LP			

0 20 40 60 80 100m

SCALE 1:2000 AT ORIGINAL SIZE

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DO NOT SCALE

Xref GHD_G_1031.dwg

Drawn	L. POSADAS	Designer	R. GREWAL
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale	1 : 2000	This Drawing must not be used for Construction unless signed as Approved	

Client: ENERGYAUSTRALIA NSW AND RE.ENERGY

Project: ASH PLACEMENT CELL CONCEPT DESIGN

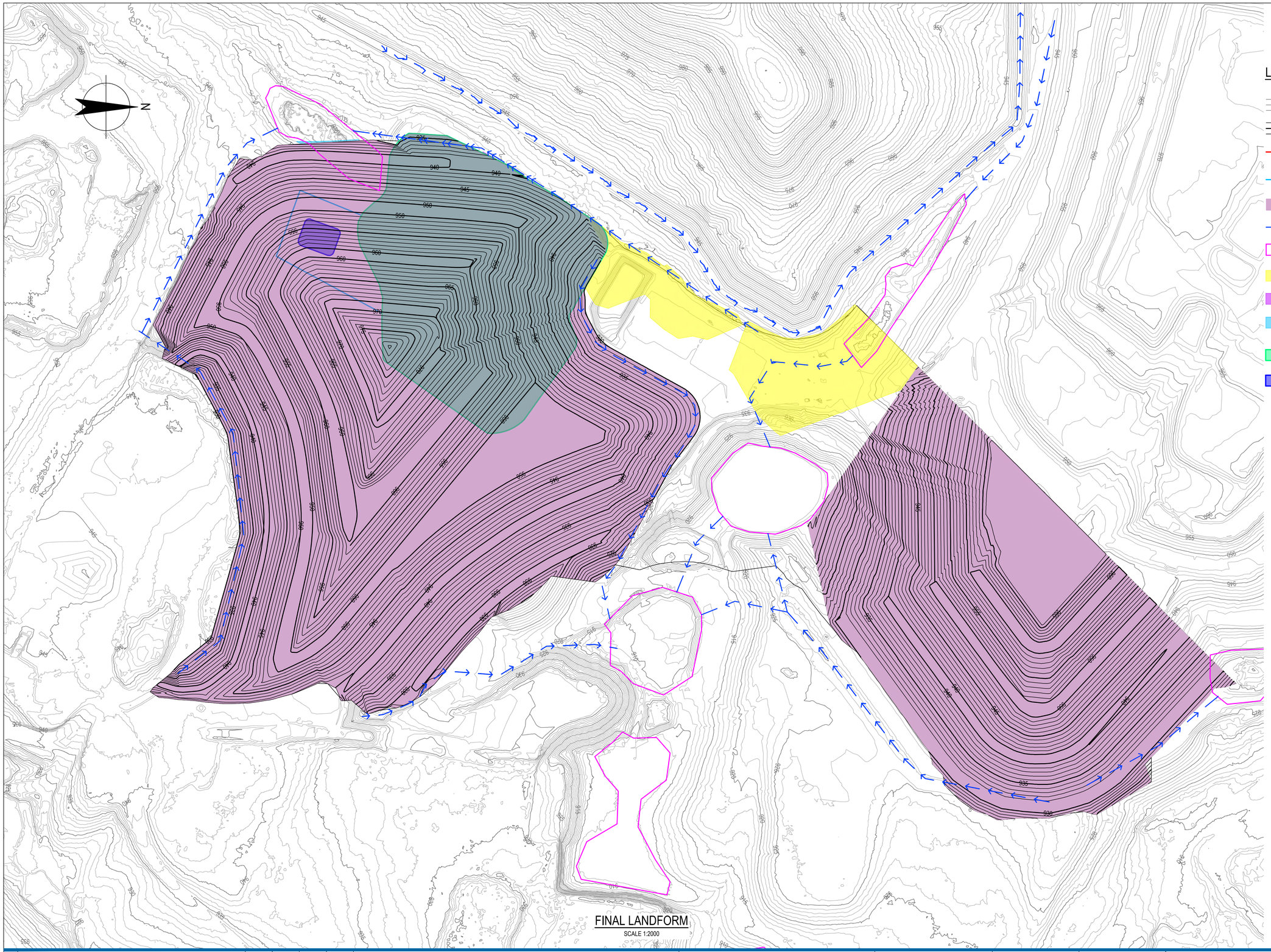
Title: FILL STAGE 2B

Original Size: A1

Drawing No: 12541487-C007

Rev: A

Plot Date: 16 February 2021 - 4:56 PM Plotted by: Rashnith Grewal Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C007.dwg



FINAL LANDFORM
SCALE 1:2000

NOTES:

1. EXISTING SITE CONTOURS BASED ON CEH SURVEY DATED 19 JULY 2019 (DRAWING TITLE: LEND LEASE SERVICES PTY. LTD. - MOUNT PIPER - ASH PLACEMENT SURVEY: 19TH JULY 2019, DRAWING NO. MPA0719 (AS SURVEYED)) AND ANZLIC COMIMITTEE OF SURVEYING & MAPPING (EXTRACTED ON 8 DECEMBER 2020).

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	INITIAL ISSUE		LP			

0 20 40 60 80 100m
SCALE 1:2000 AT ORIGINAL SIZE

GHD
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Xref GHD_G_1031.dwg

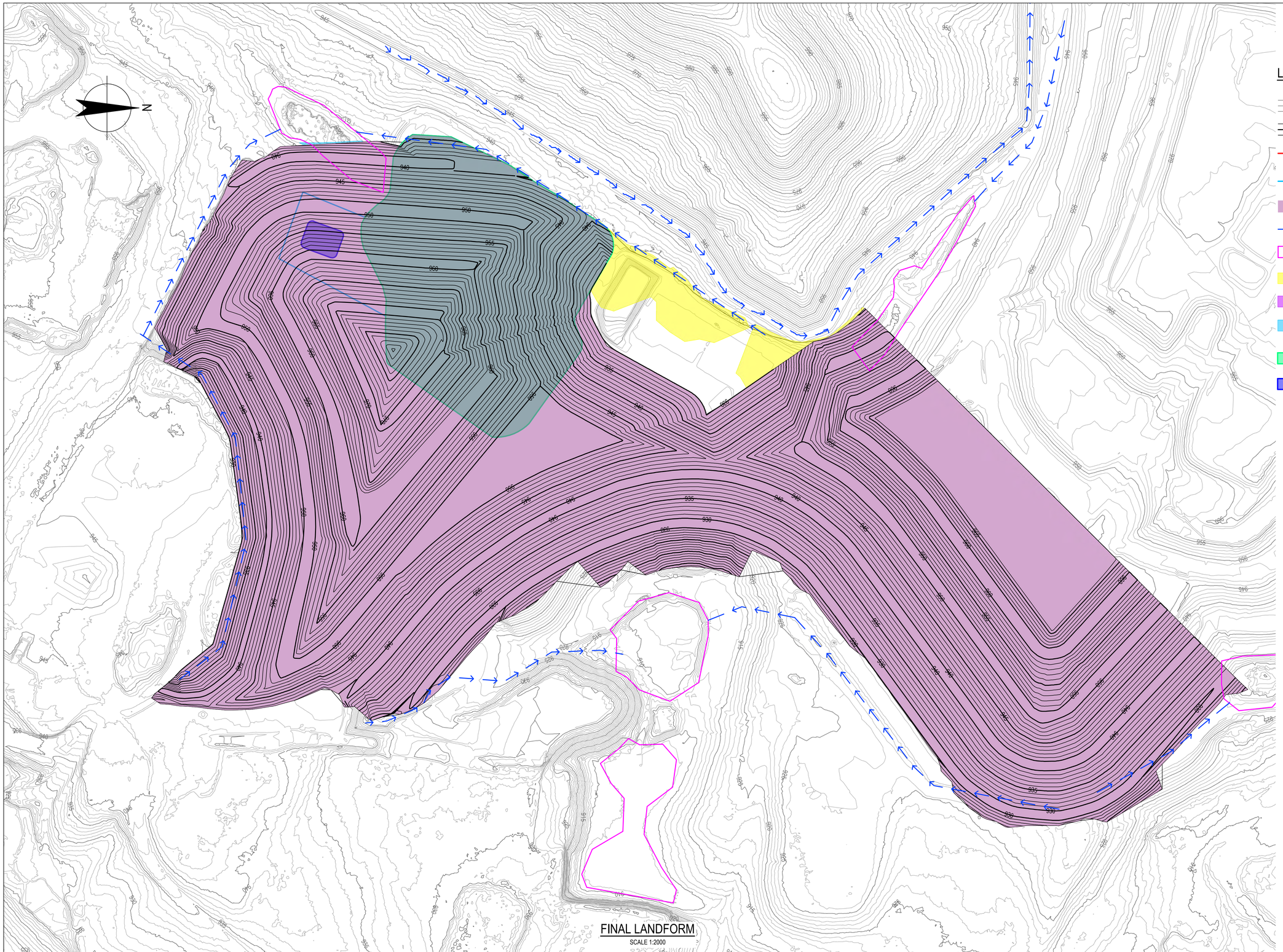
DO NOT SCALE

Drawn	L. POSADAS	Designer	R. GREWAL
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale	1 : 2000	This Drawing must not be used for Construction unless signed as Approved	

Client ENERGYAUSTRALIA NSW AND RE.ENERGY
Project ASH PLACEMENT CELL CONCEPT DESIGN
Title FILL STAGE 2C

Original Size A1
Drawing No: 12541487-C008
Rev: A

Plot Date: 17 February 2021 - 5:45 PM Plotted by: Rashnith Grewal Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C008.dwg



LEGEND

- EXISTING SITE CONTOURS
- DESIGN CONTOURS
- INDICATIVE SITE AREA
- INDICATIVE SITE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- CAPPING SYSTEM
- SURFACE WATER MANAGEMENT DRAINAGE LINES
- SURFACE WATER MANAGEMENT WATER STORAGES
- TROUGH SUBSIDENCE HAZARD - MODERATE
- TROUGH SUBSIDENCE HAZARD - HIGH
- TROUGH SUBSIDENCE HAZARD - HIGH (FIRST WORKINGS, <15M COVER)
- INDICATIVE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- PROPOSED STORMWATER POND FOR REGROUP LINED ASH PLACEMENT FACILITY

NOTES:

1. EXISTING SITE CONTOURS BASED ON CEH SURVEY DATED 19 JULY 2019 (DRAWING TITLE: LEND LEASE SERVICES PTY. LTD. - MOUNT PIPER - ASH PLACEMENT SURVEY: 19TH JULY 2019, DRAWING NO. MPA0719 (AS SURVEYED)) AND ANZLIC COMIMITTEE OF SURVEYING & MAPPING (EXTRACTED ON 8 DECEMBER 2020).

FINAL LANDFORM

SCALE 1:2000

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	INITIAL ISSUE		LP			

0 20 40 60 80 100m

SCALE 1:2000 AT ORIGINAL SIZE

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Xref GHD_G_1031.dwg

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Drawn L. POSADAS		Designer R. GREWAL
Drafting Check		Design Check
Approved (Project Director)		
Date		
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Client ENERGYAUSTRALIA NSW AND RE.ENERGY

Project ASH PLACEMENT CELL CONCEPT DESIGN

Title FILL STAGE 3A

Original Size A1

Drawing No: 12541487-C009

Rev: A

Plot Date: 16 February 2021 - 5:03 PM Plotted by: Rashnith Grewal

Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C009.dwg

N

LEGEND

- EXISTING SITE CONTOURS
- DESIGN CONTOURS
- INDICATIVE SITE AREA
- INDICATIVE SITE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- CAPPING SYSTEM
- SURFACE WATER MANAGEMENT DRAINAGE LINES
- SURFACE WATER MANAGEMENT WATER STORAGES
- TROUGH SUBSIDENCE HAZARD - MODERATE
- TROUGH SUBSIDENCE HAZARD - HIGH
- TROUGH SUBSIDENCE HAZARD - HIGH (FIRST WORKINGS, <15M COVER)
- INDICATIVE AREA OF REGROUP LINED ASH PLACEMENT FACILITY
- PROPOSED STORMWATER POND FOR REGROUP LINED ASH PLACEMENT FACILITY

NOTES:

1. EXISTING SITE CONTOURS BASED ON CEH SURVEY DATED 19 JULY 2019 (DRAWING TITLE: LEND LEASE SERVICES PTY. LTD. - MOUNT PIPER - ASH PLACEMENT SURVEY: 19TH JULY 2019, DRAWING NO. MPA0719 (AS SURVEYED)) AND ANZLIC COMIMITTEE OF SURVEYING & MAPPING (EXTRACTED ON 8 DECEMBER 2020).

FINAL LANDFORM

SCALE 1:2000

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
A	INITIAL ISSUE		LP			

0 20 40 60 80 100m

SCALE 1:2000 AT ORIGINAL SIZE

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Drafting Check		Design Check
Approved (Project Director)		
Date		
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Client ENERGYAUSTRALIA NSW AND RE.ENERGY

Project ASH PLACEMENT CELL CONCEPT DESIGN

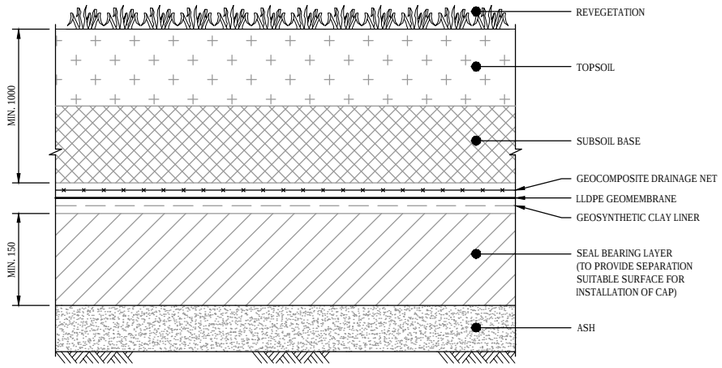
Title FILL STAGE 3C

Original Size A1

Drawing No: 12541487-C010

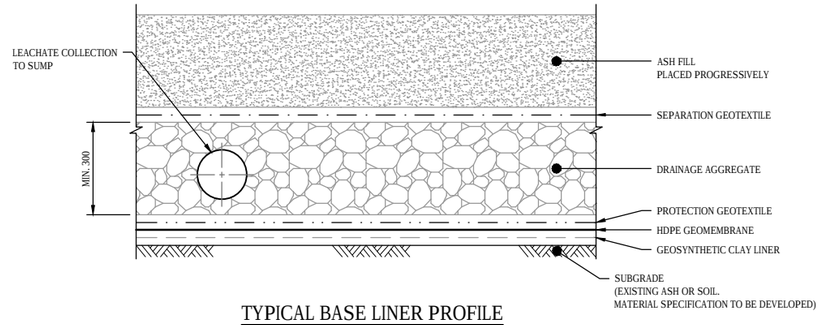
Rev: A

Plot Date: 16 February 2021 - 5:05 PM Plotted by: Rashnith Grewal Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C010.dwg



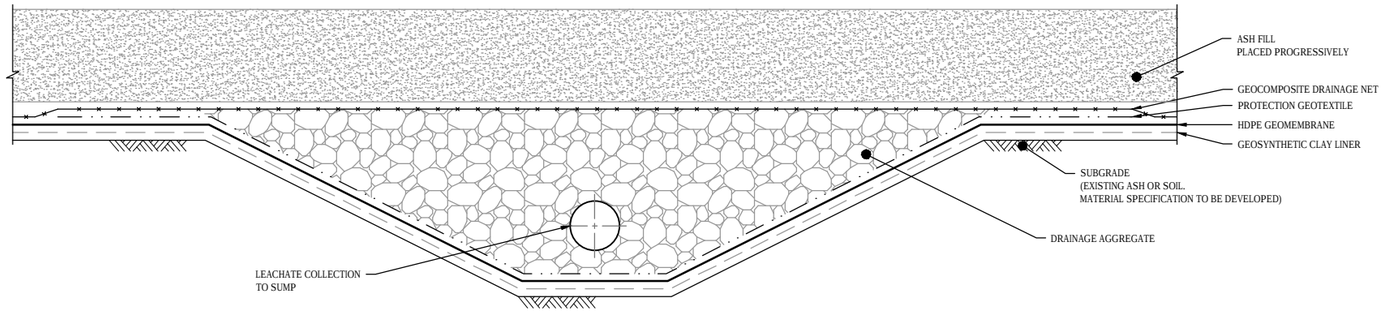
TYPICAL CAPPING SYSTEM

1 - DETAIL
NOT TO SCALE



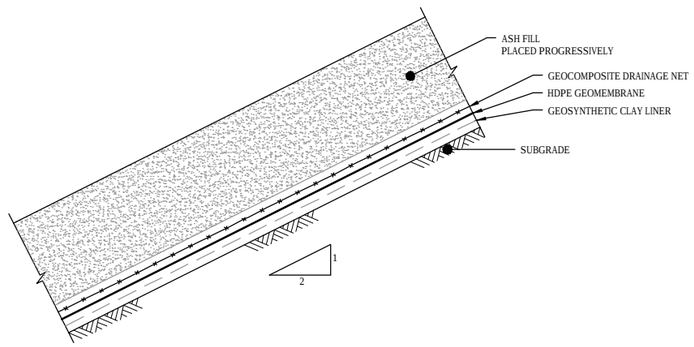
TYPICAL BASE LINER PROFILE
AGGREGATE DRAINAGE LAYER OPTION

2A - DETAIL
NOT TO SCALE



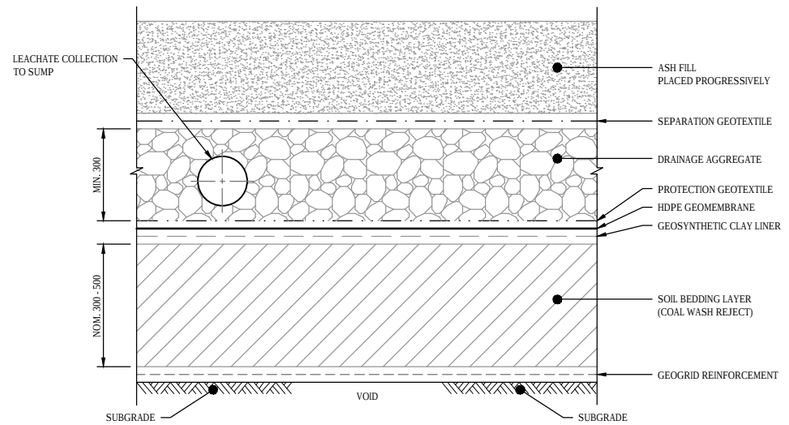
TYPICAL BASE LINER PROFILE
GEOSYTNTHETIC DRAINAGE LAYER OPTION

2B - DETAIL
NOT TO SCALE



SIDEWALL LINER PROFILE

3 - DETAIL
NOT TO SCALE



BASE LINER PROFILE POTHOLES

4 - DETAIL
NOT TO SCALE

No	Revision	Drawn	Job Manager	Project Director	Date
B	REVISED	AH			29.03.21
A	INITIAL ISSUE	LP			

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Drafting Check | Design Check
Approved (Project Director)
Date
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Client ENERGYAUSTRALIA NSW AND RE.ENERGY
Project ASH PLACEMENT CELL CONCEPT DESIGN
Title TYPICAL DETAILS

Original Size A1
Drawing No: 12541487-C011
Rev: B

Plot Date: 29 March 2021 - 11:14 AM Plotted by: Alison Horlyck Cad File No: N:\AU\Sydney\Projects\21\12541487\CADD\Drawings\12541487-C011.dwg

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