Appendix B Land Resources Assessment

Centurion North Extension Project

P-EA-100658735 and P-PRCP-100669070_V3

Centurion Coal Mining Pty Ltd

SLR Project No.: 620.042575.00001

31 October 2025

Centurion North Extension Project

Environmental Authority Amendment Application Supporting Information

Land Resources Assessment

Centurion Coal Mining Pty Ltd

Level 14, 31 Duncan Street, Fortitude Valley,
Queensland 4006

Prepared by:

SLR Consulting Australia Pty Ltd

SLR Project No.: 620.042575.00001

31 October 2025

Revision: 1.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	31/10/2025	Brad Radloff	Murray Fraser	Ben Brooks

Basis of Report

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Peabody Energy Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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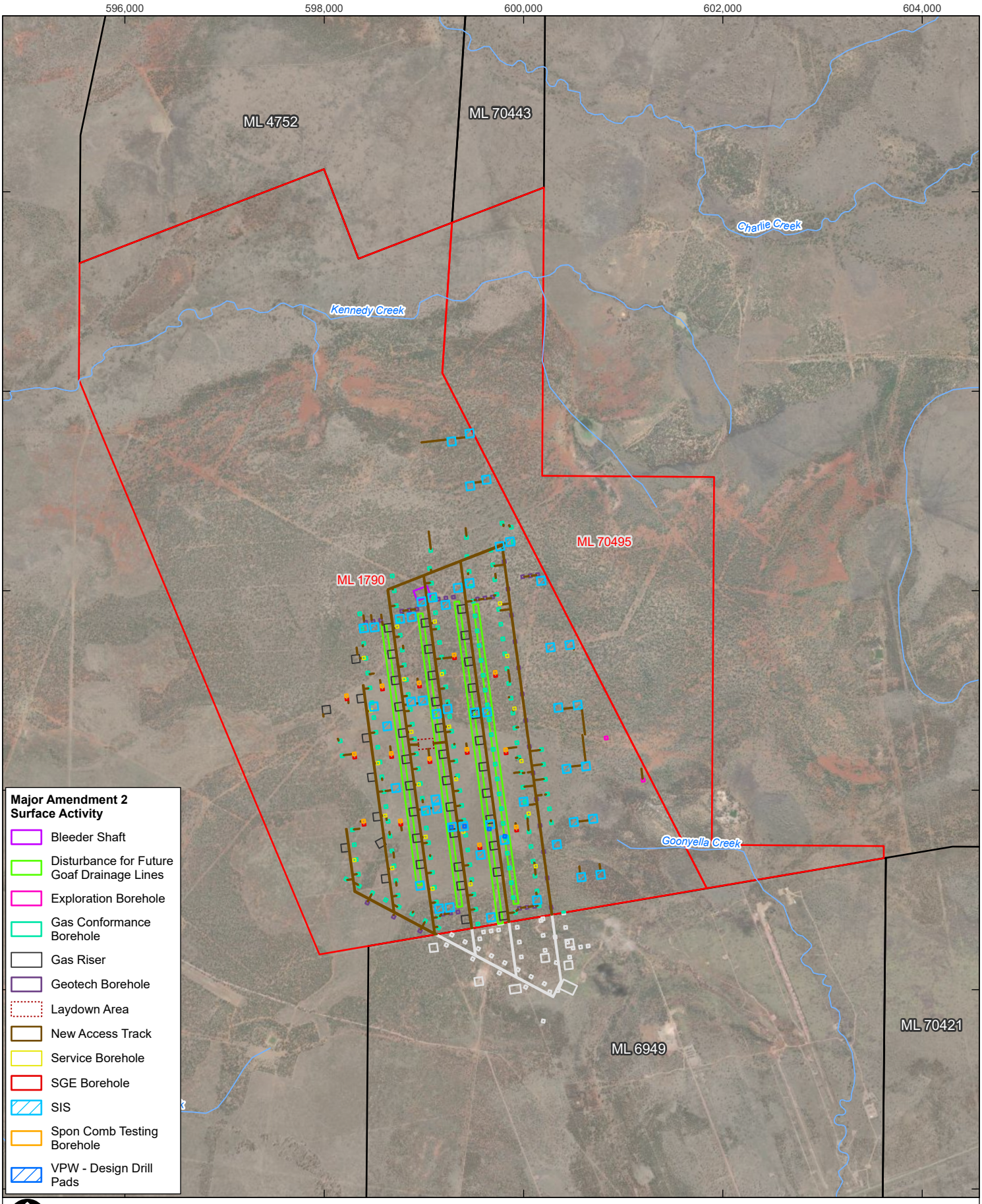
1.0 Project Description

The Centurion North Extension Project (the Project) involves the development of supporting infrastructure to enable coal seam gas (CSG) extraction and safe underground coal mining operations within the Project Area (**Figure 1.1**). All works associated with the Project will be undertaken within Mining Lease (ML) 1790. As such the approval of the project requires the amendment of Environmental Authority P-EA-100658735 (EA) and Progressive Rehabilitation and Closure Plan (PRCP) Schedule P-PRCP-100669070_V3 issued under the Environmental Protection Act 1994.

Project activities include the following:

- Construction of new access tracks;
- Installation of a laydown area;
- Construction of drill pads for Surface-to-Inseam (SIS) wells, Vertical Production Wells (VPW), gas risers, service boreholes, a bleeder shaft, and boreholes for gas conformance, specific gas emissions, spontaneous combusting testing, geotechnical and exploration;
- Drilling and operation of vertical and lateral SIS wells to drain gas from coal seams;
- Construction of gas risers to manage gas transfer to surface facilities;
- Construction of service boreholes to transfer materials from the surface to underground;
- Drilling of boreholes for sampling of gas, coal propensity, geotechnical and exploration;
- Development of a bleeder shaft for mine ventilation and safe gas management; and
- Disturbance for future goaf drainage lines.

All drilling will be undertaken using directional drilling, blind boring technologies and other conventional drilling methods, with strict safety, environmental, and gas management measures in place.



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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.042575
Date Drawn:	21-Oct-2025
Drawn by:	RB

LEGEND

- Watercourse
- Mining Lease
- Surface Activity (not subject of coordinated project application)

CENTURION NORTH DEVELOPMENT

PROPOSED PROJECT LAYOUT – SURFACE ACTIVITIES

CENTURION

FIGURE 1.1

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042575.00001 Centurion North Extension Proj\06 SLR Data\01 GIS\GIS\CNEP Major Amendment\CNEP Major Amendment.aprx\620042575_EA_LandResources_F01-01_Proposed Project layout – Surface Activities

Table 1.1 outlines the corresponding disturbance areas, presented as both the total area of disturbance for the Project, and the total disturbance once existing approved disturbance has been considered.

Table 1.1 Surface infrastructure and sampling borehole disturbance area

Category	Total Area (ha)	Total Area Accounting for Existing Approved Disturbance (ha)
Total	167.41 (6.15% of ML 1790 area)	142.98 (5.25% of ML 1790 area)

1.1 Land Resources

The land resources of the Project Area have been assessed to establish baseline conditions, evaluate current land capability, and identify potential constraints relevant to the proposed northern expansion. The assessment draws on the SKM (2012) Wards Well Soil Survey, the Wards Well PRCP (BHP, 2021), the Centurion PRCP (SGM, 2024) and regional soil and land capability datasets, interpreted in accordance with Queensland Government land evaluation guidelines and the Australian Soil Classification (Isbell & NCST, 2021).

Soils across the Project Area are variable, ranging from fertile cracking clays on alluvial plains to shallow, weakly structured soils on uplands, with significant constraints including sodicity, salinity, dispersiveness, and shallow rooting depths. While these soils support grazing as the predominant land use, their limitations reduce cropping potential and create challenges for post-mining rehabilitation.

1.2 Existing Environmental Values

The Project Area lies within a region of recognised agricultural significance, with cattle grazing on buffel grass and native pastures representing the dominant land use. Patches of remnant vegetation communities, including Poplar Box, Bloodwood, Ironbark, Acacia and Brigalow.

The Project footprint also overlaps with land mapped as Strategic Cropping Land (SCL) within the Western Cropping Zone, as defined under the Regional Planning Interests Act 2014. Resource activities that were previously subject to assessment under the former Strategic Cropping Land Act 2011, were granted approval via a compliance certificate issued in November 2013 for ML1790 (Application Reference SCLRD2013/000151). This provides regulatory certainty for those approved activities. However, any new disturbance associated with the current expansion that is not covered under the compliance certificate will require assessment against SCL criteria. Given the prevalence of dispersive and sodic soils within the Project Area, only limited land units are expected to meet the thresholds for sustainable cropping.

1.3 Review of available information

The following information/data sources were reviewed:

- Available government databases and mapping – CSIRO (2024) Australian Soil Resource Information;
- Aerial/satellite imagery – ESRI (2020) Basemaps;
- Existing land resource reports;
    - Available baseline data;

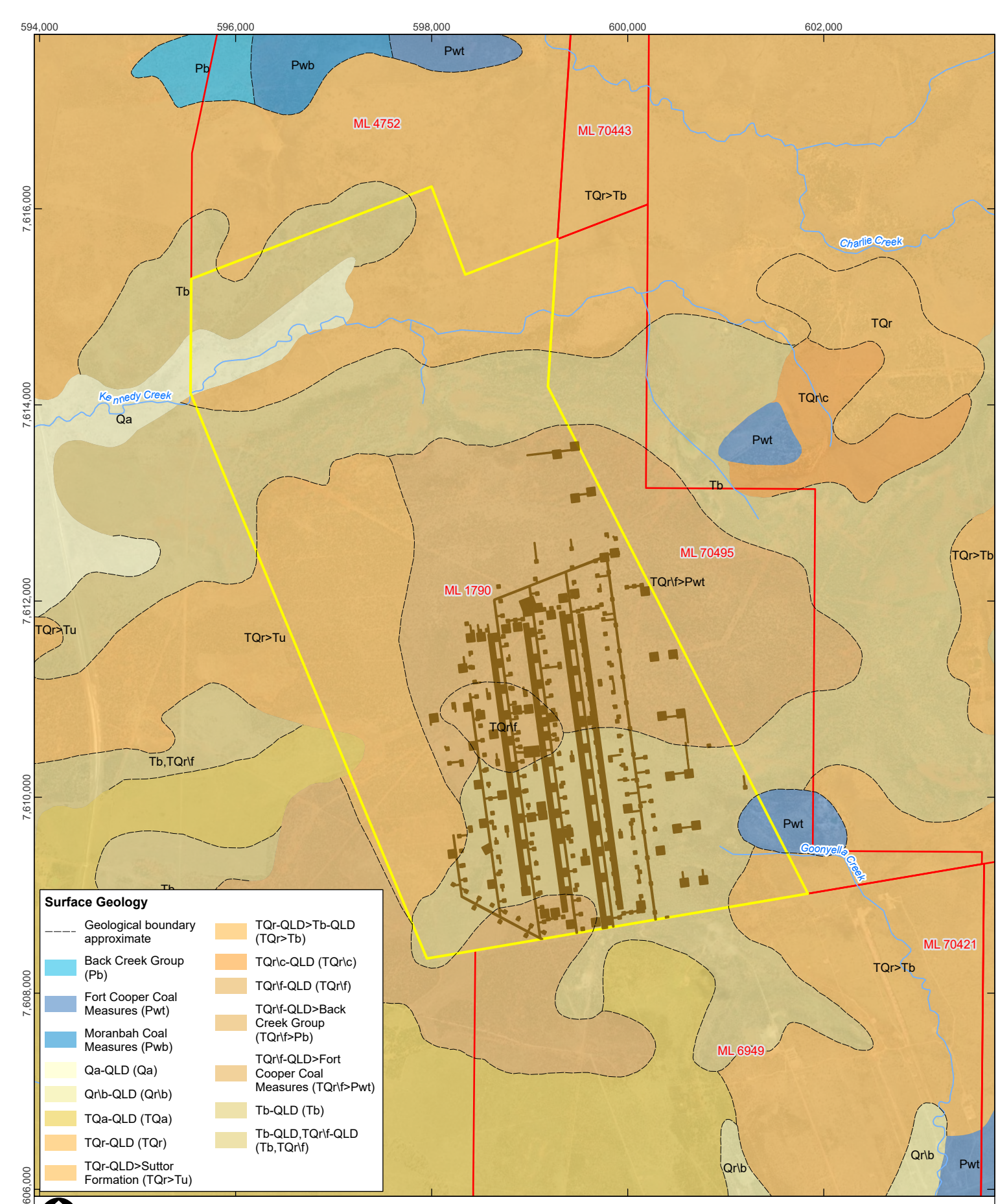
- GTES Pty Ltd (2006) BMA South Walker Creek Mine Surface Area 4, Soils and Land Suitability;
- SKM (2012) Wards Wells: Soil Survey;
- BHP (2021) Wards Well Progressive Rehabilitation and Closure Plan;
- DES (2024) Environmental Authority EPPR00668513; and
- SGM Environmental Pty Limited (2024) Progressive Rehabilitation and Closure Plan – Centurion Mine.

1.4 Surface Geology

The Project is located within the Nogoa-Belyando region, which comprises of gently undulating Tertiary land surface that was depositional over extensive lowland areas (SKM, 2012). Table 1.2 translates lithologies (Department of Resources, 2023) within the Project area (**Figure 1.2**).

Table 1.2 Surface geology lithological summary

Map Symbol	Legend	Lithological Summary	Age
TQr\f>Pwt	TQr\f-QLD>Fort Cooper Coal Measures	Older residual soils, colluvium (ferruginous soils).	Late Tertiary - Quaternary
Pwt	Fort Cooper Coal Measures (Pwt)	Lithic sandstone, conglomerate, mudstone, carbonaceous shale, coal, tuff, tuffaceous (cherty) mudstone.	Late Permian
TQr\f>Pb	TQr\f-QLD>Back Creek Group	Older residual soils, colluvium (ferruginous).	Late Tertiary - Quaternary
TQa	TQa	Locally red-brown mottled, poorly consolidated sand, silt, clay, minor gravel; high-level alluvial deposits.	Late Tertiary - Quaternary
TQr>Tu	TQr-QLD>Suttor Formation	Clay, silt, sand, gravel and soil; colluvial and residual deposits (generally on older land surfaces).	Late Tertiary - Quaternary
TQr>Tb	TQr-QLD>Tb	Clay, silt, sand, gravel and soil; colluvial and residual deposits.	Late Tertiary - Quaternary
TQr\f	TQr\f	Older residual soils, colluvium (ferruginous).	Late Tertiary - Quaternary
Tb	Tb-(Tb)	Mostly olivine basalt flows and some plugs; some areas of nephelinite, basanite etc	Tertiary



Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.042575
Date Drawn:	21-Oct-2025
Drawn by:	RB

CENTURION NORTH DEVELOPMENT

SURFACE GEOLOGY

CENTURION

FIGURE 1.2

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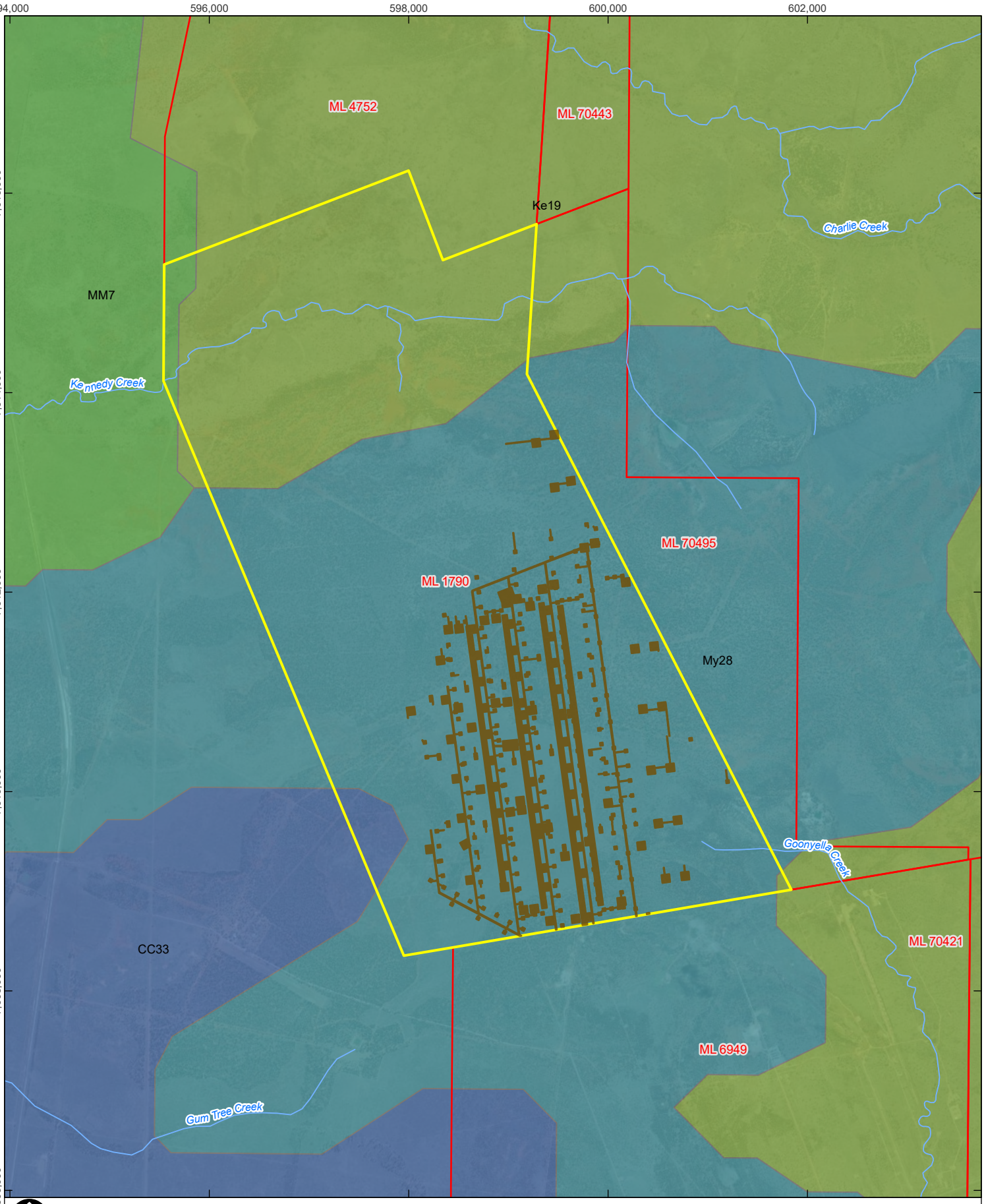
1.5 Soil Mapping Units

Four soil mapping units have been identified within the Project disturbance footprint (CC33, Ke19, MM7 and My28) (**Figure 1.3**), based on the Atlas of Australian Soils (Queensland Government Department of Resources, 2018) and site-specific investigations (SKM, 2012).

Their key characteristics and management implications are summarised below:

- CC33 (Texture-contrast soils on rises and plains): This mapping unit occurs on gently undulating rises and plains. The dominant soils are Sodosols, characterised by strongly sodic, dispersive B horizons that limit infiltration and root penetration. Surface horizons are generally light-textured loams overlying clay subsoils. Agricultural capability is restricted by high erosion risk and poor structural stability, particularly when exposed;
- Ke19 (Cracking clay plains): This unit represents level to gently sloping alluvial plains dominated by deep, heavy clay Vertosols. The soils have high natural fertility and are used for grazing across the region. However, they display significant shrink–swell behaviour, with deep cracking in dry conditions, and sodicity and salinity increase with depth. These characteristics reduce plant-available water capacity (PAWC) and may constrain rehabilitation if not managed appropriately;
- MM7 (Shallow upland soils on ridges): MM7 is associated with dissected upland terrain underlain by sandstone and conglomerate lithologies. Kandosols predominate, often shallow and stony, with weakly structured subsoils and low water-holding capacity. These soils are prone to hardsetting and surface crusting, restricting seedling establishment. Limitations include shallow rooting depth, low fertility, and high erosion potential on steeper slopes; and
- My28 (Red earths on undulating lands): The My28 unit comprises gently undulating ridge crests and low rises. Dominant soils are loamy to sandy red earths, typically Kandosols and Dermosols with moderate fertility and good internal drainage. Soil constraints include low moisture retention and reduced resilience under intensive disturbance. Erosion potential is moderate but manageable with appropriate rehabilitation practices.



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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.042575
Date Drawn:	21-Oct-2025
Drawn by:	RB

LEGEND

- Watercourse
- Mining Lease
- Project Area
- Surface Activity

Atlas of Australian Soils

Map Unit

- CC33
- Ke19
- MM7
- My28

CENTURION NORTH DEVELOPMENT

ATLAS OF AUSTRALIAN SOILS

CENTURION

FIGURE 1.3

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042575.00001 Centurion North Extension Proj\06 SLR Data\01 GIS\GIS\CNEP Major Amendment\CNEP Major Amendment.aprx\620042575_EA_LandResource_F01-03_Atlas of Australian Soils

1.6 Soil Orders

Soil units for most of the Project Area were mapped as part of the Wards Well Soil Survey (SKM, 2012). SKM (2012) completed detailed soil descriptions at 98 locations and 384 observation sites. A section of the disturbance area to the south of the Project Area was not classified by SKM (2012). The broad scale regional soil mapping (DNRME and DES, 2024) was accessed to determine the soil order. The major soil orders present on site are Kandosols, Dermosols and Vertosols (**Figure 1.4** and **Figure 1.5**).

1.6.1 Vertosol

The soil profile is predominantly clayey, with the surface soil typically consisting of light clay containing over 35% clay content. The subsoil varies from light to medium or heavy clay. Due to the characteristics of the clay minerals, these soils undergo significant shrinkage and swelling during wetting and drying cycles. When dry, they develop noticeable cracks that usually extend to the soil surface (VRO, 2021).

On-site (SKM, 2012), the observed Vertosols have a well-developed structure and high clay content, with most being utilized for grazing in the region. These cracking clays typically range from very dark brown to dark greyish black, consisting of medium to heavy clays. They are moderately to well-drained, generally alkaline, and become increasingly alkaline with depth.

Further observations include:

- Overall good fertility;
- Sodicity and salinity increase below 300 mm, restricting plant rooting depth and plant-available water capacity (PAWC) with probability of soils becoming epihypersodic[1];
- Desirable pH levels;
- High levels of nitrates, phosphorus and metals, and
- Well-structured surface soil (high organic matter and calcium relative to magnesium), though they may become dispersive below 300 mm.

1.6.2 Dermosol

Dermosols are characterised by lacking a strong texture transition between the A and B horizons and are not uniformly calcareous. They feature moderately to strongly structured B2 horizons, which are typically clayey and contain less than 5% free iron oxides. In arid regions, Dermosols are commonly found on low-angle pediments with sparse shrublands.

Within the mining lease (SKM, 2012), Dermosols have been observed to have the following properties:

- Overall low fertility (low levels of phosphorus and nitrogen);
- Sodicity and dispersiveness increase below 200 mm;
- pH at desirable levels, and

[1] Extremely high levels of exchangeable sodium within the upper part of the soil profile. Soil with very high exchangeable sodium percentage (ESP), typically in the range of 15% or more, which is considered detrimental to soil health.

- Poor surface soil structure (low organic matter and apedal) with dispersiveness below 200 mm; other tested Dermosols showed dispersiveness below 700 mm.

1.6.3 Kandosol

Kandosols are non-texture contrast soils (with little or gradual increase in clay content with depth) that have massive (i.e. weakly to non-structured) subsoils (B horizons). They are found mainly in the upland areas, often in association with Dermosols, Chromosols and Kurosols. These soils can vary from stony hardsetting soils to deeper friable soils. Some may almost be texture contrast and have a bleached subsurface (A2) horizon (VRO, 2021).

Kandosols are often found in conjunction with ferricrete deposits, within level to gently undulating plains. Their parent material usually consists of quartz-rich sedimentary rock. They are often greater than 3 m deep and clay rich. The Kandosols within the Project area were described as follows (SKM, 2012):

- pH is within desirable range;
- Good soil structure; and
- Moderate overall fertility (high levels of nitrogen, adequate phosphorus and metals, low sulphate at surface and low to moderate cation exchange capacity (CEC)).

1.6.4 Sodosol

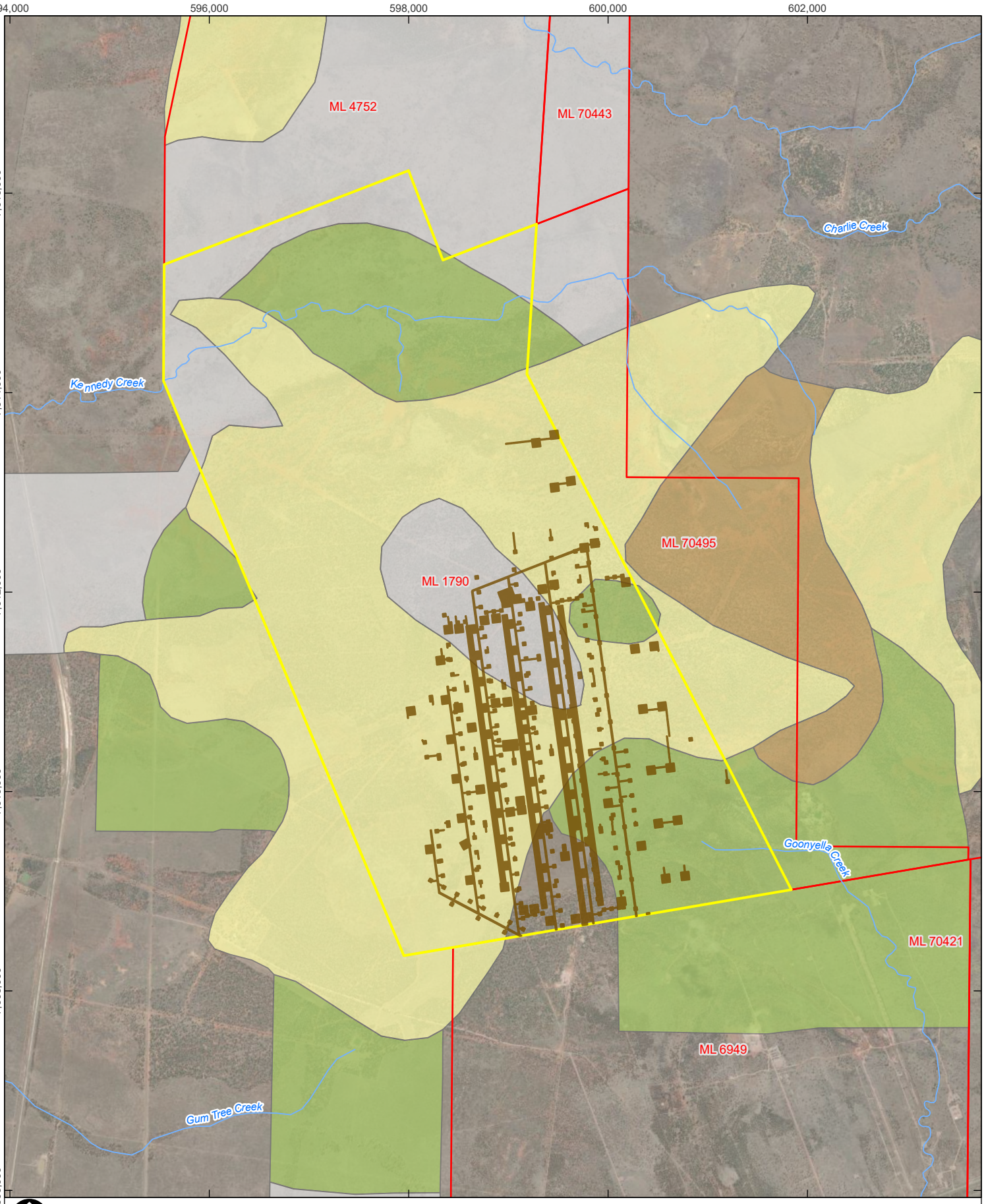
Sodosols are texture-contrast soils characterised by a sodic B horizon, typically with a strong increase in clay content at the A/B horizon boundary. The subsoils are dispersive when wet, which leads to poor structural stability, restricted permeability, and a high risk of erosion. Surface horizons are generally loamy to light clay textures that are weakly structured, while the subsoil is often dense and massive when dry and dispersive when moist. These properties result in reduced plant root penetration and variable water availability (VRO, 2021).

Sodosols are commonly associated with gently undulating plains and foot slopes and may occur in conjunction with Vertosols or Dermosols in similar landscape positions. They are widespread across inland Queensland and are considered one of the more challenging soil types for sustainable agricultural use and rehabilitation due to their sodicity.

The Sodosols within the Project area have been observed with the following characteristics (SKM, 2012):

- pH within neutral to moderately alkaline range;
- High sodicity and dispersiveness from 200–400 mm depth;
- Poor subsoil structure resulting in restricted drainage and root growth;
- Low to moderate fertility, with adequate nitrogen but limited phosphorus availability; and
- Moderate to high erosion potential, particularly where vegetation cover is removed or drainage is concentrated.

A summary of chemical properties (Table 1.3) of these soil orders has been extracted from BHP (2021).



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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.042575
Date Drawn:	21-Oct-2025
Drawn by:	RB

LEGEND

- Watercourse
- Mining Lease
- Project Area
- Surface Activity

Australian Soil Classification (SKM, 2012)

- Dermosol
- Kandasols
- Sodosol
- Vertosol

CENTURION NORTH DEVELOPMENT

AUSTRALIAN SOIL CLASSIFICATION OF PROJECT AREAS (SKM, 2012)

CENTURION

FIGURE 1.4

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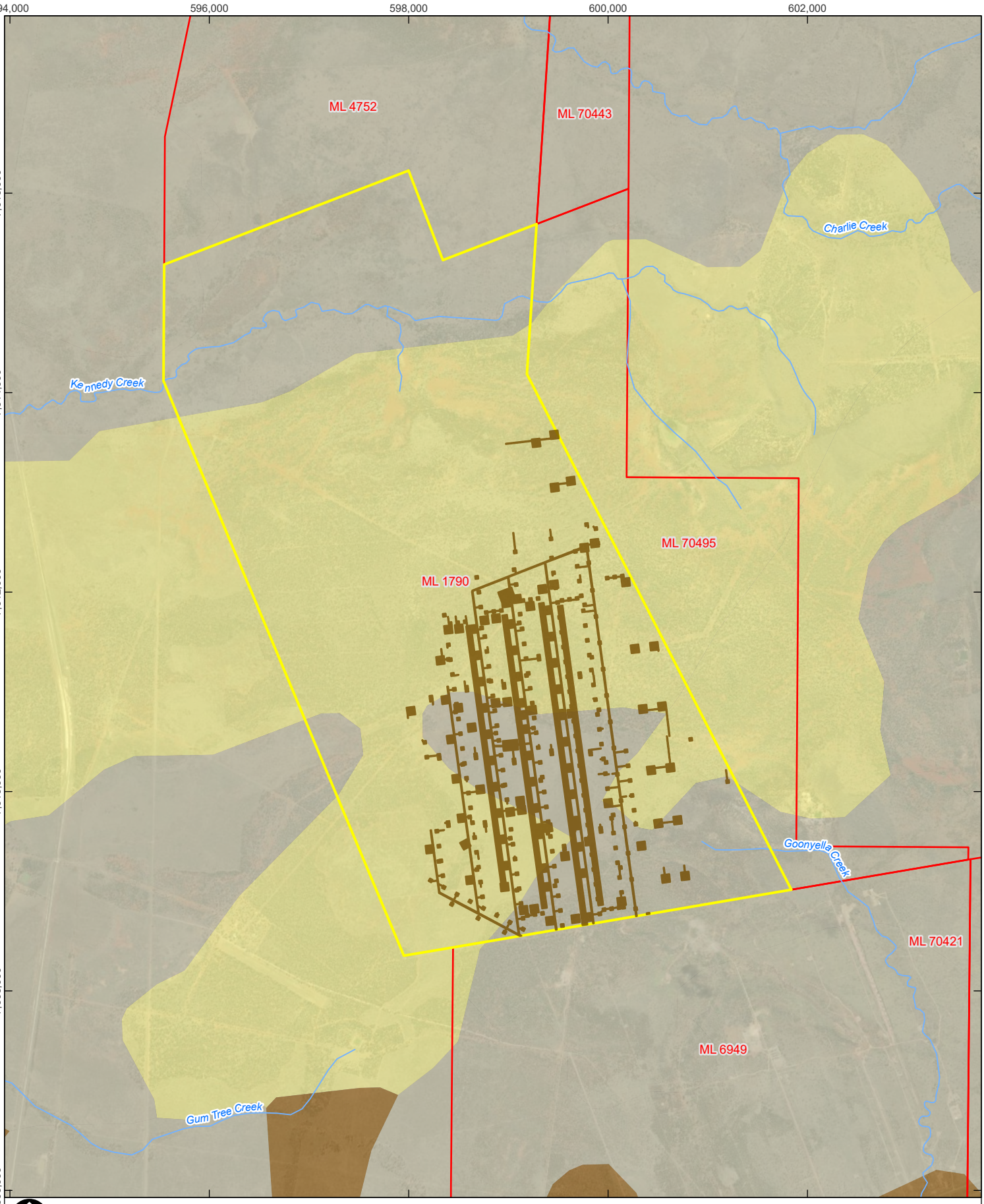

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Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:50,000 at A4
Project Number:	620.040594
Date Drawn:	21-Oct-2025
Drawn by:	RB

LEGEND

- Watercourse
- Mining Lease
- Project Area
- Surface Activity

Australian Soil Classification (DNRME and DES, 2024)

- Kandosol
- Sodosol
- Vertosol

CENTURION NORTH DEVELOPMENT

AUSTRALIAN SOIL CLASSIFICATION OF PROJECT AREAS (SKM, 2012)

CENTURION

FIGURE 1.5

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Table 1.3 Soil order chemical properties summary

Parameter	Unit	Vertosol	Dermosol	Kandosol	Sodosol
pH (1:5 water)	N/A	7.8 - 8.6	7.2 - 7.8	6.7 – 7.5	7.1-8.0
Electrical Conductivity (1:5 water)	dS/m	0.1 - 0.66	0.025 - 0.15	0.014 – 0.034	0.05-0.25
Plant Available Water content	mm	125 - 450	100 - >125	>125	75-125
Organic Carbon	%	5.1	1.4	3.6	0.8 – 1.5
Cation Exchange Capacity	cmol/kg	57 - 72.4	8.1 - 20.3	17.4 – 31	6 – 15
Exchangeable Sodium Percentage	%	0 - 12	5 – 11	0 – 5	8 – 20
Calcium to Magnesium ratio	N/A	1.1 - 2.1	0.8 – 1.2	1.2 – 1.7	0.5 – 1.1
Productivity	-	Predominate soil type in the region. Soil properties sufficient to support grasses and native trees.	Suitable for rehabilitation for cattle grazing on flat to gentle slopes.	Suitable for rehabilitation of steeper slopes due to good soil structure.	Low to moderate; limited by sodicity, dispersiveness, and shallow effective rooting depth, but capable of supporting grazing under careful management.

1.7 Land Use

Most of the Project Area is currently utilised for cattle grazing on buffel and native grasses, which were in good condition during the survey completed by SKM (2012). The vegetation in the area includes natural bush consisting of Poplar Box, Bloodwood, Ironbark, Acacia, Wattle and Brigalow species. Grazing productivity is highly variable, with Vertosols providing the most reliable feed base, while Sodosols and shallow Kandosols support only low carrying capacity. Agricultural land use is further constrained by the risk of erosion and the limited water-holding capacity of many soils (SKM, 2012).

1.8 Land Suitability

Five land suitability classes are defined for use in Queensland (**Table 1.4**). These classes are used to describe an area of land in terms of suitability for a particular land use which allows optimum, sustainable production with current technology while minimising degradation to the land (Queensland Government, 2013).

An overall suitability class for each land use is then determined for each mapping unit on a scale of 1 to 5. This is usually determined by the most severe suitability subclass that applies in that mapping unit.

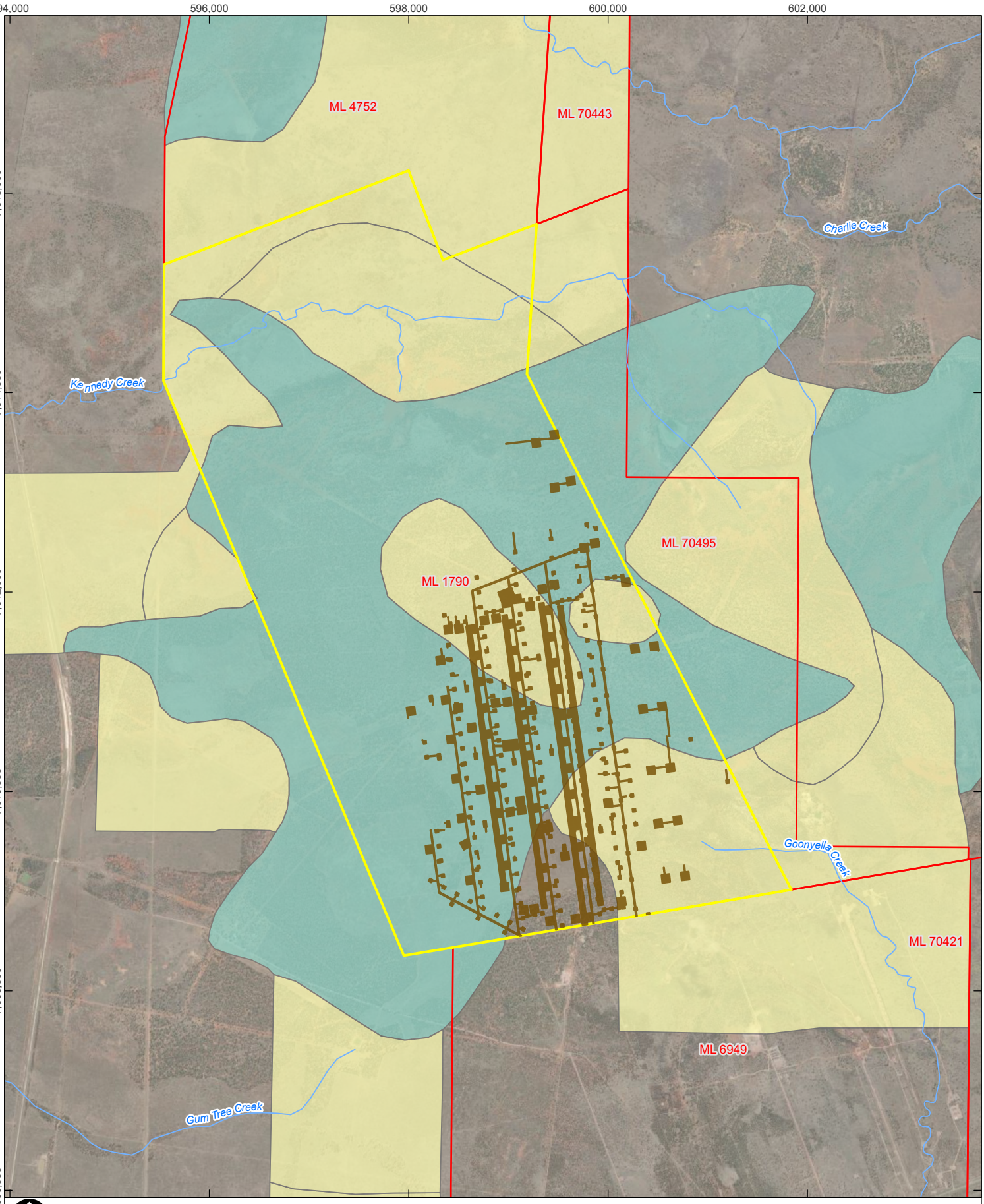
Land suitability for the Project Area was classified by SKM (2012) using the Department of Minerals and Energy (1995) *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (1995) and the grazing and cropping guidelines in Shields and Williams (1991) *Land Resource Survey and Evaluation of the Kilcummin Area, Queensland.*

The land suitability assessment undertaken as part of the *Wards Well Soil Survey* for cropping and grazing land use (SKM, 2012). Vertosol and Dermosol were Class 3 for grazing and Class 4 for cropping and Kandosol Class 2 for grazing and Class 3 for cropping (**Figure 1.6** and **Figure 1.7**). The soil survey did not evaluate the full Project Area. The area between the Kandosols and Dermosols in the southern extend of the Project Area was not evaluated. Following a conservative approach, it is assumed that this area is classified as the higher of the two land suitability classes between which it is located.

These results confirm that the land is generally suitable for grazing but has limited potential for sustainable cropping. Post-mining rehabilitation should therefore prioritise grazing and conservation outcomes.

Table 1.4 Queensland suitability classes

Class	Description
1	Highly productive land requiring only simple management practices to maintain economic production.
2	Land with limitations that either constrain production or require more than the simple management practices of class 1 land to maintain economic production.
3	Land with limitations that either further constrain production or require more than those management practices of class 2 land to maintain economic production.
4	Currently unsuitable land. The limitations are so severe that the sustainable use of the land in the proposed manner is precluded. In some circumstances, the limitations may be surmountable with changes to knowledge, economics or technology.
5	Land with extreme limitations that preclude any possibility of successful sustained use of the land in the proposed manner.



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Scale:	1:50,000 at A4
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Drawn by:	RB

LEGEND

- Watercourse
- Mining Lease
- Project Area
- Surface Activity

Land Suitable for Grazing

- 2 - Suitable grazing land with minor limitations (Kandasols)
- 3 - Suitable grazing land with moderate limitations (Dermosols, Sodosols, Vertosols)

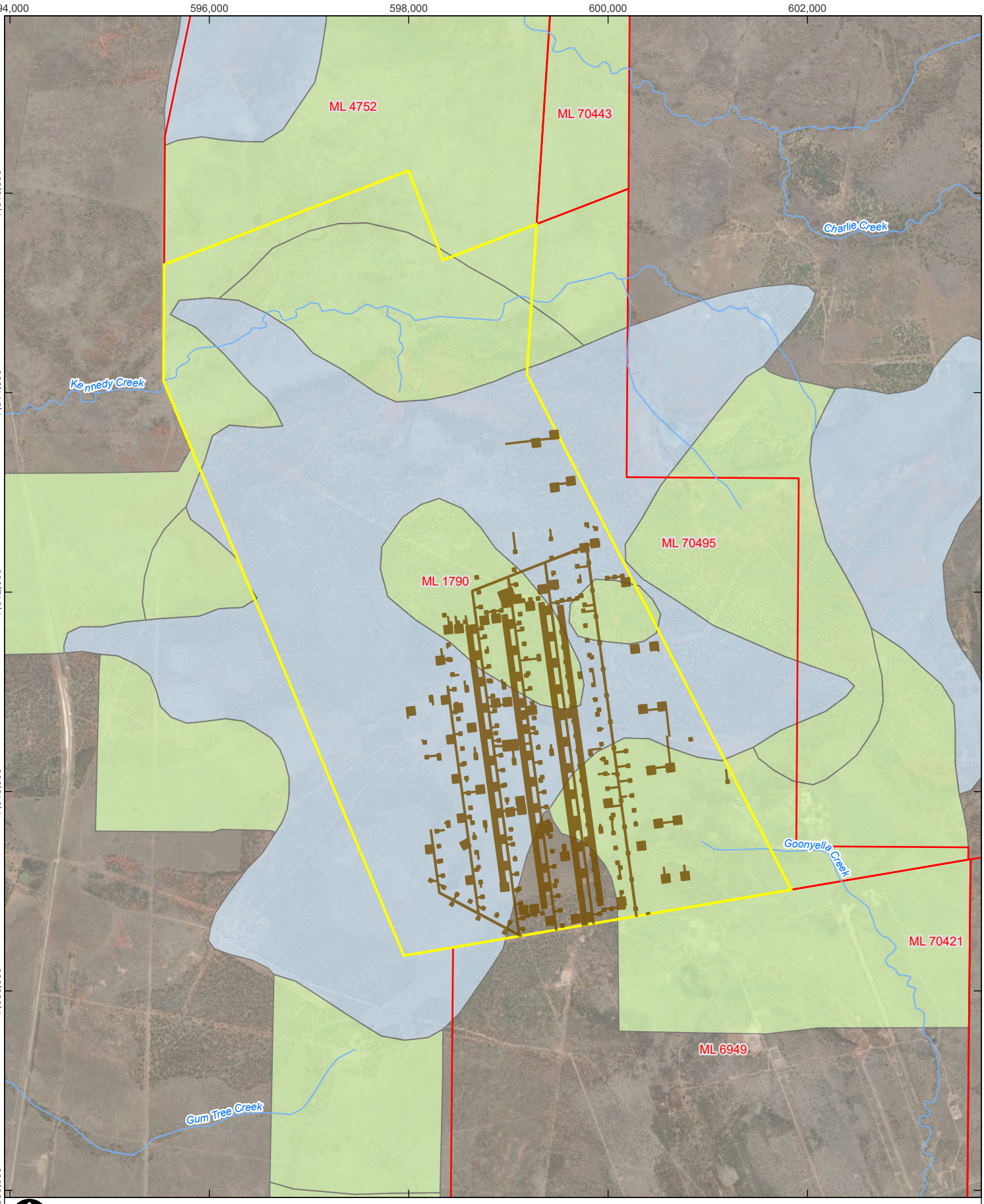
CENTURION NORTH DEVELOPMENT

GRAZING LAND CLASS SUITABILITY

CENTURION

FIGURE 1.6

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.042575.00001 Centurion North Extension Proj\06 SLR Data\01 GIS\GIS\CNEP Major Amendment\CNEP Major Amendment.aprx\620042575_EA_LandResource_F01-06_Grazing Land Class Suitability



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LEGEND

- Watercourse
- Mining Lease
- Project Area
- Surface Activity

Land Suitable for Cropping

- 3 - Cropping land with moderate limitations (Kandasols)
- 4 - Marginal cropping land (Dermosols, Sodosols, Vertosols

CENTURION NORTH DEVELOPMENT

CROPPING LAND CLASS SUITABILITY

CENTURION

FIGURE 1.7

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1.9 Regional Interest Areas

This desktop strategic cropping land (SCL) assessment has been prepared generally in accordance with the requirements of the following relevant strategic land use planning documents:

- *Regional Planning Interests Act 2014 (Act)* (DSDMIP, 2014)*;*
- *Regional Planning Interests Regulation 2014 (Regulation)* (DSDMIP, 2014)*; and*
- *Act Guideline 08/14: How to demonstrate that land in the strategic cropping area does not meet the criteria for strategic cropping land (State of Queensland, 2014) (Guideline)* (State of Queensland, 2014).

The Act commenced in 2014 and replaced the repealed Act. The Act is designed to manage the impact of resource activities and other regulated activities on areas of the State that contribute, or are likely to contribute, to Queensland's economic, social and environmental prosperity. The relevant aspects of the Act, as with regard to this report, are as follows:

- The Act incorporates the current zonal criteria and on-ground guideline for assessing whether a property (or part of a property) is SCL; and
- The Act does not allow the mapping of an Area of Regional Interest (ARI) to be challenged by proponents or third parties. However, through the process of a Regional Impact Development Approval (RIDA) application this will in essence determine if land is or not according to the Assessment Criteria contained in the Guideline. These criteria detailed are generally equivalent to those in the repealed Act.

The Project is situated within the Western Cropping Zone as defined under the Regional Planning Interests Act 2014. Several proposed disturbance areas overlap with land mapped as Strategic Cropping Land (SCL). While the 2013 compliance certificate provides regulatory certainty for previously assessed activities, any new areas of disturbance associated with the current Project outside of the area approved under the compliance certificate will require assessment against SCL criteria. Given the widespread occurrence of dispersive Sodosols and sodic Vertosols within the Project Area, only limited land units are expected to meet sustainable cropping thresholds, and the long-term suitability of these areas is likely to be constrained.

2.0 Potential Impacts

The Project will result in temporary surface disturbance including access tracks, a laydown area, drill pads, SIS wells and VPWs, gas risers, service and sampling, a bleeder shaft and gas drainage lines. These activities have the potential to temporarily impact soil resources and land suitability. The potential impacts on soil and land resources are described below for the construction, operation, and closure phases.

2.1 Construction

The construction phase includes site preparation, access track and drill pad clearance and the installation of infrastructure such as vertical and lateral wells. During this phase, soil compaction, erosion and loss of topsoil have been identified as key risks to land resources. Potential land resource impacts associated with the construction phase include:

- **Soil erosion and sedimentation** – Clearing and topsoil stripping will expose Kandosol, Vertosol and Dermosol subsoils. Kandosols cover the majority of the disturbance area, followed by Vertosols then Dermosols (**Figure 1.4** and **Figure 1.5**). Kandosols throughout the project site have non-dispersive subsoils (**Section 1.6.3**), whilst Vertosols (**Section 1.6.1**) and Dermosols (**Section 1.6.2**) exhibit sodicity and dispersiveness below 200 mm in depth.
- **Topsoil degradation** – Topsoil may lose structural integrity, fertility, organic matter/carbon and biological activity if stripped under wet conditions, stored in large stockpiles or compacted during stockpiling.
- **Soil profile disturbance** – Subsoils with high sodicity and salinity may be exposed through cut-and-fill activities and profile inversion. This can reduce infiltration capacity, increase surface crusting, and restrict revegetation potential;
- **Soil compaction** – Construction traffic and heavy equipment operation on clay-rich Vertosols can result in soil compaction, reducing porosity, infiltration, and root penetration. Compaction impacts are long-lasting and difficult to reverse without mechanical intervention; and
- **Contamination risk** – Storage and use of fuels, drilling fluids, and construction chemicals carry risks of localised soil contamination through spills or leaks.

2.2 Operation

During operation, land resources will continue to be affected by ground disturbance associated with coal seam gas drainage, underground mining, and supporting facilities:

- **Surface stability risks** – Long-term disturbance of sodic soils around shafts, access roads, and well pads will maintain a heightened risk of erosion and gully initiation. Concentrated flow paths may develop along disturbed ground, requiring engineered drainage controls;
- **Subsidence impacts** – Underground mining is expected to result in subsidence, leading to surface cracking, ponding, and localised soil instability. Subsidence can also exacerbate waterlogging in Vertosols and degrade grazing productivity;
- **Hydrological modification** – Changes to surface runoff and infiltration patterns due to compacted areas and subsidence may lead to increased salinity expression or mobilisation of dispersive materials;
- **Soil contamination** – Operational risks include hydrocarbon spills, storage tank failures, and leakage of saline or sodic groundwater from boreholes. These impacts can lead to long-term soil quality degradation if not contained; and
- **Loss of grazing productivity** – Operational areas will be excluded from pastoral use. Adjacent soils may be affected by dust deposition, compaction from vehicle access, and reduced pasture cover, lowering carrying capacity.

2.3 Closure and Rehabilitation

Closure and rehabilitation will involve decommissioning of infrastructure, reshaping of disturbed landforms, replacement of topsoil, and re-establishment of grazing post mining land uses. Potential impacts during this phase include:

- **Topsoil Inventory** – Modelling of soil balance in SGM (2024) indicates that deficits in topsoil volumes may occur at Centurion Mine. In relation to the Project site however, sufficient topsoil exists in the in-situ native soils to establish a topsoil cover of 200 mm as required under Rehabilitation Milestone RM4(a) of the PRCP Schedule. Native Dermosol, Kandosol and Vertosol soils within the Project site disturbance footprint contain topsoil to a depth of ≥ 200 mm which will provide this topsoil resource for rehabilitation and achieving the grazing post mining land use (PMLU) rehabilitation milestone criteria;
- **Failure of rehabilitation on dispersive soils** – Vertosols, if inadequately ameliorated, are unlikely to support stable pasture cover. Dispersive subsoils may re-erode after rehabilitation, particularly on slopes greater than 5–8%;
- **Landform stability risks** – Poorly designed or executed rehabilitation may result in slope instability, concentrated flow erosion, and gully initiation on reshaped landforms. These impacts may undermine long-term grazing suitability and regulatory closure criteria; and
- **Residual contamination** – Any operational spills or legacy contamination not remediated during closure may continue to limit soil productivity and constrain final land use outcomes.

3.0 Management and Mitigation Practices

The potential impacts to soils and land resources will be managed through the application of established best-practice procedures and compliance with regulatory conditions. Management will focus on minimising the scale and duration of disturbance, protecting valuable soil resources, and ensuring progressive rehabilitation is undertaken to support post-mining land use objectives.

The following mitigation measures will be implemented across all phases of the Project:

- **Permit to Disturb controls** – All vegetation clearing and soil stripping will be undertaken only within areas approved under the Permit to Disturb process, ensuring disturbance is confined to authorised project footprints;
- **Minimisation of disturbance** – Land disturbance will be restricted to the smallest practicable footprint and for the shortest practicable duration, thereby reducing the extent of soil exposure and erosion risk;
- **Erosion and sediment control (ESC)** – ESC measures will be designed and installed prior to the commencement of ground disturbance. Controls will be consistent with IECA (2008) Best Practice guidelines and will be maintained until disturbed areas are stabilised;
- **Delineation of disturbance boundaries** – Clear marking of disturbance limits will be established in the field before clearing or soil stripping to avoid unnecessary removal of vegetation and soil;
- **Surface water management** – Disturbance activities will be planned with regard to existing drainage patterns to minimise concentration of flows and protect downslope soils. Temporary diversion structures will be installed where necessary to reduce erosion risk;

- **Topsoil management** – Topsoil will be stripped according to designated profile depths (as confirmed during stripping operations) and direct return to rehabilitation areas will be prioritised. Direct placement reduces double handling, limits nutrient loss, and maintains the viability of the seed bank. Where direct return is not possible, topsoil will be stockpiled for later use;
- **Stockpile management** – Stockpiles will be constructed in low, stable forms, with surfaces left in a roughened state to enhance infiltration and reduce erosion. Stockpiles will be seeded or treated with temporary erosion controls until reuse;
- **Soil segregation** – Subsoils with high sodicity or salinity will be managed separately from topsoil and will not be used as growth media without prior amelioration (e.g., gypsum application, organic matter incorporation);
- **Rehabilitation practices** – Rehabilitation will be implemented progressively where practicable, with soil replacement, ripping, and amelioration followed by re-establishment of pasture cover. Disturbed areas will be monitored and maintained until they meet post-mining land use and relinquishment criteria.
- **Hydrocarbon and hazardous material management** – All hydrocarbons and chemicals will be stored and handled in bunded facilities in accordance with AS 1940 and mine site procedures to prevent contamination of soils;
- **Produced water management** – Water extracted from wells will be directed to on-site sumps located on drill pads and subsequently transported to the Centurion Coal Mine (CCM) for treatment and integration into the mine water management system; and
- **Monitoring and maintenance** – Rehabilitation areas will be subject to ongoing monitoring of soil stability, vegetation cover, and land capability. Maintenance (e.g., reseeding, erosion repair, soil amelioration) will be undertaken as required until regulatory criteria for post-mining land use are achieved.

4.0 Risk Assessment

The potential land and soil impacts were assessed with management and mitigation controls in place to provide an overall risk rating or the proposed development, of which details are provided (**Table 4.1**).

Table 4.1 Land resources risk assessment

Stage	Potential Impact	Likelihood	Consequence	Risk Rating	Justification
Construction	Increased erosion resulting from ground disturbance, vegetation clearance, alteration of natural drainage and flow concentration	Unlikely	Minor	Low	Erosion control measures such as drainage and sediment control will be implemented where required. Minimizing land disturbance and controlling water flow will reduce the risk of erosion.
Construction	Exposure of sodic and saline subsoils from soil profile inversion	Unlikely	Minor	Low	Topsoil stripping and controlled soil stockpiling will reduce the likelihood of exposure to sodic and saline subsoils.
Construction	Deposition of eroded material downslope or downstream	Unlikely	Minor	Low	Erosion control measures will be implemented where required to mitigate the deposition of eroded materials downslope.
Construction	Soil compaction from spoil placement or access tracks and laydown areas, potentially affecting long-term cropping and grazing productivity	Possible	Minor	Low	Limiting vehicle access and using designated tracks will reduce soil compaction. Compacted areas will be rehabilitated post-construction to restore productivity.
Operation	Soil contamination from chemical spills, leaks from gas wells, and improper management of wastewater	Unlikely	Minor	Low	Proper storage, bunding, and management of hydrocarbons and chemicals will minimize the risk of contamination.
Operation	Increased erosion and deposition of eroded material downslope/downstream resulting from alteration of natural runoff regime	Unlikely	Minor	Low	During operations, water from wells will be collected in water tanks located on drill pads to prevent erosion during operations.

Stage	Potential Impact	Likelihood	Consequence	Risk Rating	Justification
Operation	Presence of heavy machinery can result in soil compaction, reducing soil porosity and water infiltration, affecting biological activity and agricultural potential	Possible	Minor	Low	Regular visual monitoring of compacted areas and decompaction during rehabilitation will help mitigate the impacts of machinery.
Closure and Rehabilitation	Increased erosion resulting from ground disturbance and vegetation clearance	Unlikely	Minor	Low	The re-establishment of vegetation and implementation of erosion control measures during closure will reduce erosion risks.
Closure and Rehabilitation	Soil not meeting requirements for post-development land use	Unlikely	Minor	Low	Rehabilitation will focus on restoring soil structure and quality to meet post-development land use requirements.
Closure and Rehabilitation	Insufficient topsoil to reinstate vegetation	Unlikely	Medium	Medium	Topsoil will be stripped to the depth determined by soil survey results, stockpiled and re-used in rehabilitation as a growth medium in accordance with EA conditions F4 and F25.

The land resources risk assessment did not result in the identification of any high risks being posed by the project versus those currently approved under the EA. One medium and nine low risks were identified. The medium risk, being the highest identified risk presented by the project was in relation to having available topsoil to establish the 200 mm topsoil layer required under condition RM4(a) of the PRCP Schedule currently approved for the project. Controls to manage this risk include using soil surveys to identify topsoil depths, topsoil stripping to these depths and stockpiling in accordance with current EA condition F4.

5.0 Assessment Against Current EA Conditions

An assessment of the Proposed EA Amendment against current EA Conditions for the project was undertaken for this land resources assessment (**Table 6.1**).

With management and mitigation controls in-place as per the currently approved project and outlined in this report, the proposed EA Amendment works will not require any change to the land resource conditions of the current EA.

6.0 Assessment Against Current PRCP Schedule Requirements

An assessment of the Proposed EA Amendment against current PRCP Schedule Requirements for the project was undertaken for this land resources assessment (**Table 6.2** and **Table 6.3**).

With management and mitigation controls in-place as per the currently approved project and outlined in this report, the proposed EA Amendment will not require any material change to the land resources conditions of the current PRCP Schedule.

Very minor changes to adjust subscript references following the removal of the subscript for the definition of an ‘appropriately qualified person’ to the Rehabilitation area milestones table are applicable to RM4 and RM7.

Additional minor changes are also required to adjust reference to ‘Table 33 of the Wards Well Progressive Rehabilitation and Closure Plan, Version 3.0, 1 December 2021’ in RM7 to ‘Table 9-6 of the Centurion North Progressive Rehabilitation and Closure Plan, Version 4.0, 24 October 2025’.

Table 6.1 Proposed EA Amendment land resource impacts vs those approved under the current site EA

EA Condition No.	EA Condition	Proposed EA Amendment vs Current EA	Change due to Proposed EA Amendment
C10	**Stormwater and water sediment controls** An erosion and sediment control plan must be developed by an appropriately qualified person and implemented for all stages of the exploration and mining activities on the site to minimise erosion and the release of sediment to waters and contamination of stormwater.	To be actioned prior to commencement of exploration and mining activities as per approved activities under the current EA.	No Change.
E3	Where possible and practical, cleared vegetation must be mulched and/or replaced in rehabilitated areas. Cleared vegetation may be burnt as a last resort and only if there is minimal risk of causing nuisance to the neighbouring sensitive receptors. *Note: This condition does not exempt the environmental authority holder from obtaining any approval required under other legislation to conduct a burn.*	To be implemented upon clearing for the proposed EA Amendment as approved under the current EA.	No Change.
F1	**Preventing contaminant release to land** Contaminants must not be released to land in a manner which constitutes nuisance, material or serious environmental harm.	The proposed EA Amendment does not increase the risk of contaminants being released which may constitute nuisance, material or serious environmental harm.	No Change.
F2	**Storage and Spillage of Chemicals and Flammable or Combustible Liquids** All flammable or combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current version of AS 1940 - Storage and handling of flammable and combustible liquids.	The proposed EA Amendment will maintain compliance with AS1940 over the life of the project.	No Change.

EA Condition No.	EA Condition	Proposed EA Amendment vs Current EA	Change due to Proposed EA Amendment
F4	**Topsoil** Topsoil must be strategically stripped ahead of exploration activity and stockpiled no more than 2 metres in height to preserve topsoil bio-organic integrity.	Topsoil stripping and stockpile requirement standards are proposed to be maintained under the proposed EA Amendment.	No Change.
F15	Tracks should not be used when soil is saturated and prone to displacement or erosion by vehicle movement.	Under the proposed EA Amendment, it is not proposed to use site tracks when the soil is saturated and prone to displacement or erosion by vehicle movement.	No Change.
F20	Rehabilitation of areas disturbed in Category B Environmentally Sensitive Area or within **500 m** of a Category B Environmentally Sensitive Area must commence as soon as practicable to the extent that erosion impacts are minimised and be completed as soon as practicable but no longer than **three (3) months** after completion of the disturbance activity.	Under the proposed EA Amendment, the rehabilitation areas disturbed in or within 500 m of a Category B Environmentally Sensitive Area will commence as soon as reasonably practical and within **three (3) months** after the disturbance activity to minimise erosion impacts.	No Change.
F25	**PRCP Schedule** Rehabilitation of the disturbed land must be carried out in accordance with the approved Progressive Rehabilitation and Closure Plan (PRCP) schedule for this environmental authority.	Under the proposed EA Amendment, rehabilitation of the disturbed land will be carried out in accordance with the approved Progressive Rehabilitation and Closure Plan (PRCP) schedule for this environmental authority.	No Change.

Table 6.2 Proposed EA Amendment land resource impacts vs those approved under the current site EA

PRCP Schedule Condition No.	PRCP Schedule Condition	Proposed EA Amendment vs Current PRCP Schedule Requirements	Changes Due to Proposed EA Amendment
PRCP4	Rehabilitation of areas disturbed in Category B Environmentally Sensitive Area or within **500m** of a Category B Environmentally Sensitive Area must commence as soon as practicable to the extent that erosion impacts are minimised and be completed as soon as practicable but no longer than **three (3) months** after completion of the disturbance activity.	Under the proposed EA Amendment, the rehabilitation areas disturbed in or within 500 m of a Category B Environmentally Sensitive Area will commence as soon as reasonably practical and within **three (3) months** after the disturbance activity to minimise erosion impacts.	No Change.

Table 6.3 Proposed EA Amendment land resource impacts vs those approved under the current site EA

Milestone Reference	Rehabilitation Milestone	Milestone Criteria	Comment	Changes Due to Proposed EA Amendment
RM2	Remediation of contaminated	a) All contamination is remediated or removed from site in accordance with relevant legislation. b) A contaminated land survey is carried out by a suitably qualified person confirming the land does not present an unacceptable risk to proposed future land uses or the environment.	The proposed EA Amendment does not increase the risk of contaminants being released which may constitute nuisance, material or serious environmental harm.	No Change.
RM3	Landform development and reshaping	a) Landform is reshaped to be free-draining with slopes ≤ 5% and consistent with the surrounding topography.	Under the proposed EA Amendment, the land will be free-draining with slopes ≤ 5% and consistent with the surrounding topography.	No Change.

Milestone Reference	Rehabilitation Milestone	Milestone Criteria	Comment	Changes Due to Proposed EA Amendment
RM4	Surface preparation	a) Topsoil is placed at an average thickness of 200mm. b) An assessment of soil and growth media characteristics is completed by an appropriately qualified person[1], and amelioration and other treatments required identified. c) Ameliorant and physical treatments are applied as identified in RM4(b), if required for RA1.	Under the proposed EA Amendment, topsoil will be placed at an average thickness of 200 mm and soil/growth media characterisation and amelioration and other treatments prescribed by an appropriately qualified person.	Adjustment of subscript references in RM4 for an appropriately qualified person.
RM7	Achievement of post-mining land use to a stable condition (cattle grazing)	d) Land suitability class ≤3, or not different from pre-mining class if ≥4, as per **Table RM7 – Land Suitability Rule-Set (Cattle Grazing)**. The assessment is to be conducted by an appropriately qualified person1 and completed in accordance with LSA Framework for Open-Cut Coal Mine Rehabilitation 2018 (A rule-set for land suitability assessment of sustainable beef cattle grazing on land rehabilitated after open-cut coal mining in the Bowen Basin Queensland) unless otherwise agreed in writing between the administering authority and the environmental authority holder. For RM7(f), if the land suitability class is assessed as not different from pre-mining class if ≥4 for all or a portion of a rehabilitation area, an assessment of reference sites4 must be carried out to determine if the limitation/s resulting in the class of ≥4 is consistent with that of reference sites. e) Certification by an appropriately qualified person that pasture meets a pasture condition rating ≤3, based on the Pasture Condition Assessment Table as per Stocktake: Balancing Supply and Demand (https://futurebeef.com.au/workshops/sustainable-grazing/stocktake-balancing-supply-demand/), as provided in Table 33 of the Wards Well Progressive Rehabilitation and Closure Plan, Version 3.0, 1 December 2021.	The proposed EA Amendment will not change the Land Suitability Class or Pasture Condition Rating outcome vs those currently approved under the existing EA.	Adjustment of subscript references in RM7. Minor changes to adjust reference to 'Table 33 of the Wards Well Progressive Rehabilitation and Closure Plan, Version 3.0, 1 December 2021' in RM7 to 'Table 9-6 of the Centurion North Progressive Rehabilitation and Closure Plan, Version 4.0, 24 October 2025'.

7.0 Conclusion

There is a low risk of the rehabilitation of the Project Area not achieving the EA and PRCP Schedule approved PMLU of Grazing or pre-disturbance Land Suitability Class. This conclusion is based on the following:

- The nature of the proposed disturbance;
- The flat nature of the Project Area;
- Lack of streams or higher order waterways;
- Soils predominantly with topsoil characteristics amenable to plant growth; and
- The rehabilitation and land management controls proposed.

Erosion risk was deemed low, despite the potentially sodic nature of the subsoil exposed after clearing and topsoil stripping. The potential risk of erosion and sedimentation during construction will be managed by the implementation of an erosion and sediment control plan developed by an appropriately qualified person and this being implemented prior to construction as required under EA condition C10.

The highest risk to land resources identified was a medium risk to rehabilitation from insufficient topsoil due to poor stripping, stockpiling and return practices. These risks will be mitigated by stripping topsoil to a pre-determined depth identified in pre-disturbance soil surveys and stockpiling and re-using topsoil in accordance with EA conditions F4 and F25 to establish the 200 mm topsoil requirement stated in PRCP Schedule RM4(a). As such land resource risks associated with the project have been managed to as low as reasonably practicable (ALARP).

In relation to land resources, the Project will not require an amendment of the EA to proceed. The PRCP Schedule will require administrative amendments only in terms of the references to subscripts and superseded PRCP documents. Therefore, with the proposed controls in place, there is no reason to not approve the EA Amendment for the project on the basis of land resource impacts.

8.0 References

(n.d.).

BHP. (2021). *Progressive Rehabilitation and Closure Plan.*

Department of Resources. (2023). *Queensland geology regional web map service.*

DES. (2021). *Environmental Authority EPPR00668513.* Department of Environment and Science.

DME. (1995). *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.* Department of Minerals and Energy.

DNRME and DES. (2024). *Australian Soil Resource Information System.*

DPI. (1993). *Guidelines for the Identification of Good Quality Agricultural Land.* Department of Primary Industries.

DSDMIP. (2014). *Regional Planning Interest Regulation.* Brisbane, Queensland, Australia: Department of State Development, Manufacturing, Infrastructure and Planning.

DSDMIP. (2014). *Regional Planning Interests Act.* Brisbane Queensland: Department of State Development, Manufacturin, Infrastructure and Planning.

GTES. (2006). *BMA South Walker Creek Mine Surface Area 4, Soils and Land Suitability .* GTES Pty Ltd.

Queensland Government. (2013). *Guidelines for Agricultural Land Evaluation in Queensland Second Edition.*

Queensland Government Department of Resources. (2018). *Soils- Land Resource Assessment.*

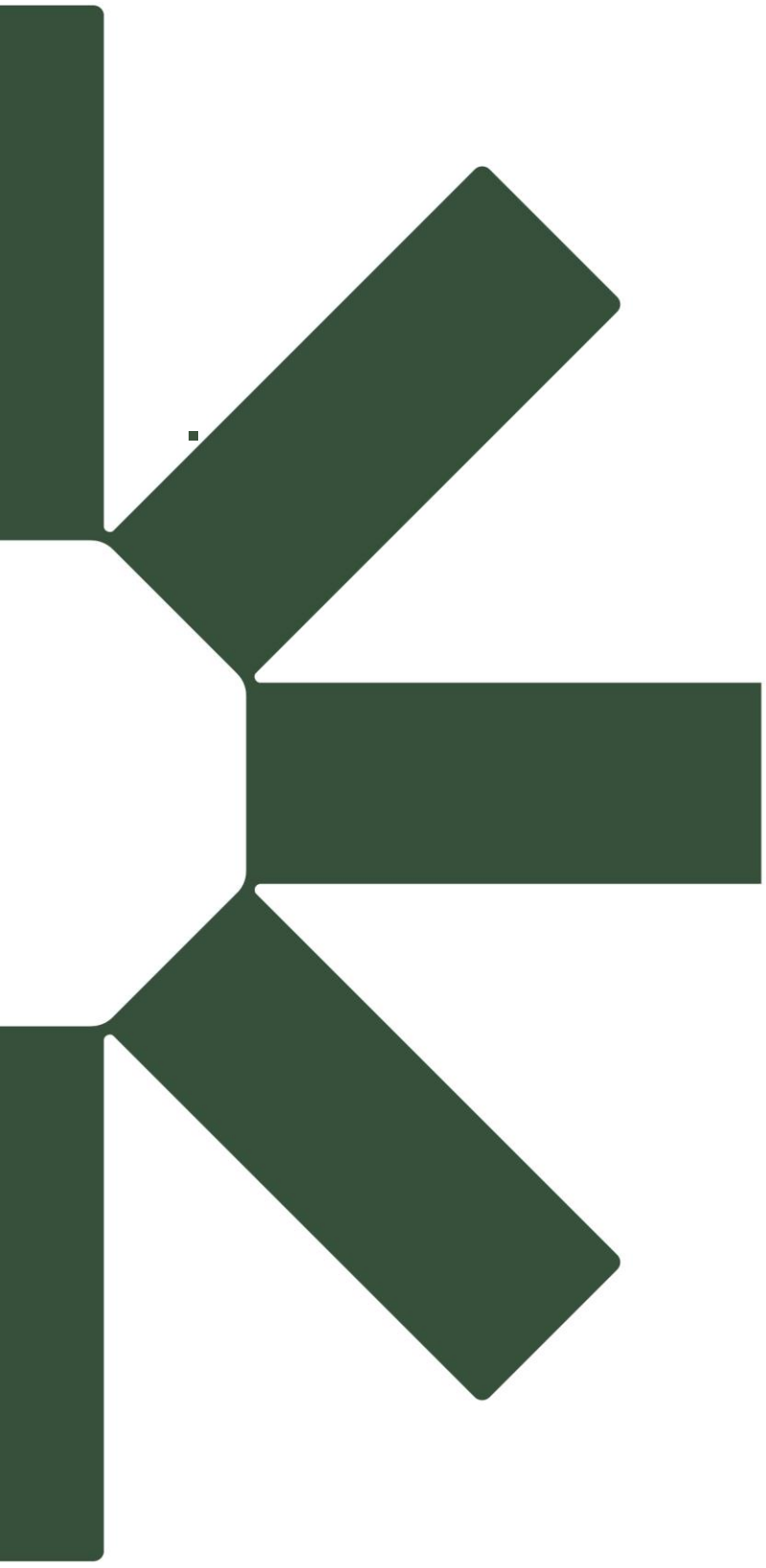
SGM. (2024). *Progressive Rehabilitation and Closure Plan - Centurion Mine.* SGM Environmental Pty Limited.

Shields, P. G., & Williams, B. M. (1991). *Land Resource Survey and evaluation of the Kilcummin Area, Queensland.* Coorparoo: Queensland Department of Primary Industries.

SKM. (2012). *Wards Well Soil Survey.* Sinclair Knight Merz.

State of Queensland. (2014). *RPI Act Guideline 08/14: how to demosntrate that land in the strategic cropping area does not meet the criteria for strategic cropping land.*

VRO. (2021). *Soil.* Victorian Resources Online.



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