SARAJI EAST MINING LEASE PROJECT

Environmental Impact Statement

Appendix B-1

Land Resources and Soils Assessment Technical Report

BMA

BHP Mitsubishi Alliance

Baseline Land Resources and Soil Suitability Assessment

Saraji East Project
BHP Coal Pty Ltd

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EXECUTIVE SUMMARY

GT Environmental Pty Ltd (GTE) was commissioned by AECOM Australia Pty Ltd (AECOM) on behalf of BM Alliance Coal Operations Pty Ltd (BMA) to conduct a baseline land resources and soils suitability assessment as part of the Environmental Impact Statement (EIS) for the Saraji East Mining Lease Project (SEMLP), herein known as 'the Project'. The Project Site is bound by Exploration Permit for Coal (EPC) 837, EPC 2103, Mining Lease Application (MLA) 70383, MLA 70459, Mining Lease (ML) 1775, ML 70142, and ML 1782.

The baseline assessment required the compilation of a soil and land suitability report for the Project; during which, the following conclusions were made:

- Twenty-six soil mapping units, including eleven variants were identified across the Project Site from four previous soil surveys.
- Representative, detailed and observation sites are in the Project Site except for an area to the west. This was reviewed using available soils survey reports, aerial photography and extrapolated data for assessment.
- The Project Site includes areas of gently undulating plains with gradational to duplex sandy soils to uniform clays with microrelief to areas of drainage depressions near active alluvial areas.

Land use suitability assessment of the 26 soil mapping units (SMUs), including 11 variants reported two SMUs and four variants suitable for cropping A2g, B1, E2, B2s and B3Bl) as Class A1. SMUs A5, B2bl, B2g, B5 and E1r were assessed as suitable for limited cropping, cotton by furrow irrigation due to plant available water capacity (PAWC) limitations.

All other SMUs identified were considered were considered suitable for beef cattle grazing activities either as simple or complex (consisting of two classes) units.

Five SMUs 17, A4, B2g, B5 and E1r were assessed as not providing any topsoil resource valuable for rehabilitation, without further soil management, amelioration or treatment. Subsoils were generally assessed as sodic with SMUs 19, A2g, A4c, A5, B1, B2s, B2bl, B3bl, B5E1, E1r and T2 providing value to rehabilitation or supporting buried soils.

All remaining SMUs and variants, were not suitable for rehabilitation reuse. They were assessed as potentially suitable for capping waste rock if stripping of the areas were required.

The Project Site is located in a Regional Planning Interests Areas of Strategic Cropping Area (SCA). An assessment was undertaken to identify Strategic Cropping Land (SCL) in the Project Site. The Project Site does not encroach on any Priority Living Areas (PLAs), Strategic Environmental Areas (SEAs) or Priority Agricultural Areas (PAAs).

Any disturbance or stripping of soil within SCA areas is only allowed as per the existing, approved Regional Interests Development Approval (RIDA), as outlined in the Restoration Plan to Support RIDA Application Saraji East Project (GTE, 2021) and RPI 19/001.

There are no further SCA areas that are approved by RPI 19/001, outside of the project site disturbance footprint that can be disturbed for stripping and stockpiling. Any disturbance of SCA not subject to an existing RIDA would require separate approval under the Regional Planning Interests Act (2014).

Based on a review of the Project Site, soil survey data and limited field indicators of the SMUs, the assessment determined a very low probability of acid sulfate soils (ASS).

Potential impacts for the site include ASS, mismanagement of topsoil stripping and post mining land impacts.

It was recommended that environmental management and ongoing environmental inspections of the site include general indicators to identify ASS.

A site specific topsoil management plan is recommended to provide tailored management procedures.

Post mine land use recommendations are based on disturbance of the Project Site and the previous land use (mining, agricultural or undisturbed land). Areas of active disturbance such as permanent infrastructure are not expected to be rehabilitated. It is envisioned that the majority of the Project Site could be reinstated to a similar previous land use or ecosystem. Rehabilitation methods and post mining land suitability are refined in a Rehabilitation Management Plan for the Project Site.

1 INTRODUCTION

1.1 Project Details

GT Environmental Pty Ltd (GTE) was commissioned by AECOM Australia Pty Ltd (AECOM) on behalf of BMA Coal Pty Ltd to conduct a baseline land resources and soils assessment as part of an Environmental Impact Assessment (EIS) for the Saraji East Mining Lease Project (SEMLP), herein known as 'The Project'.

The Project Site is bound by Exploration Permit for Coal (EPC) 837, EPC 2103, Mining Lease Application (MLA) 70383, MLA 70459, Mining Lease (ML) 1775, ML 70142, and ML 1782.

The Project Site encompasses approximately 10,000 hectares (ha) of land.

1.2 Project Background

On 24 May 2013, BMA applied for a new site-specific Environmental Authority (EA) for coal mining under the *Environmental Protection Act 1994* (EP Act) with the former Department of Environment and Resource Management (DERM), now known as Department of Environment,Science and Innovation (DESI). On 25 June 2013, DERM issued a Notice of Information Request for the EA application, requiring an EIS, however BMA ceased the progression of the EIS in 2013.

In 2017, BMA recommenced the assessment and finalisation of environmental approvals for the Project and the final Terms of Reference (TOR) for the EIS were issued on 2 June 2017. The land and soils assessment has been conducted in accordance with the TOR.

1.3 Scope of Assessment

This report provides an assessment of the land resources and soil suitability for the Project Site in response to the TOR and includes:

- description of the regulatory requirements relevant to the Project;
- review of available soils and land suitability information;
- identification and description of soil mapping units (SMUs) and their distribution across the Project Site using existing soil data and soil survey fieldworks;
- assessment of the suitability of each SMU for reuse in mine rehabilitation activities, including determination of soil stripping volumes;
- assessment of areas of regional interest relevant to the Project.

This assessment includes the review of existing soil and land suitability reports for the Project Site. Existing soil surveys included work by Emmerton, B (2005) and GT Environmental Services (GTES) (2000, 2007 and 2012), as outlined in Section 3.1.1.

Strategic Cropping Land (SCL) fieldworks were conducted (GT Environmental, 2021), the findings of which are included in this assessment report.

2 LEGISLATION AND POLICY

2.1 Legislative and Statutory Requirements

2.1.1 Commonwealth Legislation

The Project has been determined as a 'controlled action' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) under controlling provisions for listed threatened species and communities, and a water resource. There are no specific EPBC requirements for land and soils.

2.1.2 State Legislation and Policies

Environmental Protection Act

The Project will be assessed under the EP Act which is administered by DESI.

The EP Act's objective is to 'protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological processes (ecologically sustainable development)'. The EP Act and its associated regulations and policies (Air, Noise and Water) provide a regulatory framework for integrated management of activities with the potential to affect the environment, which includes:

a) ecosystems and their constituent parts, including people and communities; and

b) all natural and physical resources; and

c) the attributes and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and

d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).

Regional Planning Interests Act

The *Regional Planning Interests Act 2014* (RPI Act) identifies and protects areas of regional interest from prescribed resource or regulated activities through the protection of:

- Living areas in regional communities (Priority Living Areas) (PLA);
- High-quality agricultural areas from dislocation (Priority Agricultural Areas) (PAA);
- Strategic Cropping Areas (SCA); and,
- Regionally important environmental areas (Strategic Environmental Areas) (SEA).

A Regional Interests Development Approval (RIDA) is required when a resource activity is proposed in an area of regional interest. As the Project Site intersects land mapped as a SCA, an assessment of the Project to support a RIDA application in accordance with RPI Act Statutory Guideline (01/14) was undertaken separately (GTE, 2020).

2.1.3 Other Policies and Guidelines

This assessment includes the review of existing soil and land suitability reports for the Project Site. Existing soil surveys include work by Emmerton. B, GTES and GTE as outlined in Section 3.1.1.

The soil surveys complied in this report have been undertaken in accordance with the *Guidelines for Surveying Soils and Land Resources* (McKenzie et al. 2008). These Guidelines were developed to provide for a consistent approach to soil survey methodology across Australia. Soil characteristics and soil profiles have been described in accordance with the *Australian Soil and Land Survey Handbook* (National Committee on Soil and Terrain 2009 and Gunn et al. 1988).

Soils have been grouped according to their parent material and position in the landscape and classified in accordance with the *Australian Soil Classification* (Isbell, 2002).

Collection of soil samples for laboratory analysis was undertaken in line with the Land Suitability Assessment Techniques (LSAT) outlined in the then former Department of Minerals and Energy (DME) guideline *Technical Guidelines for Environmental Management of Exploration and Mining in Queensland* (DME, 1995). Information provided in *Guidelines for Agricultural Land Evaluation in Queensland* (DSITI & DNRM, 2015) and *Land Resource Survey and Evaluation of the Kilcummin* (Shields and Williams, 1991) area was also referred to in the existing soil survey assessment.

Determination of land suitability at the Project Site has been conducted on the SCL assessment map units (now referred to as SMUs and variants) based on the *Guidelines for Agricultural Land Evaluation in Queensland* (DSITI & DNRM, 2015) and *Regional Land Suitability Frameworks for Queensland* (DSITI & DNRM, 2013). Reference and assessment were also made with reference to the superseded LSAT suitability for beef cattle grazing assessment (LSAT, [DME,1995]).

Topsoil stripping assessment for the SCL assessment is referenced against Elliot and Veness, (1981) to assess these soil resources.

Observations of acid sulfate soils (ASS) were reviewed against the *State Planning Policy 2/02, Planning and Managing Development involving Acid Sulfate Soils*, (Queensland Government 2002), Appendix 2: Soil and Water Field Indicators.

3 METHODOLOGY

The methodology for the land resources and soil assessment, which consisted of a desktop review and field surveys, is described below.

3.1 Desktop Review

GTE reviewed the available soils and land resources information for the Project Site to establish SMUs and their distribution in the Project Site.

3.1.1 Regional Soils Reports and Available Documentation

The following references were utilised for reviewing previous soils and land suitability fieldwork, recommendations and inclusion in this report:

- Emmerton, B (2005) Soil and Land Suitability Survey, in Potential Disturbance Areas in Advance of Mining, Saraji Mine 2004 Survey.

  This report details a soil survey carried out in advance of mining to account for future disturbance of the perceived life of the mine operations. The survey was undertaken with a view to map SMUs present, their characteristics and provide recommendations on soil stripping depths for rehabilitation.

  Nineteen SMUs, their location and significance were mapped. Land suitability and topsoils resources were assessed across the SMUs with recommendations presented. The soil survey covers a majority of the western portion of the Project Site.

- GTES (2007), Soil Evaluation on Proposed Easement for Power Line, Golden Mile Road to Saraji Mine.

  This letter report describes four SMUs across the power line linear feature from Golden Mile Road to Saraji Mine. A total of 16 sites, were assessed ranging from texture contrast soils to uniform clays.

- GTES (2012), Saraji East Coal Mine Project, Soils and Land Suitability.

  This unpublished report describes ten SMUs with two variants across the Saraji East Coal Project (SECP) for the purpose of inclusion for an EIS. A total of 270 sites, including a further 16 sites described in GTES (2007) for a powerline assessment inside the survey area.

  This report includes assessments of agricultural land suitability, erosion potential and rehabilitation. The soil survey covers a majority of the eastern portion of the Project Site.

- BHP Billiton Mitsubishi Alliance (2012), Saraji East EIS Project, Chapter 4 Land Resources.

  This unpublished EIS chapter describes the land resources applicable to the Saraji East Project. This includes outlining planning provisions, native title, cultural heritage, environmental values and potential impacts and mitigation measures. The report includes GTES (2011) soils survey information as appendices and figures.

SMUs that are relevant to northern areas of the Project Site originate in mapping from Peak Downs Mine - Land Suitability and Capability Assessment of Mine Lease Areas (GTES, 2000), however attributes of the relevant SMUs are referenced in GTES (2012).

- BHP Billiton Mitsubishi Alliance (2012), Peak Downs High Wall Areas, Soil and Land Suitability Survey.

  This soil and land suitability report was undertaken for proposed areas of disturbance at BMA open-cut Peak Downs Mine Area, referred to as Peak Downs High Wall Areas. Six SMUs were reported with topsoil stripping, agricultural land suitability assessments and SCL undertaken.

  GTES submitted a Soil and Land Suitability Report to BMA Peak Downs Mine for the Heyford Mining Area in July 2005. The Heyford Mining Area is located to the north west of the High Wall areas of Peak Downs Mine therefore a significant amount of information relating to SMUs and laboratory data could be referred to and utilised as part of this assessment.

- SKM/GTES (2013), Saraji Mine and Saraji East, Assessment of Strategic Cropping Land.

  This SCL evaluation for Saraji Mine leases was based on a soil survey conducted by GTES in 2012 with additional data and mapping from a soil survey by GTES in 2008 (GTES, 2011). Five soil landscape units were identified and assessed for SCL status using the SCL criteria outlined in the repealed SCL Act. The assessment found 68% of the potential SCL according to the SCL Trigger Map qualified as SCL. The report was not submitted for review, and since then more extensive and up to date SCL assessment guidelines have been released. It was considered that the SCL evaluation would provide desktop information in assisting future SCL assessments.

- GTE (2021), Strategic Cropping Land Assessment.

  GTE conducted an SCL assessment which was undertaken for SCL Trigger Map identified in the southern area of the Project Site (Figure 6). Additional soil sampling and laboratory analysis was undertaken in accordance with *RPI Guideline 08/14 How to demonstrate that land in the strategic cropping area does not meet the criteria for strategic cropping land* (RPI 08/14).

SMUs attributes reviewed in previous soils and land suitability fieldwork which have not been directly assessed in the reporting have been assessed by GTE. These attributes include but are not limited to:

- drainage;
- agricultural land classes;
- erosion potential;
- soil quality for rehabilitation use; and
- ASS status.

These have been included as in the description of environmental values section as indicated by italics.

3.1.2 Aerial Photography

Aerial photography from Google Earth (accessed 25 January 2018) was reviewed as part of the desktop evaluations and data extrapolation.

3.1.3 Land Suitability Assessment

Land suitability assessment was reviewed and compiled for the soil survey assessments. This land suitability assessment in the soil surveys information was re-assessed where appropriate against the Guidelines for Agricultural Land Evaluation in Queensland (GALE 2015). GALE (2015) and regional land evaluation frameworks for various regions of Queensland gives specific information for appropriate land uses and their associated limitations.

An assessment of data collected on the physical, chemical and nutritional characteristics of the soil against a five-class system that applies to grazing, rainfed cropping and conservation as per DME (1995), Shields and Williams (1991) and updated to GALE (2015).

These classes are described in Table 1.

Table 1: Land Suitability Classes, GALE (2015)

Class	Suitability	Limitations	Description
1	Suitable	Negligible	Suitable land with negligible limitations which is highly productive requiring only simple management practices to maintain economic production.
2	Suitable	Minor	Suitable land with minor limitations which either reduce production or require more than the simple management practices of Class 1 land to maintain economic production.
3	Suitable	Moderate	Suitable land with moderate limitations which either further lower production or require more than those management practices of Class 2 land to maintain economic production.
4	Unsuitable	Severe	Marginal land with severe limitations which make it doubtful whether the inputs required to achieve and maintain production outweigh the benefits in the long term (presently considered unsuitable due to the uncertainty of the land to achieve sustained economic production).
5	Unsuitable	Extreme	Unsuitable land with extreme limitations that preclude its use for the proposed purpose.

3.1.4 Areas of Regional Interest

The Project Site was assessed for the following areas of regional interest:

- PAAs;
- SCAs;
- SEAs; and
- PLAs.

3.1.5 Acid Sulfate Soils Assessment

An assessment was undertaken to identify the likelihood of the presence of Actual ASS (AASS) and Potential ASS (PASS) on the Project Site based on the available fieldworks and laboratory information.

Online ASS maps (such as Australian Soil Resources Information System [ASRIS], and the National ASS Atlas) were reviewed, along with the elevation, geology, topography and aerial photograph patterns of ancient floodplains and swamps in the area.

3.1.6 Fieldwork

Data gaps identified after reviewing available documentation (refer section 3.1.1.) required additional field soil surveys to be undertaken in proposed infrastructure areas in the western side of the Project Site. In addition, due to the requirement of SCL fieldworks, extra data was also acquired from the southern portion of the Project Site.

Field surveys were undertaken between 30 June and 1 July 2018, 3 June and 6 June 2019 and 29 June to 30 June 2019 in accordance with the RPI Act Statutory Guideline 08/14 for SCL. The field surveys were undertaken by Associate Environmental Scientist Reece McCann and Environmental Consultant Greg Tuck.

Free survey is a commonly used method in broader scale land assessment as it enables flexibility in site selection (compared with more rigid grid mapping techniques), to achieve a more accurate and time effective result. This method is appropriate to detailed-scale surveys and provides a suitable basis for siting check sites, detailed sites and analysis sites (McKenzie et al. 2008).

The field investigation included representative observation sites for each target soil type and map unit. The field investigation exceeded the density and number of observation sites required to support SCL mapping and assessment.

The field survey was developed to:

- Target potential soil types and landscapes identified from desktop assessment;
- Collect information to comprehensively map and describe all soil types and landscapes present in the Project Site (Figure 2); and
- Gather sufficient information on each soil type and each of its component polygons (also known as 'map units') to confirm its SCL status.

A total of 158 additional observation sites were surveyed throughout the Project Site comprising:

- 88 detailed sites (i.e. hand auger assessment site to view the soil profile to 1.0 metre below ground level [mbgl]) to allow identification of any physiographic factors or vegetation associations that characterise the site and associated map unit, the pedological characterisation of the soil and identification of soil features of relevance to the SCL assessment criteria;
- 58 analysed sites (i.e. detailed site from which soil samples are collected and subsequently analysed in a laboratory). Where a site is associated with gilgai two sub-sites were undertaken on the mound and depression. For the purposes of this assessment these are considered one site). Analysed sites for SCL included pH, chloride, particle size analysis (PSA), soil moisture content, pedotransfer function. Rigid soils included cation exchange capacity (CEC), exchangeable sodium percentage (ESP) and calcium and magnesium ratio (Ca:Mg); and
- 70 check sites (i.e. check of surface and landscape characteristics and, as required, a shallow assessment of the soil profile), including exclusion sites (Figure 2) to collect detail to allocate the site to a specific soil type and map unit.

3.1.7 Nomenclature of Sites

Naming conventions for observation sites are as follows:

- Detailed sites with "-SCL" suffix indicates this is an existing site location (GTES, 2011) with the same site number which was revisited and where required, samples for analysis taken, in order to confirm the accuracy of existing descriptions and to document the site in greater detail as required by RPI Act Statutory Guideline 08/14;
- Detailed sites with prefix "N" indicate this is a new 2019 detailed site location;
- Check sites with prefix "NC" indicate this is a new 2019 check site location;
- Representative sites with prefix "PD" indicate this is a site from Peak Downs (GTES, 2012);
- Sites with prefix "18-"indicate this was a new 2018 site; and
- Sites are labelled as were referenced in Emmerton (2005). These sites have been delineated on Figure 1. Emmerton (2005) representative sites nominated include other soil surveys as well. Representative sites beginning with S denotes profiles from the original highwall survey, H denotes profiles from the Hakea pit survey and J denotes profiles from the Jacaranda survey.

The field investigation layout is shown on Figure 1. The layout was developed from the desktop study information and refined in the field. The field investigation was based on existing soil survey site locations (GTES, 2011) and free survey techniques (McKenzie et al. 2008 and Gunn et al. 1988) to verify soil types and assign boundaries to each map unit.

Relevant detailed sites are shown in Figure 1. Observation site data is presented in Appendix A for Emmerton (2005), Appendix B for GTES (2012) and Appendix C and Appendix D for GTE (2021). Laboratory results are presented in Appendix E.

4 DESCRIPTION OF ENVIRONMENTAL VALUES

4.1 Soil Mapping Units

Twenty-six SMUs, including eleven variants were identified across the Project Site (Figure 1) based on existing soil reports and gap assessment soil assessment. The SMUs are summarised in Table 2 and presented in Figure 1.

Thirty-two representative sites (of a total of 148 sites) were recorded by Emmerton, B. (2005) and 14 representative sites (of a total of 270 sites) were recorded by GTES (2011). Figure 1 illustrates the spatial distribution of all SMUs and variants in the Project Site and detailed descriptions of each SMU are provided in the following sections.

Table 2: Summary of SMUs

SMU and Variants	Concept	Representative Sites
2/20	Light sandy clay loam duplex soils to non-cracking clays on unconsolidated Cainozoic sediments	Site J4, S40 and 104 (Variant)
3	Sandy loam surfaced duplex soils on unconsolidated Cainozoic sediments	S12, J31, 33 and 96
4	Cracking clays with minor gilgai supporting Brigalow and Dawson Gum	S41, J27, J32 and 119
5	Cracking and non-cracking clays supporting Dawson Gum and Brigalow on deep Tertiary clays	S28 and 76
8	Clay loam duplex soils on sediments supporting Dawson Gum and Brigalow (Breakaway areas)	S7 and 22 (scalded surface)
12	Sandy loam surfaced duplex soils on reworked Cainozoic sediments supporting poplar box	J22 and 145
13	Hard-set silty duplex supporting mixed species (heavy shrub layer)	J23, 48, 134 and 138
16/23	Fine sandy loam to silt loam surfaced duplex and gradational soils (older alluvial duplex soils)	S17 (Variant), H32, 42 (Variant) and 60
17	Minor clay soils in anabranches	S32 and 57
18	Loamy sands, loams and gradational soils on stream banks and near stream levees	S51, H32 and 109
19	Loamy sand gradational soils present as relict alluvial levees	S49 and 142
A1 & A1V	Poplar box on deep duplex loams	38
A2	Alluvial Brigalow clay drainage lines	21
A2g	Variant of SMU A2, colour of soil profile is grey	N1

SMU and Variants	Concept	Representative Sites
A3	Alluvial loamy creek channels	52
A4	Dark brown sands with sandy loam subsoils near drainage lines	N17
A4c	Variant of SMU A4, texture includes higher clay percentage	N20
A5	Dark grey clay loams to grey brown clays within forested drainage line areas	N23
B1	Undulating clay plains under Brigalow or belah	1
B2 & B2v	Mixed Brigalow scrub on brown cracking clays	27
B2s	Variant of SMU B2, increase of salt content in subsoils	N13
B2g	Variant of SMU B2, colour of soil profile is black, with minor sub-dominant grey	N4,
B2bl	Variant of SMU B2, colour of soil profile is black	91-SCL
B3	Cracking dark Brigalow clays with gilgai	222 and 223
B3bl	Variant of SMU B3, colour of soil profile is black	5-SCL
B4	Melan holed Brigalow clay plains	118 and 117
B5	Deep sandy clay loams with clay subsoils on gently undulating plains of tall woodlands	N28
E1	Eucalypt woodlands on deep sandy loams	173
E1r	Variant of SMU E1 over red clay (minor brown sub-dominant) subsoils on gently undulating plains	10-SCL
E2	Mt Coolibah on dark basalt soils	110-SCL
E3	Poplar box on shallower loams	169
T1	Sandy hard duplex poplar box	PD-51 Peak Downs Site
T2	Deep sandy duplex plains with poplar box and ironbark	PD-21 Peak Downs Site

The SMUs 1 and 14 identified in Table 2 overlapped areas of soils mapped by GTES (2011). Preference was given to GTES (2011) SMUs for distribution of SMU boundaries between these SMUs.

4.1.1 SMU 2 / 20 (Variant)

Overview

This SMU is a reasonable soil for pasture improvement. In the dominant SMU, SMU 2, the soil surface is very hard set and generally massive in the duplex profiles with an algal crust often being present. Where clays are present on the surface the crust is slightly cracking. A superior variant exists, and vegetation is heavier and is dominated by low belah with some Dawson Gum also present. It occurs in the central western portion of the Project Site (refer to Figure 1).

The superior variant, SMU 20 has a heavier natural vegetation cover and intergrades to the cracking clays with minor gilgai supporting Brigalow and Dawson Gum (some areas of this variant may exist in that SMU but due to vegetation similarities are not always mappable separately). The profile is similar in structure and colour to the dominant SMU; however, it is generally slightly heavier, has a softer surface condition (generally firm) and has a higher proportion of calcium carbonate in the subsoil and parent material. It is in the centre of the Project Site near the boundary of the two main soil surveys.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that SMU 2/20 has:

- texture ranges from a light sandy clay loam to loam, fine sandy with occasional areas of light clay;
- pH's of the profiles analysed are slightly acidic in the A horizon, neutral in the upper B horizon and strongly alkaline in the subsoil;
- very low electrical conductivity and chloride in the surface layers, however this increases with depth in the B horizon;
- cation exchange capacity is at a high level in the surface and the soil has a good ability to hold applied nutrients;
- exchangeable sodium percentage is generally low in the surface (moderate in one profile), and increases in the upper B horizon, becoming high in the mid and lower subsoil;
- calcium to magnesium ratios are at good levels for the maintenance of structure in the surface, but decline in the B horizon to imbalanced levels which are too low for the maintenance of structure;
- R1 dispersion ratio is slightly elevated (0.49 m to 0.57 m) indicating poorer physical conditions than is desirable in a surface soil (the soil would be prone to sheet erosion on elevated slopes). Dispersion increases with depth to 0.84 m to 0.99 m in the subsoil; the subsoil is highly dispersive; and
- the total phosphorus present is low to moderate.

Representative Site

Three sites were chosen as the most representative of this SMU and variant including the major soil dominant attributes which define the SMU for chemical analysis. Site 104 is shown in Figure 1.

A land summary is presented in Table 3 and soil profile description summaries are presented in Tables 4 and 5. The soil chemistry results for the sites are presented in Appendix E.

Table 3: Land Summary

Item	Description
SMU	2 / 20 (Variant)
Representative Site Number	Site J4, S40 and 104 (Variant)
Representative Site photograph	No photo available.
Site survey type	Detailed. Hand auger.
Vegetation	Dawson gum and Brigalow, with minor poplar box, wilga, yellowwood and belah, some sandalwood and currant bush with low relatively sparse grassland below
Location	n/a
Disturbance	The area has been cleared
Landform element /pattern	Very to gently undulating Plain
Micro relief	Minor gilgai
Permeability	Assessment unavailable *GTE Assessment – Slowly permeable*
Slope (%)	<1.5
Drainage	Assessment unavailable *GTE Assessment – Moderately well-drained*
Surface coarse fragments	No coarse fragments reported
Surface condition	Crust with slight cracking Variant has a softer (firm) cracking surface
Substrate	Unconsolidated Cainozoic sediments
ASC Order (s)	Assessment unavailable *GTE Assessment – brown sodosol*
Land suitability summary	**Estimated effective rooting depth**: Site S40: 120cm. Site J4: 90cm. Site 104: 90cm **Estimated soil water storage:** Site S40: 96mm. Site J4: 84mm. Site 104: 86mm **Cropping suitability class**: 4 **Grazing suitability class:** 3 **Agricultural Land Class**: *GTE Assessment C1*
Erosion potential	This SMU is located on undulating sloping areas with a medium clay surface. Laboratory results indicated; • R1 dispersion ratio is slightly elevated (0.49m to 0.57m) indicating poorer physical conditions than is desirable in a surface soil (the soil would be prone to sheet erosion on elevated slopes). Dispersion increase with depth to 0.84m to 0.99m in the subsoil which is highly dispersive; • ESP is generally low in the surface (moderate in one profile), and increases in the upper B horizon, becoming high in the mid and lower subsoil.

Item	Description
	• Calcium to magnesium ratios are at good levels in the surface layers and decline with depth. *GTE Assessment - Erosion potential through dispersion is considered low however slightly increasing with subsoils, appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.30 metres below ground level (mbgl) Recommended topsoil use: Strip the A horizon of the duplex soils (20 to 30 cm) avoiding the lighter coloured B horizon clays. Where clay soils are present, stripping should only take place to a maximum of 30 cm. Poorer surface structural characteristics are indicated and replacement should only be on relatively low slope angles Recommended subsoil strip depth: 0.00 mbgl Recommended subsoil use: Nil, do not strip the lighter coloured B horizon clays in duplex areas. *GTE Recommendation – Reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS, Nil field indicators of AASS*
Total area (ha)	221

Table 4 Soil Profile Description Site J4

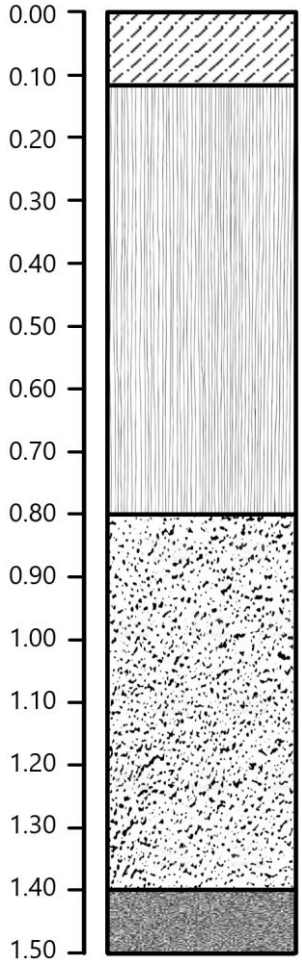
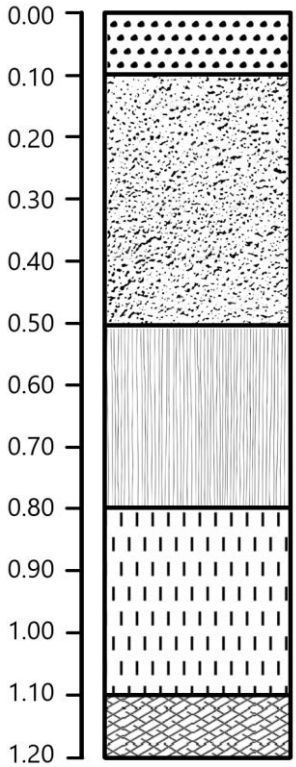
Site 4 (J4)	Depth (cm)	Description	pH	EC
	0-10	Very hard dark brown clay loam A1 horizon	7.0	137
	10-20	As above	6.8	121
	20-30	As above to 28cm, slight bleached A2 horizon below	6.6	100
	30-40	Very tight dark brown medium clay B21 horizon, some soft carbonate	7.1	176
	50-60	As above	8.4	315
	80-90	Brown medium clay B22 horizon, no carbonate	8.4	498
	110-120	As above	7.7	682
	140-150	Slightly mottled brown Tertiary Parent material. End of Borehole	7.5	705

Table 5: Soil Profile Description Site 104

Site 104 (Variant)	Depth (cm)	Description	pH	EC
	0-10	Dark brown loam A to 5cm, light clay B21 horizon below	6.3	115
	10-20	Dark brown light clay B21 horizon	7.2	94
	20-30	As above	7.6	83
	30-40	As above	8.2	108
	50-60	Dark brown light clay B22 horizon with soft carbonate present (colour lightening)	9.6	475
	80-90	Brown to strong brown medium clay (sandy) B3 horizon, high soft carbonate present	9.2	1296
	110-120	Brown to strong brown medium heavy clay Cainozoic, high soft carbonate present. End of Borehole	9.3	1090

4.1.2 SMU 3

Overview

This SMU is in the western portion of the Project Site (refer to Figure 1). The landform is slightly elevated, and slope is low being less than 2% in most areas investigated (an eroded variant may be present in occasional areas where slopes rise above 4%). Most of the area was recorded as relatively natural during the fieldwork survey undertaken by Emmerton, B (2005).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a loamy sand to fine sandy loam;
- pH's of the profiles analysed are around neutral in the surface, slightly acidic in the A2 horizon and alkaline in the B horizon, becoming more alkaline with depth;
- very low electrical conductivity and chloride in the surface layers, however, this increases with depth in the B horizon;
- cation exchange capacity is extremely low in the surface and low to moderate in the subsoil indicating a poor ability to hold nutrients;
- exchangeable sodium percentage may be non-sodic in the surface and A2 horizons and becomes highly sodic in the B horizon (extreme at depth);
- calcium to magnesium ratios are at reasonable levels for the maintenance of structure in the surface horizon but decline rapidly in the B horizon;
- R1 dispersion ratio is high (0.77 to 0.81) and this is likely due to the low clay content. Dispersion increases further down the profile to 0.90 to 0.95 in the B horizon;
- the level of extractable phosphorus is low and considered to be too low for pasture improvement.

Representative Site

Two sites were chosen as representative of this SMU for chemical analysis.

A land summary is presented in Table 6 and soil profile description summaries are presented in Tables 7 and 8. The soil chemistry results for the sites are presented in Appendix E.

Table 6: Land Summary

Item	Description
SMU	3
Representative Site Number	S12, J31, 33 and 96
Representative Site photograph	No photo available.
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box open woodland, with lesser ghost gum ironwood, bloodwood and bulloak
Location	Site 33 0637674E / 7515738N, Site 96 0633481E / 7523458N
Disturbance	Much of the area is relatively natural (some area towards the south has been cleared) and the appearance of an area of natural vegetation
Landform element /pattern	Very gently to gently (eroded variant) undulating plain
Micro relief	No microrelief
Permeability	Assessment unavailable *GTE Assessment – Moderate to slowly permeable*
Slope (%)	<2.0. ≥4.0 Eroded variant
Drainage	Assessment unavailable *GTE Assessment – Imperfectly drained*
Surface coarse fragments	No coarse fragments reported
Surface condition	Firm to hard set and massive
Substrate	Unconsolidated Cainozoic sediments
ASC Order (s)	Assessment unavailable *GTE Assessment – brown sodosol*
Land suitability summary	**Estimated effective rooting depth**: Site S12: 90cm. Site J31: 60cm. **Estimated soil water storage:** Site S40: 90mm. Site J4: 58mm **Cropping suitability class**: 5 **Grazing suitability class:** 4, minor Class 5 in eroded or drainage areas **Agricultural Land Class**: *GTE Assessment -C2/C3*
Erosion potential	This SMU is located on undulating sloping areas with a medium clay surface. Laboratory results indicated; • R1 dispersion ratio is high (0.77 to 0.81) and this is likely due to the low clay content. Dispersion rises further down the profile to 0.90 to 0.95 in the B horizon; • ESP may be non-sodic in the surface and A2 horizons and becomes highly sodic in the B horizon (extreme at depth); • Calcium to magnesium ratios are at reasonable levels for the maintenance of structure in the surface horizon but decline rapidly in the B horizon. *GTE Assessment - Erosion potential through dispersion is moderate to high increasing with subsoils. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.30 mbgl Recommended topsoil use: Strip the upper A horizon (20 to 30 cm) avoiding the lighter coloured A2 or B horizon clays. Replacement should only be on very low slope angles as nutrition is low and structure is weak. Recommended subsoil strip depth: 0.00 mbgl Recommended subsoil use: Nil, no stripping recommendations for subsoils provided.

Item	Description
	GTE Recommendation – Reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	115

Table 7: Soil Profile Description Site 33

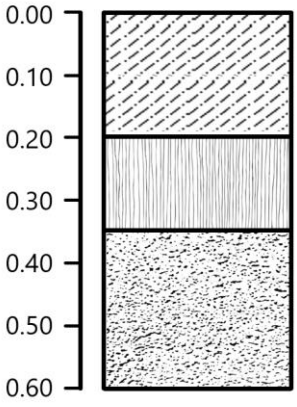
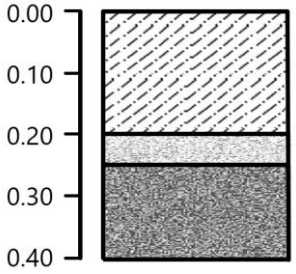
Site 33	Depth (cm)	Description	pH	EC
	0-10	Dark brown sandy loam A1 horizon	6.0	55
	10-20	As above	5.8	48
	20-30	Brown sandy loam A2 horizon	5.7	45
	30-40	As above to 35 cm, mottled B21 horizon below	5.8	50
	50-60	Mottled greyish brown/yellowish brown sandy clay B21 horizon, not recoverable below 60 cm. End of borehole	6.5	103

Table 8: Soil Profile Description Site 96

Site 96 (semi disturbed area)	Depth (cm)	Description	pH	EC
	0-10	Dark brown fine sandy loam A1 horizon	6.3	99
	10-20	As above	6.0	58
	20-30	Brown fine sandy loam A2 (some laterite to 25 cm, underlain by mottled medium clay B21 horizon	5.9	58
	30-40	Mottled greyish brown / yellowish brown medium clay B21 horizon End of borehole	5.8	80

4.1.3 SMU 4

Overview

This SMU is limited in extent and occurs mainly in the western, centre portion of the Project Site (Figure 1). Slope is low being less than 1% in the areas investigated. Slight gilgai (<40 cm) may be present.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a light to medium clay;
- pH's of the profiles analysed are around neutral in the surface, and alkaline below;
- low electrical conductivity and chloride in the surface layers however this increases with depth below 20 to 30 cm reaching levels which may limit rooting depth below 60 to 80cm;
- cation exchange capacity is low in the surface and increases in the subsoil;
- exchangeable sodium percentage slightly elevated (still low) in the surface and increases with depth becoming sodic by 20 cm and highly sodic by 50 cm;
- calcium to magnesium ratios reasonable levels for the maintenance of structure in the surface horizon but decline rapidly down the profile to imbalanced levels which are considered too low;
- R1 dispersion ratio is only low to moderate;
- the level of extractable phosphorus present is moderate and considered to be well suited to pasture improvement.

Representative Site

Four sites were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

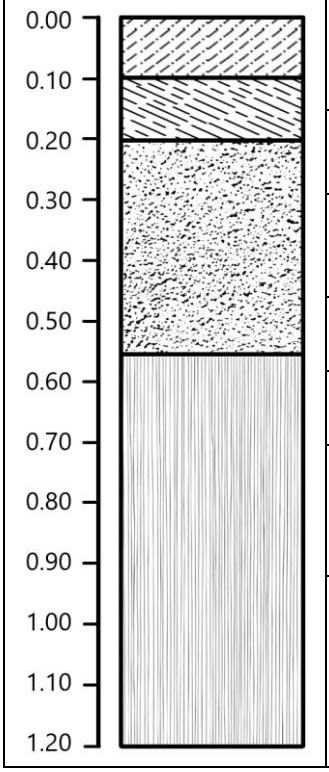
A land summary is presented in Table 9 and a soil profile description summary is presented in Table 10. The soil chemistry results for the sites are presented in Appendix E.

Table 9: Land Summary

Item	Description
SMU	4
Representative Site Number	S41, J27, J32 and 119
Representative Site photograph	No photo avilable
Site survey type	Detailed. Hand auger.
Vegetation	Brigalow with lesser Dawson Gum and yellowwood present
Location	Site 119 0633 832E 7524 606N
Disturbance	Natural woodlands
Landform element /pattern	Very gently undulating plain
Micro relief	Minor gilgai
Permeability	Assessment unavailable *GTE Assessment – Slowly permeable*
Slope (%)	<1.0
Drainage	Assessment unavailable *GTE Assessment – Moderate to imperfect*
Surface coarse fragments	No coarse fragments reported
Surface condition	Firm to hard set and massive
Substrate	n/a
ASC Order (s)	Assessment unavailable *GTE Assessment – endohypersodic grey vertosol*
Land suitability summary	**Estimated effective rooting depth**: Site S41: 90 cm. Site J27: 60 cm. Site J32: 60 cm. Site 119: 60 cm. **Estimated soil water storage:** Site S41: 112 mm. Site J27: 84 mm. Site J32: 74 mm. Site 119: 82 mm **Cropping suitability class**: 4 **Grazing suitability class:** 3 **Agricultural Land Class**: *GTE Assessment - C1*
Erosion potential	Laboratory results indicated; • R1 dispersion ratio is only low to moderate; • ESP slightly elevated (still low) in the surface and increases with depth becoming sodic by 20 cm and highly sodic by 50 cm); • Calcium to magnesium ratios are reasonable levels for the maintenance of structure in the surface horizon but decline rapidly down the profile to imbalanced levels which are considered too low. *GTE Assessment - Erosion potential through dispersion is low to moderate increasing with subsoils. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.30 mbgl Recommended topsoil use: For use as topsoil, limit stripping to the surface 30 cm in most areas, (avoiding light brown subsoil materials). Patches of very dark clays containing carbonate could be taken to a total depth of 50 cm. The soils are suitable for replacement on elevated slopes as good nutrition and reasonable structural characteristics are evident. Initial plant establishment may be slowed by salinity. *GTE Assessment, to have a maximum of 0.30 mbgl of stripping depth* Recommended subsoil strip depth: 0.00 mbgl

Item	Description
	Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE Recommendation – Reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl may be an option if required.*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	42

Table 10: Soil Profile Description Site 119

Site 119	Depth (cm)	Description	pH	EC
	0-10	Very dark greyish brown light clay A horizon	6.3	174
	10-20	Very dark greyish brown medium clay B21 horizon	6.6	185
	20-30	Dark yellowish brown medium clay B22, horizon soft carbonate present	8.2	330
	30-40	As above	8.8	457
	50-60	As above, grading to brown B23/B3 horizon below	8.8	928
	80-90	Mottled brown/strong brown medium clay Cainozoic, some slight carbonate and coarser quartz present	8.8	1391
	110-120	As above. End of borehole	8.9	1259

4.1.4 SMU 5

Overview

This SMU is a relatively minor soil and only occurs near the western portion, adjacent current mining operations (Figure 1). Slope is low being less than 2% in the areas investigated. Very slight gilgai (<15 cm) may or may not be present.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a light to medium clay to a medium to heavy clay in subsoils;
- pH's of the profiles analysed are around neutral in the surface layers, with strongly acidic parent clays at depth;
- low electrical conductivity and chloride in the surface layers however this increases rapidly with depth to relatively high levels by 60 cm;
- cation exchange capacity is low to moderate levels in the surface and at moderate to good levels below indicating a reasonable ability to hold nutrients;
- exchangeable sodium percentage is elevated (sodic) in the surface and increases with depth to highly sodic levels by 20 cm;
- calcium to magnesium ratios low levels for the maintenance of structure in the surface horizon and decline further with depth;
- r1 dispersion indices which are elevated (0.55 and 0.67) and indicate moderately dispersive tendencies, and the soil becomes more dispersive below 20 cm; and
- level of extractable phosphorus is moderate to good and considered to be suited to pasture improvement**.**

Representative Site

Two sites were chosen as the most representative of this SMU and variant including the major soil dominant attributes which define the SMU for chemical analysis.

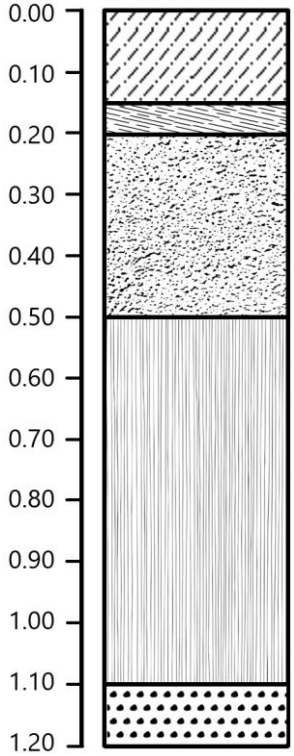
A land summary is presented in Table 11, and a soil profile description summary is presented in Table 12. The soil chemistry results for the sites are presented in Appendix E.

Table 11: Land Summary

Item	Description
SMU	5
Representative Site Number	S28 and 76.
Representative Site photograph	No photo avilable
Site survey type	Detailed. Hand auger.
Vegetation	Dawson gum and Brigalow and a low height relatively sparse grass cover is present
Location	Site 76 0634028E 7521010N
Disturbance	Assessment unavailable
Landform element /pattern	Very gently undulating plain
Micro relief	Slight gilgai may or may not be present
Permeability	Assessment unavailable *GTE Assessment – Moderate to slowly*
Slope (%)	<2.0
Drainage	*Assessment unavailable* *GTE Assessment – Moderate to imperfect*
Surface coarse fragments	Some ironstone and silcrete may be present
Surface condition	Noncracking or slightly cracking friable which is non self-mulching and may be hard set or may have a weak firm surface flake
Substrate	Deep Tertiary clays
ASC Order (s)	*Assessment unavailable* *GTE Assessment - Endohypersodic Brown Vertosol*
Land suitability summary	**Estimated effective rooting depth**: Site S28: 60 cm. Site 76: 60 cm. **Estimated soil water storage:** Site S40: 100 mm. Site J4: 93 mm **Cropping suitability class**: 4 **Grazing suitability class:** 3 **Agricultural Land Class**: *GTE Assessment - C1*
Erosion potential	Laboratory results indicated; • R1 dispersion indices which are elevated (0.55 and 0.67) and indicate moderately dispersive tendencies, and the soil becomes more dispersive below 20 cm; • ESP is elevated (sodic) in the surface and increases with depth to highly sodic levels by 20 cm; • Calcium to magnesium ratios low levels for the maintenance of structure in the surface horizon and decline further with depth. *GTE Assessment - Erosion potential through dispersion is moderate to high increasing with subsoils. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.20 mbgl Recommended topsoil use: Strip the surface 20 cm as topsoil and a seed source in most areas. In occasional areas depth may be as little as 10 cm (structure is poor, and the material should not be reused on steep slopes). Recommended subsoil strip depth: Nil Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE Recommendation – Reuse as capping for waste rock due to saline and dispersive attributes to a*

Item	Description
	depth of 1.20 mbgl
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS., Nil field indicators of AASS*
Total area (ha)	137

Table 12: Soil Profile Description Site 76

Site 76	Depth (cm)	Description	pH	EC
	0-10	Dark brown light clay A horizon	5.6	0-10
	10-20	As above to 15cm, darker brown light medium clay B21 horizon below	5.5	164
	20-30	Brown whole coloured light medium clay B21 horizon, no carbonate	5.6	161
	30-40	As above	6.0	279
	50-60	Dark brown light medium clay B22 horizon (sandy), no carbonate	6.5	574
	80-90	As above	4.8	960
	110-120	Mottled dark brown/reddish brown medium clay (sandy) B3 horizon End of Borehole	4.5	1004

4.1.5 SMU 8

Overview

This SMU is a minor soil which exhibits instability and occurs in the western portion of the Project Site in lower sloped areas (Figure 1). Landform is cleared gently to moderately undulating plains dominated by Dawson gum and Brigalow.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a fine sandy clay to clay loam surface and light to light-medium clay in subsoils;
- pH's neutral in the surface, and rise to highly alkaline levels with depth in the subsoil and parent material;
- slightly elevated levels of electrical conductivity and chloride in the surface layers and this increases rapidly with depth to high levels by 40 to 50 cm;
- cation exchange capacity is at reasonable levels in the surface and down the profile indicating a reasonable ability to hold nutrients;
- exchangeable sodium percentage is elevated (sodic) in the surface of one profile (which was scalded) and increases with depth to a highly sodic level by 20 cm;
- calcium to magnesium ratios are at low levels for the maintenance of structure in the scalded profile and at good levels in the other profile;
- r1 dispersion indices is high (0.74) in the scalded profile and only moderate (0.47) in the partially scalded profile; and
- extractable phosphorus present is at a level that is moderate and considered to be suited to pasture improvement**.**

Representative Site

Two sites were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis. The sites are not presented on Figure 1 as they are not in the Project Site.

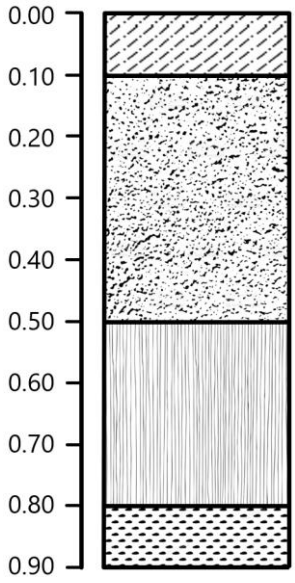
A land summary is presented in Table 13, and a soil profile description summary is presented in Table 14. The soil chemistry results for the sites are presented in Appendix E.

Table 13: Land Summary

Item	Description
SMU	8
Representative Site Number	S7 and 22 (scalded surface)
Representative Site photograph	No photo available
Site survey type	Detailed. Hand auger.
Vegetation	Dawson gum with some Brigalow
Location	Site 22 0637791E 7513604N
Disturbance	Much of the area has been cleared
Landform element /pattern	Gently to moderately undulating plain
Micro relief	Slight gilgai may or may not be present
Permeability	Assessment unavailable *GTE assessment – moderate to slowly*
Slope (%)	3.0 – 10.0
Drainage	Assessment unavailable *GTE assessment – moderate to imperfect*
Surface coarse fragments	No coarse fragments reported
Surface condition	Hard-set with an algal crust present
Substrate	Sediments
ASC Order (s)	Assessment unavailable *GTE assessment – brown sodosol*
Land suitability summary	**Estimated effective rooting depth**: Site S7: 30 cm. Site 22: 60 cm. **Estimated soil water storage:** Site S7: 64 mm. Site 22: 70 mm. **Cropping suitability class**: 5 **Grazing suitability class:** 5 **Agricultural Land Class**: *GTE assessment - C3*
Erosion potential	Laboratory results indicated; • R1 dispersion indices is high (0.74) in the scalded profile and only moderate (0.47) in the partially scalded profile; • ESP is elevated (sodic) in the surface of one profile (which was scalded) and increases with depth to a highly sodic level by 20 cm; • Calcium to magnesium ratios are at low levels for the maintenance of structure in the scalded profile and at good levels in the other profile. *GTE assessment - Erosion potential varies between the two soil profiles however dispersion is assessed as high in site S7 increasing in subsoils. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.15 mbgl Recommended topsoil use: The surface 10 to 15 cm (A horizon) may be useful on very flat areas, (do not strip the scalded areas). Recommended subsoil strip depth: Nil Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – reuse as first layer capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*

Item	Description
AASS/PASS Assessment	*GTE assessment - Very low field indication of PASS, Nil field indicators of AASS*
Total area (ha)	181

Table 14: Soil Profile Description Site 22

Site 22	Depth (cm)	Description	pH	EC
	0-10	Dark brown silty surfaced sandy clay loam A horizon	6.3	285
	10-20	Brown light clay B21 horizon	6.2	135
	20-30	As above	6.2	218
	30-40	As above	7.3	270
	50-60	Dark yellowish brown light clay B22 horizon, some hard carbonate present	8.4	190
	80-90	Yellowish brown light clay B3, siltstone inclusions present. End of Borehole	8.5	166

4.1.6 SMU 12

Overview

This SMU is mainly present associated with lower slope creek systems and is in the most southern area of the western portion of the Project Site. The SMU is similar to that of the "Sandy loam surfaced duplex soils on unconsolidated Cainozoic sediments supporting poplar box" but occurs in lower slope positions on apparently reworked Cainozoic material.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a loamy sand to fine sandy loam surface and sandy clay loam to light medium clay in subsoils;
- pH's slightly acidic to neutral in the surface layers and may be either slightly acidic or alkaline in the upper B horizon;
- very low electrical conductivity and chloride in the surface layers however this increases with depth in the heavier profile in the B horizon;
- cation exchange capacity is low in the surface and low to moderate in the subsoil indicating a poor ability to hold nutrients;
- exchangeable sodium percentage is low in the surface and A2 horizons and becomes sodic in the upper B horizon of the profile with the heavier subsoil;
- calcium to magnesium ratios are at reasonable levels for the maintenance of structure in the surface horizons but decline rapidly in the B horizon to levels which are considered low;
- R1 dispersion ratio is high (around 0.75) and this is likely due to the low clay content (only 6 to 10%) present. This level of dispersion rises further down the profile to higher levels in the A2 and B horizons; and
- extractable phosphorus is low and considered to be too low for pasture improvement**.**

Representative Site

Two sites were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

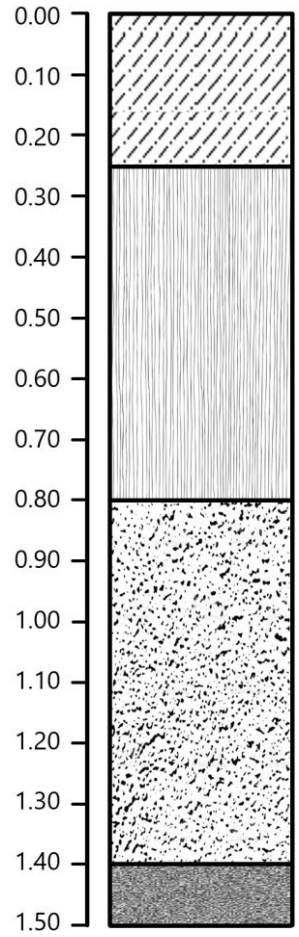
A land summary is presented in Table 15, and a soil profile description summary is presented in Table 16. The soil chemistry results for the sites are presented in Appendix E.

Table 15: Land Summary

Item	Description
SMU	12
Representative Site Number	J22 and 145
Representative Site photograph	No photo available
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box open woodland, with lesser ghost gum and occasional river gum and moreton bay ash on stream channels
Location	Site 145 0633147E 7528468N
Disturbance	Much of the area is relatively natural and the appearance of an area of natural vegetation
Landform element /pattern	Very gently undulating plain
Micro relief	Nil
Permeability	Assessment unavailable *GTE assessment – highly to moderate*
Slope (%)	<0.5
Drainage	Assessment unavailable *GTE assessment – Rapid to moderately well drained.*
Surface coarse fragments	Nil
Surface condition	Firm to hard set and massive
Substrate	Reworked Cainozoic sediments
ASC Order (s)	Assessment unavailable *GTE assessment – brown sodosol*
Land suitability summary	**Estimated effective rooting depth**: Site J22: 60 cm. Site 145: 90 cm. **Estimated soil water storage:** Site SJ22: 60 mm. Site 145: 67 mm. **Cropping suitability class**: 5 **Grazing suitability class:** Class 4 on levees, Class 5 on creek banks **Agricultural Land Class**: *GTE assessment - C2/C3*
Erosion potential	Laboratory results indicated; • R1 dispersion ratio is high (around 0.75) and this is likely due to the low clay content (only 6 to 10%) present. This level of dispersion rises further down the profile to higher levels in the A2 and B horizons; • ESP is low in the surface and A2 horizons and becomes sodic in the upper B horizon of the profile with the heavier subsoil; • Calcium to magnesium ratios are at reasonable levels for the maintenance of structure in the surface horizons but decline rapidly in the B horizon to levels which are considered low. *GTE assessment - Erosion potential for dispersion is assessed as high and increases in subsoils. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.40 mbgl Recommended topsoil use: Strip the upper 40 cm, avoiding lower A2 or B horizon materials. Replacement should only be on very low slope angles as nutrition is low and structure is weak. Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – Reuse as buried subsoils and capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*

Item	Description
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	2

Table 16: Soil Profile Description Site 145

Site 145	Depth (cm)	Description	pH	EC
	0-10	Dark brown loamy sand A11 horizon	5.7	57
	10-20	As above	5.8	55
	20-30	As above to 25cm, dark yellowish brown loamy sand A12 horizon below	5.9	50
	30-40	Dark yellowish brown loamy sand A12 horizon	6.0	56
	50-60	As above	6.1	48
	80-90	Mottled brown/yellowish brown sandy clay loam B21 horizon	5.5	49
	110-120	Slightly mottled yellowish brown light sandy clay loam reworked Cainozoic	5.4	47
	140-150	As above. End of borehole	5.6	52

4.1.7 SMU 13

Overview

This SMU is formed in backwater areas and is associated to a limited degree with all creek systems. It occupies a small portion in the west to north-west portion of the Project Site (Figure 1). The SMU is a silty loam surfaced duplex soil with poor surface structural characteristics.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a sandy loam to silty clay loam surface and sandy silt loam to medium clay in subsoils;
- pH's neutral in the surface, and generally rise to alkaline levels in the B horizon;
- low electrical conductivity and chloride in the surface layers but this increases to moderate levels with depth in the B horizon;
- cation exchange capacity is low to moderate in the surface and also moderate in the B horizon indicating a reasonable ability to hold nutrients;
- exchangeable sodium percentage variable in the surface, being low in the two better vegetated profiles but elevated (sodic) in the scalded profile. Sodicity increases in the B horizon and becomes high at depth;
- calcium to magnesium ratios are usually at reasonable levels for the maintenance of structure in the surface but decline in the lower A and B horizons to imbalanced levels which are considered too low;
- R1 dispersion ratio in the surface horizon is high (0.67 to 0.77) indicating poor structure and a propensity to surface sealing; and
- extractable phosphorus is at a level which is moderate and is adequate for pasture improvement.

Representative Site

Four sites were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 17, and soil profile description summaries are presented in Tables 18, 19 and 20. The soil chemistry results for the sites are presented in Appendix E.

Table 17: Land Summary

Item	Description
SMU	13
Representative Site Number	J23, 48, 134 and 138
Representative Site photograph	No photo available
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box but with some Dawson Gum, bauhinia, belah, yellowwood and Brigalow also present
Location	Site 48 0637338E 7517603N, Site 134 0632239E 7528755N, Site 138 0633952E 7525593N
Disturbance	Much of the area is relatively natural and the appearance of an area of natural vegetation
Landform element /pattern	Very gently undulating plains
Micro relief	Nil
Permeability	Assessment unavailable *GTE assessment - moderate*
Slope (%)	<0.5
Drainage	Assessment unavailable *GTE assessment – well to imperfect*
Surface coarse fragments	Nil
Surface condition	Firm to hard set and massive
Substrate	Alluvium
ASC Order (s)	Assessment unavailable *GTE assessment – sodic dermosol*
Land suitability summary	**Estimated effective rooting depth**: Site J23: 90 cm. Site 48: 60 cm. Site 134: 90 cm. Site 138: 60 cm. **Estimated soil water storage:** Site J23: 83 mm. Site 48: 67 mm. Site 134: 82 mm. Site 138: 66 mm. **Cropping suitability class**: Class 4 on levees, Class 5 on creek banks **Grazing suitability class:** Class 3 on levees, Class 5 on creek banks **Agricultural Land Class**: *GTE assessment - C1/C3*
Erosion potential	Laboratory results indicated; • R1 dispersion ratio in the surface horizon is high (0.67 to 0.77) indicating poor structure and a propensity to surface sealing; • ESP variable in the surface, being low in the two better vegetated profiles but elevated (sodic) in the scalded profile. Sodicity increases in the B horizon and becomes high at depth • Calcium to magnesium ratios are usually at reasonable levels for the maintenance of structure in the surface but decline in the lower A and B horizons to imbalanced levels which are considered too low. *GTE assessment - Erosion potential for dispersion is assessed as high and increases in subsoils. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.25 mbgl Recommended topsoil use: Strip the A horizon (15 to 25 cm) avoiding B horizon clays which are generally dispersive. Only reuse the soil on almost flat areas (<0.5%) as the soil has very poor physical characteristics with low infiltration rates and is prone to surface sealing. If sufficient volumes of other soils are available for rehabilitation, the SMU may be better discarded. Recommended subsoil strip depth: 0.00 mbgl.

Item	Description
	Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – Potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS., Nil field indicators of AASS*
Total area (ha)	17

Table 18: Soil Profile Description Site 48

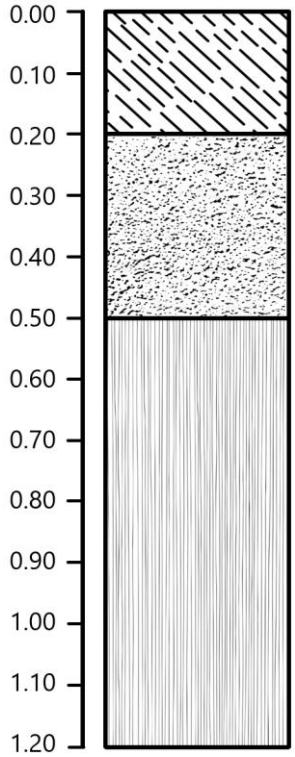
Site 48	Depth (cm)	Description	pH	EC
	0-10	Noncracking dark brown silty clay A horizon	6.6	278
	10-20	As above	6.9	226
	20-30	Brown silty clay loam B21 horizon	7.1	175
	30-40	As above	7.2	124
	50-60	Mottled brown / yellowish brown silty clay loam B22 horizon	6.1	293
	80-90	As above	6.0	436
	110-120	As above, texture lightening and tending towards alluvium. End of borehole	-	-

Table 19: Soil Profile Description Site 134

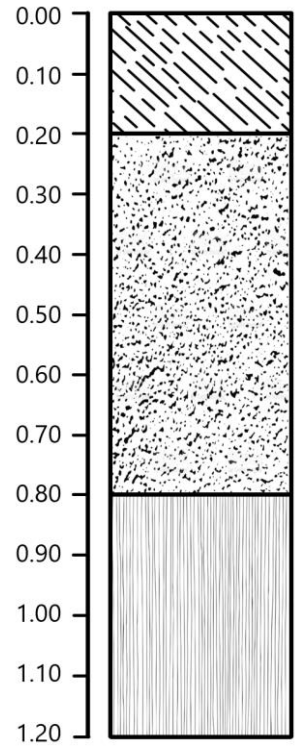
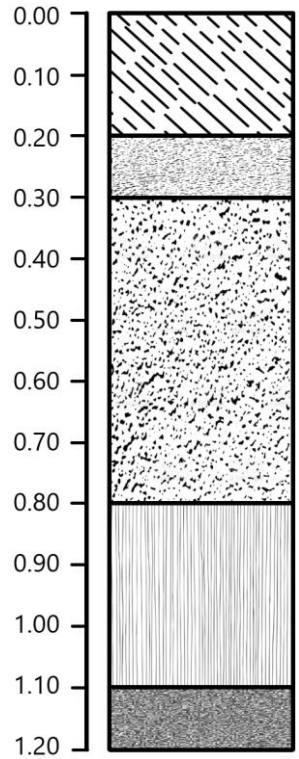
Site 134	Depth (cm)	Description	pH	EC
	0-10	Brown silty fine sandy loam A horizon	5.7	125
	10-20	As above, gradual interface to B21 horizon below	5.8	92
	20-30	Dark greyish brown to brown weakly consolidated silt loam B21 horizon	6.2	88
	30-40	As above	6.5	121
	50-60	As above	9.1	419
	80-90	Yellowish brown parent alluvial silt loam, slight hard and soft carbonate	9.2	736
	110-120	As above. End of borehole	9.1	925

Table 20: Soil Profile Description Site 138

Site 138	Depth (cm)	Description	pH	EC
	0-10	Dark brown silty fine sandy loam A1 horizon	5.2	67
	10-20	As above	5.2	142
	20-30	Dark greyish brown silty fine sandy loam A2 horizon	5.4	218
	30-40	Very dark greyish brown more weakly consolidated medium clay B21 horizon	6.4	511
	50-60	As above	8.1	806
	80-90	Weakly mottled dark greyish brown/olive brown medium clay B22, horizon, some hard carbonate	8.9	1061
	110-120	Brown weakly mottled heavy clay alluvium, with hard carbonate present. End of borehole	9.1	973

4.1.8 SMU 16 / 23 (Overlain Variant)

Overview

This SMU is present are present in association with most the larger creek systems in the Project Site. The SMU is in the north, north-west portion of the Project Site adjacent the existing mine (Figure 1). The SMU consists of fine sandy loam to silt loam duplex and gradational soils in lower slope positions.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a sandy loam to sandy clay loam surface and clay loam to medium clay in subsoils;
- pH's slightly acidic or alkaline in the upper horizons and generally alkaline at depth;
- very low electrical conductivity and chloride in the surface layers and levels either remain low or may rise to moderate levels down the profile;
- cation exchange capacity is low to moderate in the surface and moderate in the subsoil indicating a lower than desirable capacity to hold nutrients;
- exchangeable sodium percentage is low in the surface, and usually increases only very slightly at depth;
- calcium to magnesium ratios are at good levels for the maintenance of structure in the surface horizons and these levels may be maintained down the profile or may decline in the B horizon;
- R1 dispersion ratio is elevated (0.70 to 0.78) and this is likely due to the low clay content (only 7 to 15% present); and
- extractable phosphorus is at a low to good level (considered to be adequate for pasture improvement)**.**

Representative Site

Four sites were chosen as the most representative of this SMU and variant including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 21, and two soil profile description summaries are presented in Table 22 and 23. The soil chemistry results for the sites are presented in Appendix E.

Table 21: Land Summary

Item	Description
SMU	16 / 23 (overlain variant)
Representative Site Number	S17 (Variant), H32, 42 (Variant) and 60
Representative Site photograph	No photo available
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box with occasional blue gum, moreton bay ash, broad leafed ironbark and leichhardt bean
Location	Site 42 0636772E 7516760N Site 60 0635842E 7519633N
Disturbance	Much of the area has been cleared but the appearance of natural vegetation present
Landform element /pattern	Very gently undulating plains
Micro relief	Nil
Permeability	Assessment unavailable *GTE assessment – moderate*
Slope (%)	<0.5
Drainage	Assessment unavailable *GTE assessment – moderately well drained*
Surface coarse fragments	Nil
Surface condition	Hard-set
Substrate	Alluvium
ASC Order (s)	Assessment unavailable *GTE assessment – sodic brown dermosol*
Land suitability summary	**Estimated effective rooting depth**: Site S17: 120 cm. Site H32: 90 cm. Site 42: 90 cm. Site 60: 90 cm. **Estimated soil water storage:** Site S17: 91 mm. Site H32: 80 mm. Site 42: 74 mm. Site 60: 74 mm **Cropping suitability class**: Class 4, minor Class 5 on stream banks **Grazing suitability class:** Class 3, some Class 4 and 5 on stream banks and the overlain variant **Agricultural Land Class**: *GTE assessment - C1/C3*
Erosion potential	Laboratory results indicated; • R1 dispersion ratio which is elevated (0.70 to 0.78) and this is likely due to the low clay content (only 7 to 15% present); • ESP is low in the surface, and usually increases only very slightly at depth; • Calcium to magnesium are at good levels for the maintenance of structure in the surface horizons and these levels may be maintained down the profile or may decline in the B horizon. *GTE assessment - Erosion potential for dispersion is assessed as low, increasing very slightly with depth. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.25 mbgl Recommended topsoil use: Strip the A horizon material (20 to 25 cm) avoiding bleached A2 material (where present) or B horizon clays. The material should only be used on flatter slopes as structural instability is indicated. Recommended subsoil strip depth: 0.00 mbgl Recommended subsoil use: The material in the lower horizons is strongly slaking and some of this subsoil material is dispersive.

Item	Description
	GTE recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	115

Table 22: Soil Profile Description Site 42 (Variant)

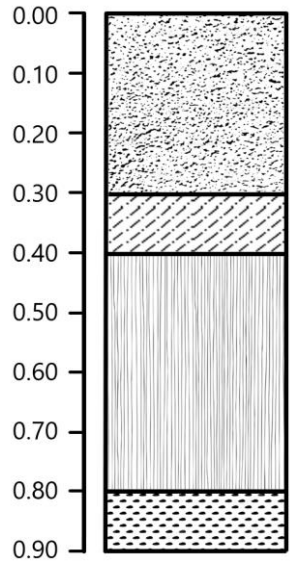
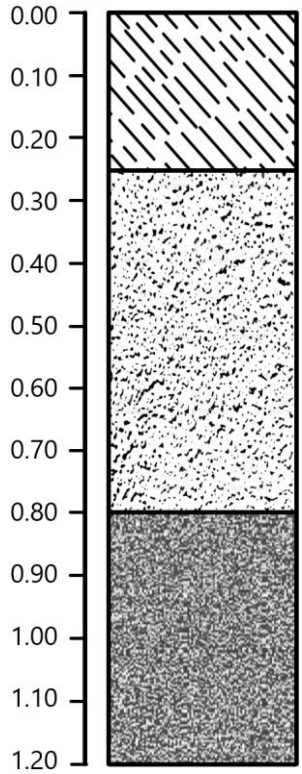
Site 42	Depth (cm)	Description	pH	EC
	0-10	Hard-set brown platey/angular fine sandy loam A11 horizon	6.9	173
	10-20	As above	6.5	105
	20-30	As above	6.3	81
	30-40	Dark brown sandy clay loam A12 horizon to 50 cm	6.4	70
	50-60	Brown very weakly cemented sandy loam A13 horizon	6.4	55
	80-90	Mottled greyish brown/dark yellowish brown light medium clay B21 horizon (no carbonate). End of borehole	6.5	73

Table 23: Soil Profile Description Site 60

Site 60	Depth (cm)	Description	pH	EC
	0-10	Dark brown fine sandy loam A horizon	7.2	101
	10-20	As above	8.0	112
	20-30	As above to 25 cm, mottled sandy clay loam B21 horizon under	8.4	145
	30-40	Mottled very dark greyish brown/brown sandy clay loam B21 horizon (no carbonate)	8.5	145
	50-60	As above	8.4	118
	80-90	Mottled light yellowish brown/strong brown sandy clay loam PM (high soft carbonate present)	8.5	160
	110-120	As above. End of Borehole	8.6	123

4.1.9 SMU 17

Overview

This SMU is an insignificant soil with poor structural characteristics and only occurs in very isolated pockets on floodplains. It is situated in very minor areas in the western portion of Project Site (Figure 1). The profiles have often been affected by pit water.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a silt loam to silty clay surface and silty clay loam to silty medium clay in subsoils;
- pH's of the profiles analysed are acidic;
- low levels of electrical conductivity and chloride in the surface layers and this increases to moderate levels at 50 to 60 cm in the pit water influenced profile;
- cation exchange capacity is at relatively low levels in the surface and down the profile indicating a poor ability to hold nutrients;
- exchangeable sodium percentage is elevated (sodic) in the surface and increases down the profile being extremely sodic by 20 cm;
- calcium to magnesium ratios are at low levels for the maintenance of structure in the surface horizon and at depth;
- R1 dispersion ratio which is high for a surface soil (0.80) and indicates poor surface physical conditions; and
- extractable phosphorus is at a level which is moderate to high.

Representative Site

Two sites were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

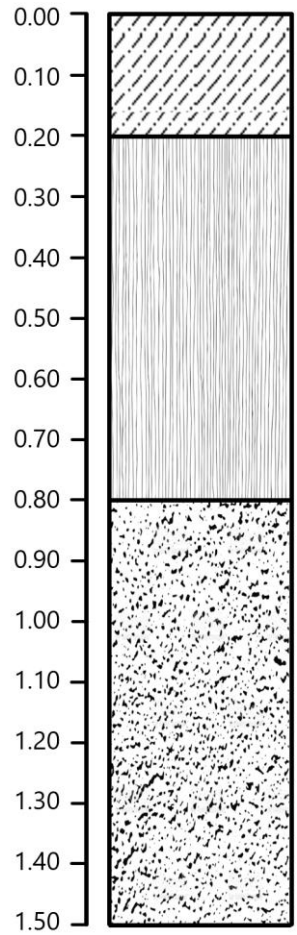
A land summary is presented in Table 24, and soil profile description summaries are presented in Table 25. The soil chemistry results for the sites are presented in Appendix E.

Table 24: Land Summary

Item	Description
SMU	17
Representative Site Number	S32 and 57
Representative Site photograph	No photo available
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box with occasional blue gum, moreton bay ash, broad Leafed ironbark and leichhardt bean
Location	n/a
Disturbance	Much of the area has been cleared but the appearance of natural vegetation present
Landform element /pattern	Very gently undulating plains
Micro relief	Nil
Permeability	Assessment unavailable *GTE assessment – moderate to slowly*
Slope (%)	Extremely low
Drainage	Assessment unavailable *GTE assessment - moderate to imperfect*
Surface coarse fragments	No coarse fragments reported
Surface condition	Hard-set cracking
Substrate	Alluvium
ASC Order (s)	Assessment unavailable *GTE assessment – epihypersodic vertosol*
Land suitability summary	**Estimated effective rooting depth**: Site S32: 60 cm. Site 57: 30 cm. **Estimated soil water storage:** Site S32: 70 mm. Site 57: 48 mm. **Cropping suitability class**: Class 5 **Grazing suitability class:** Class 4 **Agricultural Land Class**: *GTE assessment - C2*
Erosion potential	Laboratory results indicated; • R1 dispersion ratio which is high for a surface soil (0.80) and indicates poor surface physical conditions; • ESP is elevated (sodic) in the surface and increases down the profile being extremely sodic by 20cm; • Calcium to magnesium is at low levels for the maintenance of structure in the surface horizon and at depth. *GTE Assessment - Erosion potential for dispersion is assessed as high, increasing with depth. Appropriate management of bare earths, especially subsoils must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: Nil Recommended topsoil use: Generally nil, minor SMU with little seed source Recommended subsoil strip depth: Nil Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – Reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl*
AASS/PASS	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*

Item	Description
Assessment	
Total area (ha)	4

Table 25: Soil Profile Description Site 57

Site 57	Depth (cm)	Description	pH	EC
	0-10	Dark grey platey/angular weakly consolidated silty clay A horizon	5.3	85
	10-20	As above	5.4	76
	20-30	Dark grey/greyish brown weakly consolidated silty clay B21 horizon (some ferric staining)	5.9	70
	30-40	As above	6.5	92
	50-60	As above	8.1	158
	80-90	Grey/yellowish brown strongly mottled non-consolidated medium clay (fine sandy) B3/PM horizon	8.3	244
	110-120	As above	8.3	371
	140-150	As above. End of Borehole	8.1	517

4.1.10 SMU 18

Overview

This SMU occurs on the immediate banks and some of the nearby levees of most the larger creek systems in the Project Site (Figure 1). The SMU is associated with lower slope associated with alluvium and consists of gradational loamy sands.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a loamy sand to gradational sandy loam profile;
- pH's is neutral or slightly alkaline, while occasional subsoil samples may be strongly alkaline;
- low electrical conductivity and chloride;
- cation exchange capacity is at low to moderate levels indicating a lower than desirable ability to hold nutrients;
- exchangeable sodium percentage is low;
- calcium to magnesium ratios is at a good level for the maintenance of structure in all analysed horizons;
- R1 dispersion ratio is elevated (0.68 to 0.84 in the surface); and
- extractable phosphorus present in heavier surfaced profiles are at good levels, but sandy profiles may have low levels**.**

Representative Site

Three sites were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

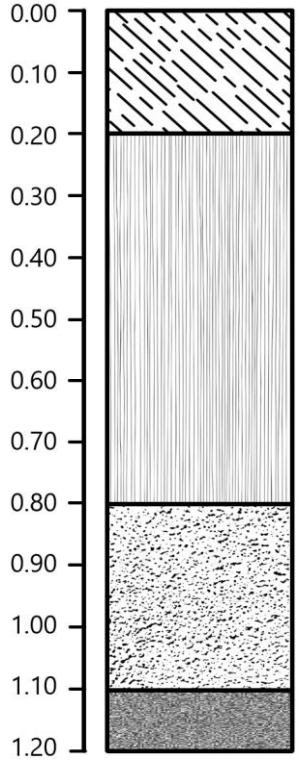
A land summary is presented in Table 26 and a soil profile description summary is presented in Table 27. The soil chemistry results for the sites are presented in Appendix E.

Table 26: Land Summary

Item	Description
SMU	18
Representative Site Number	S51, H32 and 109
Representative Site photograph	No photo available
Site survey type	Detailed. hand auger.
Vegetation	Moreton bay ash with lesser blue gum, ghost gum and poplar box present
Location	Site 109 0631776E 7530533N
Disturbance	Area has been previously disturbed
Landform element /pattern	Very gently undulating plains to steep inclines
Micro relief	Nil
Permeability	Assessment unavailable *GTE assessment – highly too slowly*
Slope (%)	Generally low on the levees, however on stream banks can be high (up to 40%)
Drainage	Assessment unavailable *GTE assessment – rapid to moderately drained*
Surface coarse fragments	No coarse fragments reported
Surface condition	Soft to firm
Substrate	Alluvium
ASC Order (s)	Assessment unavailable *GTE assessment – brown kandosol*
Land suitability summary	**Estimated effective rooting depth**: Site S51: 150 cm. Site H32: 120 cm. Site 109: 65 mm **Estimated soil water storage:** Site S51: 87 mm. Site H32: 100 mm. Site 109: 65 mm **Cropping suitability class**: Class 4 on levees, Class 5 on creek banks **Grazing suitability class:** Class 3 on levees, Class 4 on creek banks **Agricultural Land Class**: *GTE assessment - C1/C2*
Erosion potential	Laboratory results indicated; • R1 dispersion ratio is elevated (0.68 to 0.84 in the surface); • ESP is low; • Calcium to magnesium ratios is at a good level for the maintenance of structure in all analysed horizons. *GTE assessment - Erosion potential for dispersion is assessed as high, however ESP and calcium and magnesium ratios are favourable. Appropriate management of bare earths, especially subsoils must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.50 mbgl Recommended topsoil use: Strip the surface 50 cm as soil in most areas, however close to the creek systems, around 90 cm of useable material (essentially a germination medium for flatter slopes) may be present. Avoid the inclusion of lower clay layers as some of these materials in the Hughes and Spring creek areas may be very dispersive. Overall structure is weak and the material should not be reused on steep slopes. Recommended subsoil strip depth: Nil Recommended subsoil use: The material in the lower horizons (below around 50 cm) is strongly slaking and has little resistance to erosion but does not appear to be dispersive (some parent

Item	Description
	materials may be dispersive). Nil, no stripping recommendations for subsoils provided. *GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.50 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	33

Table 27: Soil Profile Description Site 109

Site 109	Depth (cm)	Description	pH	EC
	0-10	Dark brown fine loamy sand A11 horizon	6.3	86
	10-20	As above	6.4	58
	20-30	Dark yellowish brown fine loamy sand A12 horizon	6.4	55
	30-40	As above	6.4	54
	50-60	As above	6.3	58
	80-90	Weakly cemented mottled brown/strong brown fine sandy loam to light sandy clay loam A13 horizon	6.6	62
	110-120	Brown/strong brown sandy flow layer 2D horizon End of Borehole	6.6	57

4.1.11 SMU 19

Overview

This SMU is present mainly in one relatively large area north in the western portion of the Project Site (Figure 1). It is associated with slightly elevated areas above the floodplain of creeks. The SMU may be duplex or gradational with loamy sand to sandy loam A horizon over sandy clay loam to sandy clay alluvium.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture ranges from a loose loamy sand or occasionally sandy loam surface to sandy loam to sandy clay alluvium;
- pH's are slightly below neutral in the surface and around neutral in the subsoil;
- very low electrical conductivity and chloride in the surface layers and down the profile;
- cation exchange capacity is extremely low down the profile indicating a poor ability to hold nutrients;
- exchangeable sodium percentage is low in the surface (the value of 6% for Site 142 is due to cattle urine) and down the profile, sometimes rising to sodic levels in the deep subsoil where texture becomes heavier;
- calcium to magnesium ratios are at reasonable levels for the maintenance of structure in the surface horizons and are maintained at reasonable levels down the profile until the deep subsoil is encountered;
- R1 dispersion ratio is very high (0.81 and 0.96) and this is likely due to the low clay content (only 5%) present; and
- extractable phosphorus present is at a low to moderate level (considered to be adequate for pasture improvement).

Representative Site

Two sites were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

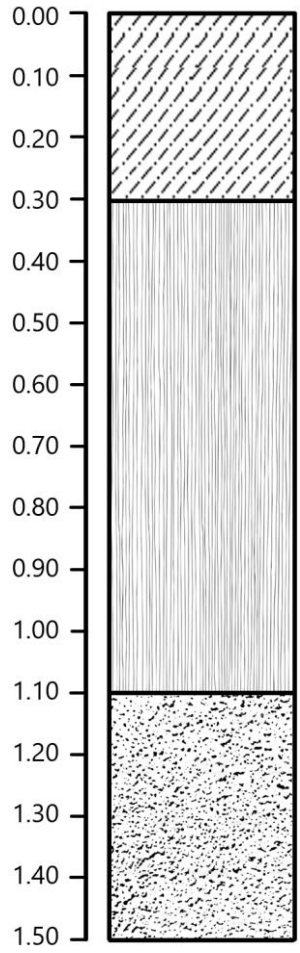
A land summary is presented in Table 28 and soil profile description summary is presented in Table 29. The soil chemistry results for the sites are presented in Appendix E.

Table 28: Land Summary

Item	Description
SMU	19
Representative Site Number	S49 and 142
Representative Site photograph	No photo available
Site survey type	Detailed. Hand auger.
Vegetation	Moreton bay ash with lesser poplar box, bloodwood and leichhardt bean
Location	Site 142 0633668E 7527125N
Disturbance	Assessment unavailable
Landform element /pattern	Very gently undulating plains to steep inclines
Micro relief	Nil
Permeability	Assessment unavailable *GTE assessment – highly*
Slope (%)	Generally low on the levees, however on-stream banks can be high (up to 40%)
Drainage	Assessment unavailable *GTE assessment – rapid*
Surface coarse fragments	Nil
Surface condition	Loose and weak
Substrate	Alluvium
ASC Order (s)	Assessment unavailable GTE assessment – brown tenosol
Land suitability summary	**Estimated effective rooting depth**: Site S49: 90 cm. Site 142: 120/150 cm. **Estimated soil water storage:** Site S51: 61 mm. Site H32: 77/93 mm. **Cropping suitability class**: Class 4 **Grazing suitability class:** Class 3 **Agricultural Land Class**: *GTE assessment - C1*
Erosion potential	Laboratory results indicated; • R1 dispersion ratio is very high (0.81 and 0.96) and this is likely due to the low clay content (only 5%) present; • ESP is low in the surface and down the profile, sometimes rising to sodic levels in the deep subsoil where texture becomes heavier; • Calcium to magnesium ratios are at reasonable levels for the maintenance of structure in the surface horizons and are maintained at reasonable levels down the profile until the deep subsoil is encountered. *GTE assessment - Erosion potential for dispersion is assessed as very high, however ESP and Ca/Mg ratios are favourable in topsoil. Subsoils ESP and Ca/Mg ratios indicate dispersive attributes. Appropriate management of bare earths, especially subsoils must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.50 mbgl Recommended topsoil use: Strip the surface 50cm as better quality soil. Recommended subsoil strip depth: Nil Recommended subsoil use: The subsoil should not be incorporated due to hard setting tendency. Nil, no stripping recommendations for subsoils provided.

Item	Description
	GTE recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 0.60 mbgl
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	59

Table 29: Soil Profile Description Site 142

Site 142	Depth (cm)	Description	pH	EC
	0-10	Brown loamy sand A11 horizon	6.1	119
	10-20	As above	6.6	111
	20-30	As above	6.8	92
	30-40	Strong brown loamy sand A12 horizon	6.8	91
	50-60	As above	6.6	85
	80-90	As above	6.9	89
	110-120	Weakly cemented yellowish red sandy loam A13 horizon	6.4	57
	140-150	As above. End of Borehole	6.3	54

4.1.12 SMU A1

Overview

This SMU is a duplex sandy soil with whole coloured reddish-brown clay subsoils associated with alluvial plains with Poplar Box and occasional Brigalow. It is situated near alluvial plains and drainage lines of the Project Site (Figure 1). A variant was observed, A1V, which had a slight variation in soil colour.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- duplex soil with moderately well-structured and drained clay subsoils;
- pH of the profile analysed is neutral to slightly alkaline;
- non-saline or and non-sodic;
- limited plant available water capacity will prevent cropping;
- productive grazing lands requiring sound management to prevent loss of the sandy upper horizon from erosion; and
- reasonable fertility, pastures would respond well to Nitrogenous fertilizer.

Representative Site

Site 38 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 30, and a soil profile description summary is presented in Table 31. The soil chemistry results for the sites are presented in Appendix E.

Table 30: Land Summary

Item	Description
SMU	A1
Representative Site Number	Site 38
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box, Moreton bay ash, areas of Brigalow mixed scrub
Location	639822E 7515013N
Disturbance	The area is semi-cleared woodland
Landform element /pattern	Low lying flat plain / alluvial plain
Micro relief	Nil
Permeability	Moderate to high
Slope (%)	<1.0
Drainage	Moderate
Surface coarse fragments	Nil
Surface condition	Cracking medium clay with some areas having a friable surface flake and some areas being weakly (finely) self-mulching. Surface is firm to hard setting
Substrate	Alluvium
ASC Order (s)	Red brown sodosol
Land suitability summary	**Estimated effective rooting depth**: 0.60-0.70 m **Estimated soil water storage:** 50 mm **Cropping suitability class**: 5 **Grazing suitability class:** 3 Preferred Use: Light Grazing **Agricultural Land Class**: *GTE assessment - C2*
Erosion potential	Laboratory results indicated; • ESP (is low in the surface and upper subsoil layers and increases slowly down the profile becoming sodic below 50cm. *GTE assessment - Erosion potential through reviewing sodicity, soil texture and structure are considered low however slightly increasing with subsoils, appropriate management of bare earths must be*

Item	Description
	considered when stockpiling and for reuse of this SMU for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.40 mbgl Recommended topsoil use: Topsoil may be retrieved for the major extent of the sandy A horizon. The material is suitable for use on all level to gently sloping rehabilitation areas. Recommended subsoil strip depth: Nil Recommended subsoil use: The subsoil should not be incorporated due to hard setting tendency. Nil, no stripping recommendations for subsoils provided. *GTE Recommendation – Reuse as capping for waste rock due to dispersive attributes to a depth of 0.60 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	463

Table 31: Soil Profile Description

Site 38	Depth (cm)	Description	pH
	0-40	Brown (7.5YR3/4), sandy loam, loose, massive structure, no crust, field pH 5.5, no inclusions, dry, clear boundary to;	5.5
	40-100	Reddish brown (5YR4/6), sandy clay, moderate to coarse angular blocky (5-10 mm), field pH 6.0, no inclusions, occasional orange mottles, moist. End of Borehole	6.0

4.1.13 SMU A2

Overview

This SMU is dark uniform clay associated with recent alluvial drainage lines with Brigalow duplex. Like SMU A1, it is located near alluvial plains and drainage areas (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- deep alkaline brown to black clay;
- pH is neutral with increasing alkalinity at depth;
- non saline at the surface but EC and chlorides become limiting beyond 50cm (GTES, 2011) and by 30 cm (Burgess, 2003);
- highly sodic with poor subsoil; and
- soil has satisfactory levels of organic matter and quite good levels of available major nutrients but with significant restrictions to rooting depth.

Representative Site

Site 21 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 32, and a soil profile description summary is presented in Table 33. The soil chemistry results for the sites are presented in Appendix E.

Table 32: Land Summary

Item	Description
SMU	A2
Representative Site Number	21
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Cultivation
Location	640296E 7515043N
Disturbance	Cleared Brigalow, belah scrub
Landform element /pattern	Level plain / alluvial plain
Micro relief	Nil
Permeability	Slow
Slope (%)	<1.0
Drainage	Imperfect
Surface coarse fragments	No coarse fragments reported
Surface condition	Cracking, weak crusting
Substrate	Alluvium
ASC Order (s)	Crusting black vertosol
Land suitability summary	**Estimated effective rooting depth**: 0.40-0.50 m **Estimated soil water storage:** 50 mm **Cropping suitability class**: 5 **Grazing suitability class:** 3 Preferred Use: Grazing **Agricultural Land Class**: *GTE assessment - C2*
Erosion potential	Laboratory results indicated. • ESP is low in the surface and upper subsoil layers and increases slowly down the profile becoming sodic below 0.4mbgl. *GTE assessment - Erosion potential through reviewing sodicity, soil texture and structure are considered low however slightly increasing with subsoils, appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*

Item	Description
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.30 mbgl Recommended topsoil use: Topsoil should only be retrieved from the upper 20 cm as salinity risk increases below this level. The material is suitable for use on lower sloping rehabilitation areas and should ideally be placed to a depth of 20 cm. Recommended subsoil strip depth: Nil Recommended subsoil use: The subsoil should not be considered due to increased salinity levels. Nil, no stripping recommendations for subsoils provided. *GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	442

Table 33: Soil Profile Description

Site 10	Depth (cm)	Description	pH
	0 – 2	A11, weak sandy crust, massive	7.0
	2 – 10	A12, dark greyish brown (10YR4/3), silty to sandy clay, strong sub-angular blocky (5-10 mm), no inclusions, moist, clear boundary change to;	7.5
	10-50	B21, very dark greyish brown (10YR3/1), medium heavy clay sandy, coarse and hard angular blocky (10-15 mm), field pH 8.0, moist, gradual boundary change to,	8.0
	50 – 90+	B22, greyish brown (10YR4/4), medium heavy clay, coarse angular blocky (10-15 mm), field pH 8.0, few mottles, dry. End of Borehole	8.0

4.1.14 SMU A2g

Overview

This SMU variant consists of crusting grey clay with sub dominant black clays soils on gently undulating alluvial plains with mixed shrubbery and woodlands. It was observed a minor sub-dominant colour of black soils in the SMU; however, this was aggregated in the larger dominant observed grey vertosol.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- deep alkaline grey clay (Sub-dominant black clay);
- pH is alkaline and levels increase with depth; and
- low levels of chloride increasing slightly with depth.

Representative Site

Site N1 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 34, and a soil profile description summary is presented in Table 35. The soil chemistry results for the sites are presented in Appendix E.

Table 34: Land Summary

Item	Description
SMU	A2g
Representative Site	N1
Representative Site photograph	
Location	641005mE 7512573mN
Current Use	Grazing
Site survey type	Detailed, 50 mm hand auger.
Vegetation	Mount coolabah, semi-cleared
Disturbance	Semi-cleared
Landform element / pattern	Very gently undulating plain / Open depression
Micro relief	Nil microrelief
Erosion	Nil erosion
Slope (%)	2.0/1.0
Drainage	Moderate
Surface coarse fragments	Nil coarse fragments
Surface condition	<10mm peds, cracking 2-6mm, crust
ASC Order (s)	Crusting Grey Vertosol (minor sub-dominant black vertosol [N1])
Land suitability summary	**Estimated effective rooting depth**: 1.00 m **Estimated soil water storage:** 120 mm **Cropping suitability / Regional frameworks class**: 3 **Grazing suitability class:** 2 **Agricultural Land Class**: A1
Erosion potential	Low to moderate based on surface crusting attributes
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.10 mbgl Recommended topsoil use: Suitable - Recommended for slope and level plain application. Recommended subsoil strip depth: 0.10-0.30 mbgl Recommended subsoil use: Subsoils may be marginal for use as supporting subsoils on level plains. Additional laboratory analysis for dispersive (ESP) attributes may allow soils to be used on slopes.

Item	Description
	Subsoils below 0.30 to 1.00 mbgl is suitable for capping waste rock due to strongly alkaline pH levels. Additional soil amelioration using powdered sulphur will reduce pH levels,
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	7

Table 35: Soil Profile Description for Site N1

Site N1 (Previously N1-SCL as per photo)									
Horizon Depth (m), Boundary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observations**
A11 0.00-0.02 Abrupt	Light clay	Moderate, firm<10mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottles Nil bleaching	Moderate moist, moderate	Few fine	0.02 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.09-1.00	Nil
A12 0.02-0.10 Abrupt	Light clay	Moderate, firm10-30mm sub-angular	<1% calcium carbonate	10YR2/2 Very dark brown Nil mottles Nil bleaching	Dry, moderate	Few fine	0.10 / 6.5		
B21 0.10-0.70 Abrupt	Medium clay	Moderate, firm10-30mm sub-angular	2% calcium carbonate nodules	10YR2/2 Very dark brown Nil mottles Nil bleaching	Dry, moderate	Very fine, very few	0.30 / 7.0 0.60 / 7.5		
B22 0.70-1.00 End of Borehole (EOBH)	Medium clay	Moderate, firm10-30mm sub-angular	2% calcium carbonate nodules	10YR4/2 Dark greyish brown Nil mottles Nil bleaching	Dry, moderate	Very fine, very few	0.90 / 7.5		

4.1.15 SMU A3

Overview

This SMU consists of deep loamy sands with active alluvial channels located to the north and one SMU to the south of the Project Site (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- deep loamy sand or duplex alluvial soils with buried layers;
- non-saline or sodic;
- productive grazing lands requiring sound management to prevent loss of the sandy upper horizon from erosion;
- fertility is reasonable; and
- flooding will occur regularly.

Representative Site

Site 52 was chosen as representative of this SMU. No samples were taken for analysis due to the minor distribution of this soil. Burgess (2003) reported that German alluvial soil was essentially neutral with low levels of soluble salts and non-sodic.

A land summary is presented in Table 36, and a soil profile description summary is presented in Table 37.

Table 36: Land Summary

Item	Description
SMU	A3
Representative Site Number	Site 52
Representative Site photograph	
Site survey type	Soil Pit
Vegetation	Blue gums, river oaks, poplar box and moreton bay ash
Location	641114E 7515890N
Disturbance	Open woodland
Landform element /pattern	Creek channel benches on drainage lines / alluvial plain
Micro relief	Nil
Permeability	High
Slope (%)	<0.5
Drainage	Slow
Surface coarse fragments	Nil
Surface condition	Loose, sandy
Substrate	Alluvium of sand, silt, clay and gravels
ASC Order (s)	Brown rudosol / tenosol
Land suitability summary	**Estimated effective rooting depth**: 0.70 m **Estimated soil water storage:** 70 mm **Cropping suitability class**: 5 **Grazing suitability class:** 3 Preferred Use: Natural Areas – Light grazing **Agricultural Land Class**: *GTE assessment - C3*
Erosion potential	Laboratory results indicated; • Calcium and magnesium ratio (as calculated using Burgess. (2003) SMU exchangeable cations, calcium and magnesium results of 2.3; • ESP is low throughout. *GTE assessment - Erosion potential through reviewing sodicity, soil texture and structure are considered*

Item	Description
	low. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.50 mbgl Recommended topsoil use: Topsoil strip depth may extend well past the nominated 50 cm strip depth although more intensive testing for EC and structural assessments should be conducted beforehand. The sandy loam topsoil may be taken until hard clayey subsoil is encountered. The material is suitable for use on most level to gently sloping rehabilitation areas and should ideally be placed to a depth of 20cm or more. Recommended subsoil strip depth: Nil Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	454

Table 37: Soil Profile Description

Site 52	Depth (cm)	Description	pH
	0 – 50	A11, Brown (7.5YR4/4), silty loam, loose, weak/ massive structure, well drained, no inclusions, dry, gradual boundary change to;	6.0
	50 – 120+	A12, Brown (7.5YR5/6), sandy clay, coarse angular blocky 10-15 mm), no inclusions. End of Borehole	7.0

4.1.16 SMU A4

Overview

SMU A4 consists of duplex dark grey sands with sandy loam subsoils near drainage lines.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture contrast loamy sands on sandy loam subsoils;
- pH is neutral with levels increasing with depth to strongly alkaline; and
- low levels of chloride increasing at 0.8 mbgl.

Representative Site

Site N17 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 38, and a soil profile description summary is presented in Table 39. The soil chemistry results for the sites are presented in Appendix E.

Table 38: Land Summary

Item	Description
SMU	A4
Representative Site	N17
Representative Site photograph	
Location	643797mE 7514822mN
Current Use	Grazing
Site survey type	Detailed, 50 mm hand auger.
Vegetation	Brigalow, Mount Coolibah
Disturbance	Nil disturbance
Landform element /pattern	Gently undulating plain, stream channel / depression
Micro relief	Nil microrelief
Erosion	Nil erosion
Slope (%)	<2% / <2%
Drainage	Well-moderate
Surface coarse fragments	No coarse fragments
Surface condition	Soft
ASC Order (s)	Black Sodosol
Land suitability summary	**Estimated effective rooting depth**: 0.30 - 0.60 m **Estimated soil water storage:** <50 mm **Cropping suitability / Regional frameworks class**: 5 **Grazing suitability class:** 5 **Agricultural Land Class**: C3
Erosion potential	Laboratory results indicated. • ESP is sodic within subsoils Erosion potential is assessed as low to moderate due to surface texture.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.00 mbgl Recommended topsoil use: Topsoil is not recommended due to the texture grade. Recommended subsoil strip depth: Nil Recommended subsoil use: Subsoils below 0.10 is suitable for capping waste rock due to increase in

Item	Description
	alkaline pH levels and sodic levels increasing from sodic to strongly sodic. Additional soil amelioration using powdered sulphur may reduce pH levels and fine grade gypsum may reduce sodicity.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	10

Table 39: Soil Profile Description for Site N17

Site N17									
Horizon Depth (m), Bound-ary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregati-ons**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observa-tions**
A1 0.00-0.10 Abrupt	Loamy sand	Massive, loose	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Yes	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.9-1.00	Nil
B21 0.10-0.20 Abrupt	Sandy loam	Moderate, very firm sub-angular <20mm	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Yes	0.20 / 8.5		
B21 0.20-0.47 Abrupt	Sandy loam	Moderate, very firm sub-angular <10mm	<10% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Yes	0.30 / 8.5		
B21 0.47-0.88EOBH	Sandy loam	Moderate, very firm sub-angular <10mm	<20% coarse fragments	10YR4/2 Brown Nil mottles / bleaching	Dry, well – moderate	Yes – 0.60m bgl	0.60 / 8.5		

4.1.17 SMU A4c

Overview

This SMU variant consists of dark grey, greyish brown sandy loams to sandy clay loams near drainage lines.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- Gradational texture contrast sandy loams to sandy clay loams;
- pH is neutral and levels increase with depth to alkaline; and
- low levels of chloride in topsoil with a slight increase at 0.9 mbgl.

Representative Site

Site N20 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

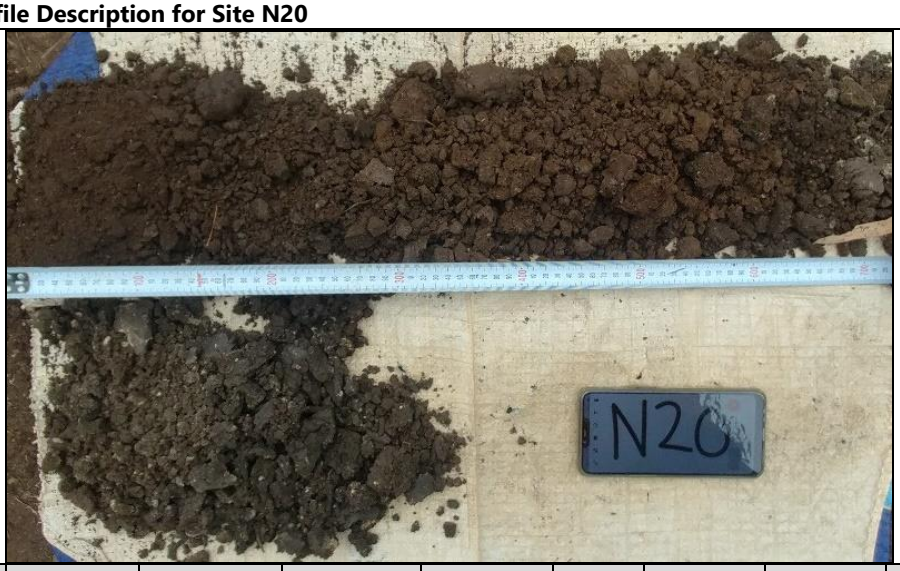
A land summary is presented in Table 40, and a soil profile description summary is presented in Table 41. The soil chemistry results for the sites are presented in Appendix E.

Table 40: Land Summary

Item	Description
SMU	A4c
Representative Site	N20
Representative Site photograph	
Location	642943mE 7513907mN
Current Use	Grazing
Site survey type	Detailed, 50 mm hand auger.
Vegetation	Brigalow
Disturbance	Nil disturbance, clearing nearby outside the immediate drainage line area
Landform element /pattern	Very gently undulating plain, Alluvial depression, stream channel
Micro relief	Nil microrelief
Erosion	Nearby sheet and gully erosion
Slope (%)	1.0 / 0.0
Drainage	Well to well and moderate
Surface coarse fragments	<10% <5mm
Surface condition	Soft
ASC Order (s)	Black Dermosol
Land suitability summary	**Estimated effective rooting depth**: 0.85 m **Estimated soil water storage:** 73 mm **Cropping suitability / Regional frameworks class**: 5 **Grazing suitability class:** 4 **Agricultural Land Class**: C3
Erosion potential	Laboratory results indicated. • ESP is low increasing to sodic below 0.68 mbgl to strongly sodic at 0.90 mbgl. Erosion potential is assessed as low.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.10 mbgl Recommended topsoil use: Highly suitable - Recommended for slope and level plain application. Recommended subsoil strip depth: 0.10–0.50 mbgl Recommended subsoil use: Suitable for support topsoil placement, slopes or level plains.

Item	Description
	Subsoils below 0.50 mbgl present strongly alkaline pH levels and force to disrupt peds greater than 3, suitable for capping waste rock.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	96

Table 41: Soil Profile Description for Site N20

Site N20									
Horizon Depth (m), Bound-ary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregati-ons**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observa-tions**
A1 0.00-0.12 Abrupt	Sandy loam	Weak to moderate, soft sub-rounded <10mm	Nil inclusions / segregation	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Yes	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.9-1.00	Nil
B21 0.12-0.37 Abrupt	Sandy loam	Moderate, firm sub-rounded <10mm	Nil inclusions / segregation	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Yes	0.20 / 8.5		
B22 0.37-0.68 Abrupt	Sandy loam	Moderate, firm sub-rounded <20mm	<2% calcium carbonate	7.5YR3/2 Dark brown Nil mottle / bleaching	Dry, well – moderate	Yes	0.30 / 8.5		
B23 0.68-0.85 Abrupt	Sandy clay loam	Moderate, very firm sub-rounded <20mm	<20% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate to imperfect	Yes	-		
B24 0.85-1.00 EOBH	Sandy clay loam	Moderate, very firm sub-rounded <20mm	<5% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate to imperfect	Nil	0.90 / 8.5		

4.1.18 SMU A5

Overview

This SMU consists of dark grey clay loams to grey brown clays in forested drainage line areas.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture contrast deep grey clay loams to grey brown clays;
- pH is alkaline increasing alkalinity at depth; and
- non sodic topsoils with sodicity levels increasing in subsoils.

Representative Site

Site N23 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 42, and a soil profile description summary is presented in Table 43. The soil chemistry results for the sites are presented in Appendix E.

Table 42: Land Summary

Item	Description
SMU	A5
Representative Site	N23
Representative Site photograph	
Location	642838mE 7513991mN
Current Use	Grazing
Site survey type	Detailed - 50mm hand auger
Vegetation	Mixed vegetation
Disturbance	Cropping nearby disturbance
Landform element / pattern	Depression
Micro relief	Nil microrelief
Erosion	Minor sheet erosion
Slope (%)	<1% / <1%
Drainage	Well to well-moderate
Surface coarse fragments	Soft, <10% cf <5mm
Surface condition	Firm, crust with minor self-mulching
ASC Order (s)	Grey Dermosol
Land suitability summary	**Estimated effective rooting depth**: 1.00 m **Estimated soil water storage:** 75-100 mm **Cropping suitability / Regional frameworks class**: 4 **Grazing suitability class:** 3 **Agricultural Land Class**: B
Erosion potential	Laboratory results indicated. • ESP is low to 0.50 mbgl, sodic to strongly sodic levels are below Erosion potential is assessed as low.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.10 mbgl Recommended topsoil use: Suitable - Recommended for slope and level plain application. Recommended subsoil strip depth: 0.10-0.45 mbgl Recommended subsoil use: Suitable for support topsoil placement, slopes or level plains.

Item	Description
	Subsoils below 0.50 mbgl present strongly alkaline pH levels, sodic soils and force to disrupt peds greater than 3, suitable for capping waste rock.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	8

Table 43: Soil Profile Description for Site N23

Site N23									
Horizon Depth (m), Bound-ary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregati-ons**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observa-tions**
A1 0.00-0.12 Abrupt	Clay loam	Weak, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.9-1.00	Nil
B21 0.12-0.48 Abrupt	Light clay	Weak to moderate, firm sub-rounded <10mm	<5% weathered rock	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
B22 0.48-1.00 EOBH	Light clay	Moderate, very firm sub-rounded <20mm	<5% calcium carbonate	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.60 / 8.5 0.90 / 8.5		

4.1.19 SMU B1

Overview

This SMU includes deep, well-structured medium clays on gently undulating plains with Brigalow, Belah softwood scrub. This SMU is in the southern area of the Project Site (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- deep uniform to slightly gradational black clays;
- pH is alkaline which increases with depth;
- non-saline or sodic at the surface and at depth although chloride levels are becoming moderate by 120 cm depth;
- satisfactory calcium to magnesium ratio and non-sodic; and
- low dispersion tendency indicated from R1 throughout the profile.

Representative Site

Site 1 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 44, and a soil profile description summary is presented in Table 45. The soil chemistry results for the sites are presented in Appendix E.

Table 44: Land Summary

Item	Description
SMU	B1
Representative Site Number	Site 1
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Small remnant Brigalow and belah softwood scrub
Location	642377E 7508687N
Disturbance	Mostly cleared with areas of cropping
Landform element /pattern	Midslope, gently undulating plain
Micro relief	Nil
Permeability	Moderate
Slope (%)	1.0-2.0
Drainage	Moderate
Surface coarse fragments	Possibly few small rounded ironstone and carbonate nodules.
Surface condition	Self-mulching
Substrate	Mixed sediments
ASC Order (s)	Black vertosol
Land suitability summary	**Estimated effective rooting depth**: 1.00 m **Estimated soil water storage:** 100 mm **Cropping suitability class**: 2 **Grazing suitability class:** 1 Preferred Use: Grazing with opportunistic cropping **Agricultural Land Class**: *GTE assessment - A1* *Regional Frameworks: 3*
Erosion potential	Laboratory results indicated; • ESP is low in the upper subsoil layers and increases slowly down the profile becoming sodic below 0.5 mbgl. *GTE assessment - Erosion potential for dispersion is assessed as low, increasing very slightly with depth. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU*

Item	Description
	for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.50 mbgl Recommended topsoil use: Excellent quality topsoil which could be taken deeper than the 50 cm nominated depth (up to 90cm) or double stripped. The material is suitable for use on all rehabilitation areas and should ideally be placed to a depth of 20 cm or more. Recommended subsoil strip depth: Nil Recommended subsoil use: Further testing is recommended to check for saline and sodic subsoil, otherwise current laboratory results suggest a subsoil stripping depth may be taken to 0.90 mbgl. *GTE recommendation – subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	711

Table 45: Soil Profile Description

Site 1	Depth (cm)	Description	pH
	0 – 5	A1, Brown (7.5YR4/2), light medium clay, <2 mm strong granular, no inclusions. clear boundary change to;	7.5
	5 – 40	B21, Dark brown (10YR3/2), medium clay, 3-5 mm strong angular blocky, field pH 7.5, no carbonate nodules, dry, clear boundary change to,	7.5
	40-100	B22, Dark brown (10YR3/2), medium heavy clay, 5-10 mm strong lenticular structure, field pH 8.0, some carbonate nodules, moist, gradual boundary change to,	8.0
	100 – 120+	B23, Greyish brown (10YR4/3), medium heavy clay, 10-15mm coarse angular blocky, field pH 8.5, increasing carbonate nodules. Moist. End of Borehole	8.5

4.1.20 SMU B2 & B2v

Overview

This SMU includes light brown sandy clay with coarser structured subsoils on uplands of mixed Brigalow scrub. This SMU includes a minor variant of thin red brown duplex soils along relic ridgelines. is in the southern area of the Project Site with the variant located adjacent to the west (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- light sandy to medium clay to 40 cm overlies coarse yellow clay. (B2v) and minor brown dermosol variant B2b;
- pH has strong alkaline reaction trend;
- low salinity and chlorides to at least 100 cm. A mappable variant, SMU B2s has increased salinity and chlorides at depth, >0.60 mbgl;
- moderately sodic by 80 cm and calcium to magnesium ratios suggest dispersive behaviour may occur although R1 dispersion are not high; and
- lower subsoil from 70 cm is sodic with hard coarse structure which would restrict rooting depth.

Representative Site

Site 27 was chosen as the most representative of this SMU and variant including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 46 and a soil profile description summary is presented in Table 47. The soil chemistry results for the sites are presented in Appendix E.

Table 46: Land Summary

Item	Description
SMU	B2
Representative Site Number	Site 27
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Cleared Brigalow and Dawson Gum
Location	642384E 7514949N
Disturbance	The area has been cleared
Landform element /pattern	Upper midslope, undulating plain
Micro relief	Minor linear gilgai may be present, but none were observed in detailed or check
Permeability	Slow
Slope (%)	2.0
Drainage	Imperfect
Surface coarse fragments	Some rounded ironstone
Surface condition	Blade ploughed
Substrate	Unconsolidated calcareous Tertiary sediments
ASC Order (s)	Brown dermosol
Land suitability summary	**Estimated effective rooting depth**: 0.70 m **Estimated soil water storage:** 070 mm **Cropping suitability class**: 4 **Grazing suitability class:** 2 Preferred Use: Grazing with opportunistic forage **Agricultural Land Class**: *GTE assessment - C1*
Erosion potential	Laboratory results indicated; • ESP is low in the topsoil layers and increases slowly down the profile becoming sodic below 0.8 mbgl. *GTE assessment - Erosion potential for dispersion is assessed as low, increasing very slightly with depth. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*

Item	Description
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.30 mbgl Recommended topsoil use: Topsoil should not be taken deeper than the 30 cm nominated depth as below this depth the subsoil is quite hard and coarse structured which would seal if placed on rehabilitation. The material is suitable for use on flatter rehabilitation areas as it tends to erode. It should ideally be placed to a depth of 20 cm or more Recommended subsoil strip depth: Nil Recommended subsoil use: Subsoils are not saline or sodic but are still not very good quality for reuse on rehabilitation. *GTE recommendation – subsoils may be used as supporting buried subsoils for topsoil placement or capping for waste rock to a depth of 1.00 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	377

Table 47: Soil Profile Description

Site 27	Depth (cm)	Description	pH
	0 – 20	AP, Yellowish brown (10YR6/4), weakly cracking fine sandy clay, 2mm weak blocky, field pH 6.5, no inclusions, dry, clear change to,	7.5
	20 – 40	B21, Yellowish brown (10YR6/4), medium clay - sandy, 5-10mm strong angular blocky, field pH 8.5, trace (5%) soft carbonate, moist, gradual change to,	7.5
	40-120	B22, Greyish brown (10YR5/4), medium heavy clay, 10-15mm coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist.	8.0

4.1.21 SMU B2g

Overview

This SMU consists of a grey and black duplex sandy loam to clay soils on gently undulating plains with mixed eucalyptus species. It was observed a minor sub-dominant colour of brown duplex soils in the SMU with check site to the north indicating that the area is small.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture contrast sandy loam on clay soils;
- pH is neutral to alkaline increasing depth;
- very low levels of chloride increasing slightly at 0.80 mbgl; and
- non sodic topsoils with sodicity levels increasing in subsoils.

Representative Site

Site N4 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 48, and a soil profile description summary is presented in Table 49. The soil chemistry results for the sites are presented in Appendix E.

Table 48: Land Summary

Item	Description
SMU	B2g
Representative Site	N4
Representative Site photograph	
Location	641871mE 7513601mN
Current Use	Grazing
Site survey type	Detailed, 50 mm hand auger.
Vegetation	Eucalyptus species
Disturbance	Semi-disturbed
Landform element /pattern	Very gently undulating plain mid-slope
Micro relief	Nil microrelief
Erosion	Nil erosion
Slope (%)	2.0/1.0
Drainage	Imperfect
Surface coarse fragments	2-6 mm coarse fragments
Surface condition	Soft
ASC Order (s)	Black Dermosol (with minor grey chromosol variant, site N4)
Land suitability summary	**Estimated effective rooting depth**: 1.00 mbgl **Estimated soil water storage:** 75 mm **Cropping suitability / Regional frameworks class**: 4 **Grazing suitability class:** 2 **Agricultural Land Class**: B
Erosion potential	Laboratory results indicated. • ESP is low in the surface and upper subsoil layers and increases down the profile becoming sodic below 0.8mbgl. Erosion potential is assessed as low to moderate due to sodic attributes increasing in subsoils.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.00 mbgl Recommended topsoil use: Not suitable due to texture grade of the surface. Alternate recommendation includes adding surface soils (0.00-0.15 mbgl) to a clay surface soils for

Item	Description
	rehabilitation reuse. Recommended subsoil strip depth: Nil Recommended subsoil use: Subsoils, unlike topsoil have value in they are assessed as suitable in 0.20-0.30 mbgl; however, the sodic conditions beneath 0.30 mbgl suggests that stripping of this subsoil layer would be very difficult and risk contamination from the soil layers above and below. Therefore, soils for the profile are recommended for capping waste rock unless soil amelioration to reduce sodicity (such as gypsum) is applied. Alternate recommendation includes adding in surface soils (0.00-0.15 mbgl) to a clay surface soils for rehabilitation reuse.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	24

Table 49: Soil Profile Description for Site N4

Site N4 (Previously N4-SCL as per photo)									
Horizon Depth (m), Boundary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observations**
A1 0.00-0.17 Abrupt	Sandy loam	Weak, soft <10mm sub-rounded	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/ bleach	Moderate moist, rapid	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil
B21 0.17-0.44 Abrupt	Light clay with minor sand	Moderate, firm <30mm sub-angular	<2% pale red nodules	10YR4/2 Dark greyish brown Nil mottles /bleach	Moderately moist, moderate	Very fine, very few	0.30 / 7.5		
B22 0.44-1.00 EOBH	Medium clay	Moderate, firm <30mm sub-angular	10-15% calcium carbonate nodules	10YR5/3 Brown Nil mottles/ bleach	Dry, moderate	Very fine, very few	0.60 / 7.5 0.90 / 7.5		

4.1.22 SMU B2s

Overview

This SMU variant consists of dark greyish brown weak to moderately structured clay soils on cleared gently undulating plains.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture contrast deep alkaline brown clay (Sub-dominant black clay);
- pH is neutral and levels increase with depth to marginally strongly alkaline;
- very low levels of chloride increasing slightly at 0.60 mbgl; and
- non sodic in surface soils, increasing to sodic subsoils.

Representative Site

Site N13 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 50, and a soil profile description summary is presented in Table 51. The soil chemistry results for the sites are presented in Appendix E.

Table 50: Land Summary

Item	Description
SMU	B2s
Representative Site	N13
Representative Site photograph	
Location	640940mE 7512735mN
Current Use	Grazing
Site survey type	Detailed - 50mm hand auger
Vegetation	Grasses
Disturbance	Extensive disturbance
Landform element / pattern	Gently undulating plains, mid-slope
Micro relief	Nil microrelief
Erosion	Nil erosion
Slope (%)	<2.0/<2.0
Drainage	Moderate – well
Surface coarse fragments	Nil coarse fragments
Surface condition	Firm, cracking
ASC Order (s)	Black Dermosol
Land suitability summary	**Estimated effective rooting depth**: 1.00 m **Estimated soil water storage:** 1.00-1.10 mm **Cropping suitability / Regional frameworks class**: 3 **Grazing suitability class:** 2 **Agricultural Land Class**: A1
Erosion potential	Laboratory results indicated. • ESP is low in surface soils however increases to sodic at 0.20 mbgl and below Erosion potential is assessed as low.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.15 mbgl Recommended topsoil use: Highly suitable - Recommended for slope and level plain application. Recommended subsoil strip depth: 0.15-0.60 mbgl Recommended subsoil use: Suitable for support topsoil placement on level plains.

Item	Description
	Subsoils between 0.20-0.60 mbgl may benefit from a low dosage of gypsum if erosive or dispersive soil attributes are observed during stripping or stockpiling. Subsoils below 0.60 mbgl present increase salt content levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	8

Table 51: Soil Profile Description for N13

Site N13									
Horizon Depth (m), Bound-ary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregati-ons**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observa-tions**
A1 0.00-0.15 Abrupt	Sandy clay loam	Weak to moderate. Soft, sub rounded <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles/ bleaching	Dry, well	Present	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.9-1.00	Nil
B21 0.15-0.75 gradual	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil	10YR3/2 Very dark greyish brown Nil mottles/ bleaching	Dry, moderate – well	Present	0.30 / 7.5 0.60 / 7.5		
B22 0.75-1.00 EOBH	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil	10YR3/2 Very dark greyish brown Nil mottles/ bleaching	Dry, moderate – well	Present	0.90 / 7.5		

4.1.23 SMU B2bl

Overview

This SMU consists of dark sandy clay with coarser structured clay subsoils on gently undulating plains.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- dark texture contrast sandy clays and clay loams on light sandy clays;
- pH is alkaline and increases with depth to strongly alkaline;
- very low levels of chloride increasing at 0.80 mbgl; and
- non sodic in surface soils, sodic in subsoils.

Representative Site

Site 91-SCL was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 52, and a soil profile description summary is presented in Table 53. The soil chemistry results for the sites are presented in Appendix E.

Table 52: Land Summary

Item	Description
SMU	B2bl
Representative Site	91-SCL
Representative Site photograph	
Location	643899mE 7510777mN
Current Use	Grazing
Site survey type	Detailed - 50mm hand auger
Vegetation	Cleared, nearby remnant Belah
Disturbance	Extensive disturbance
Landform element /pattern	Very gently undulating plain, mid-slope
Micro relief	Nil microrelief
Erosion	Nil erosion
Slope (%)	2.0/1.0
Drainage	Moderate
Surface coarse fragments	Nil coarse fragments
Surface condition	Firm
ASC Order (s)	Black Dermosol
Land suitability summary	**Estimated effective rooting depth**: 1.00 mbgl **Estimated soil water storage:** 70-100 mm **Cropping suitability / Regional frameworks class**: 4 **Grazing suitability class:** 3 **Agricultural Land Class**: B
Erosion potential	Laboratory results indicated. • ESP is low in surface soils with increasing with subsoils based on SCL sites N27 and 32-scl.

Item	Description
	Erosion potential is assessed as low.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.10 mbgl Recommended topsoil use: Suitable - Recommended for slope and level plain application. Recommended subsoil strip depth: 0.10-0.80 mbgl Recommended subsoil use: Suitable for support topsoil placement, slopes or level plains. Subsoils below 0.80 mbgl present increased salt content levels and strongly sodic levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	590

Table 53: Soil Profile Description for Site 91-SCL

Site 91-SCL									
Horizon Depth (m), Bound-ary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregati-ons**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observa-tions**
A1 0.00-0.12 Abrupt	Sandy Clay	Moderate, weak <20mm sub-angular	Nil inclusions and segregations	10YR2/1 Black Nil mottles /bleach	Dry, moderate	Few, fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.9-1.00	Nil
B21 0.12-0.50 Clear	Light sandy clay	Moderate, firm 20-50mm sub-angular	Nil inclusions and segregations	10YR2/2 Very dark brown Nil mottles/ bleach	Dry, moderate	Few, fine	0.30 / 6.5		
B22 0.50-1.00 EOBH	Light clay	Moderate, firm 20-50mm sub-angular blocky	<2% calcium carbonate nodules	10YR3/3 Dark brown Mottles <2% 10YR5/3 Brown Nil bleach	Dry, moderate	Very few, very fine	0.60 / 7.0 0.60 / 7.5		

4.1.24 SMU B3

Overview

This SMU includes clay plains often with gilgai which are mostly less than 0.4 m deep in Brigalow lowlands. This SMU is in the approximate centre of the Project Site located in four areas (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- gilgai 20 – 50 cm deep (mostly <40 cm) occupy up to 20 - 30% of surface;
- red brown mounds occupy 70-80% of surface and dark cracking depressions remainder;
- mounds are firm non-cracking sandy clay over coarse yellow clay, have reduced infiltration and will shed water rapidly. Mound positions are the major areas of pasture production;
- depressions are very dark, coarse crusting and cracking heavy clay. They are often bare of vegetation and have elevated salts, chlorides and sodicity at shallow depths (<30cm);
- pH has alkaline reaction trend (mound) and neutral becoming alkaline (depression);
- low salinity and chlorides to 40 cm but very high by 90 cm (mound) and Highly saline below 50 cm;
- moderately sodic at 30 cm and high by 80 cm (mound) and sodic from 20 cm (depression); and
- calcuim to magnesium ratios suggest structural restrictions below 50 cm (mound) and very low below 30 cm (depression).

Representative Site

Sites 222 and 223 were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 54, and a soil profile description summary for the mound and depression are presented in Tables 55 and 56. The soil chemistry results for the sites are presented in Appendix E.

Table 54: Land Summary

Item	Description
SMU	B3
Representative Site Number	Site 222 (mound) / 223 (depression)
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Brigalow regrowth / bare
Location	640300E 7520760N / 640300E 7520760N
Disturbance	The area has been cleared
Landform element /pattern	Relic alluvial plain
Micro relief	Inter-gilgai positions of gilgaied landform
Permeability	Very slow
Slope (%)	<0.5
Drainage	Poor
Surface coarse fragments	5-10% mixed gravels with ironstone / Some mixed gravels with ironstone and quartz
Surface condition	Firm sandy. Non-cracking Crusting and cracking
Substrate	Unconsolidated calcareous mixed sediments
ASC Order (s)	Brown dermosol
Land suitability summary	**Estimated effective rooting depth**: 0.70 m (mound) 0.40 m (depression) **Estimated soil water storage:** 85 mm (mound), 50 mm (depression) **Cropping suitability class**: 4 **Grazing suitability class:** 2 Preferred Use: Grazing with opportunistic forage **Agricultural Land Class**: *GTE assessment - C1*
Erosion potential	Laboratory results indicated; • ESP is low in the topsoil layers and increases significantly down the profile becoming sodic below 0.1 mbgl. *GTE assessment - Erosion potential for dispersion is assessed as low, increasing significantly with depth. Appropriate management of bare earths must be considered when stockpiling, specifically subsoils and*

Item	Description
	for reuse of this SMU for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.30 mbgl Recommended topsoil use: These soils are traditionally variable in quality – particularly between mounds and depression positions. The mounds are better quality than many other melon hole situations and are not excessively saline or sodic above about 50 cm depth. Nevertheless, topsoil should not be taken deeper than the 30 cm because of the risk of contamination from saline subsoil. The material is suitable for use on flatter rehabilitation areas as it tends to erode. It should ideally be placed to a depth of 20 cm or more Recommended subsoil strip depth: Nil Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	1,616

Table 55: Soil Profile Description - Mound

Site 222	Depth (cm)	Description	pH
	0 – 5	A1, Brown (10YR4/4), Sandy clay, weak sub-angular blocky, field pH 7.0, no inclusions, dry, clear change boundary to,	7.0
	5 – 40	B21, Brown (10YR4/3), medium clay, 5-10 mm strong angular blocky, trace soft carbonate, moist, clear change boundary to,	8.5
	40-100	B22, Greyish brown (10YR5/4), medium heavy clay, 10-15 mm coarse angular blocky, moderate calcareous concretions, moist. End of borehole.	8.5

Table 56: Soil Profile Description – Depression

Site 223	Depth (cm)	Description	pH
	0 – 4	A1, Dark brown (10YR3/2), fine sandy clay, <2 mm weak blocky, occasional (<2%) carbonate nodules, dry, clear boundary change to	8.0
	4 – 40	B21, Dark brown (10YR3/1), sandy medium clay, 5-10 mm strong sub-angular blocky / lenticular, trace soft carbonate, moist, clear boundary change to,	8.5
	40-100	B22, Greyish brown (10YR4/4), medium heavy clay, 10-20 mm coarse sub-angular blocky, moderate (5-10%) calcareous concretions, moist, End of borehole.	8.5

4.1.25 SMU B3bl

Overview

This SMU consists of black clay soils with gilgai microrelief on gently undulating plains of mixed regrowth.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- deep alkaline black clay;
- pH is alkaline and levels increase with depth; and
- very low levels of chloride increasing slightly at 0.80 mbgl.

Representative Site

Site 5-SCL was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 57, and a soil profile description summary is presented in Table 58. The soil chemistry results for the sites are presented in Appendix E.

Table 57: Land Summary

Item	Description
SMU	B3bl
Representative Site	5-SCL-M (Mound)
Representative Site photograph	
Location	641663mE 7508746mN
Current Use	Grazing
Site survey type	Detailed - 50mm hand auger
Vegetation	Grasses
Disturbance	Extensively disturbed
Landform element / pattern	Gently undulating plain, mid-slope
Micro relief	Gilgai microrelief present 40% coverage
Erosion	Nil erosion
Slope (%)	2% / 1%
Drainage	Well to moderately drained
Surface coarse fragments	Nil coarse fragments
Surface condition	Self-mulching with cracking
ASC Order (s)	Black Vertosol
Land suitability summary	**Estimated effective rooting depth**: 1.00 m **Estimated soil water storage:** 100 – 120 mm **Cropping suitability / Regional frameworks class**: 3 **Grazing suitability class:** 3 **Agricultural Land Class**: A1
Erosion potential	Low to moderate based on surface crusting attributes

Item	Description
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.10 mbgl Recommended topsoil use: Highly suitable - Recommended for slope and level plain application. Recommended subsoil strip depth: 0.10-1.00 mbgl Recommended subsoil use: Subsoils may be suitable for use as supporting subsoils on level plains. Additional laboratory analysis for dispersive (ESP) attributes may allow soils to be used on slopes.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	468

Table 58: Soil Profile Description for Site 5-SCL(Mound)

Site 5-SCL-M									
Horizon Depth (m), Boundary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observations**
A1 0.00-0.12 Abrupt	Light clay	Moderate, soft <20mm sub-angular	Nil inclusions and segregation	10YR2/1 Black Nil mottles / bleaching	Humid, Well drained	Common, medium	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.9-1.00	Nil
B21 0.12-0.60 Abrupt	Medium heavy clay	Moderate, Firm <30mm sub-angular	Nil inclusions and segregation	10YR2/2 Very dark brown Nil mottles / bleaching	Humid, Well drained	Few, medium	0.30 / 7.0		
B22 0.60-1.00	Medium heavy clay	Moderate, Firm <30mm subangular	<2% Calcium carbonate	10YR3/3 Dark brown Mottles: <2% 10YR5/3 Brown Nil bleach	Humid, Well - moderate drained	Few, fine	0.10 / 7.0		

4.1.26 SMU B4

Overview

This SMU includes clay plains with large melon holes on Brigalow lowlands. This SMU is in the approximate centre, centre-east and north portions of the Project Site (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

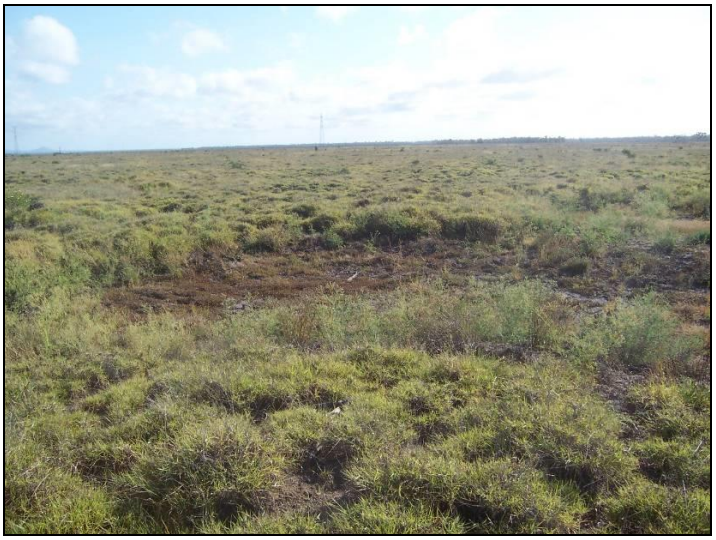
- melon holes > 50 cm deep are more common than in B3 and may occupy up to 60% of land surface;
- very hard and coarse yellow subsoils;
- mounds are brown and firm none or weakly cracking sandy clay;
- depressions are very dark, coarse crusting and cracking heavy clay. Little vegetation other than salt tolerant weeds is present;
- pH has an alkaline reaction trend (mound and depression); and
- mounds often saline by 20 cm depth and depressions from 50 cm.

Representative Site

Sites 117 and 118 were chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 59, and a soil profile description summary for the mound and depression are presented in Table 60 and 61. The soil chemistry results for the sites are presented in Appendix E.

Table 59: Land Summary

Item	Description
SMU	B4
Representative Site Number	Site 118 (mound) / 117 (depression)
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Cleared
Location	638593E 7516484N / 638626E 7516181N
Disturbance	Cleared
Landform element /pattern	Relic alluvial plain
Micro relief	Melan holes up to 90 cm deep.
Permeability	Very slow
Slope (%)	<0.5
Drainage	Poor
Surface coarse fragments	Minor gravels, some mixed gravels with ironstone and quartz
Surface condition	Firm, non-cracking
Substrate	Mixed sediments
ASC Order (s)	Black vertosol
Land suitability summary	**Estimated effective rooting depth**: 0.20 m (mound) 0.40 m (depression) **Estimated soil water storage:** 20 mm (mound), 40mm (depression) **Cropping suitability class**: 5 **Grazing suitability class:** 3/4 Preferred Use: Grazing **Agricultural Land Class**: *GTE assessment - C2*
Erosion potential	Laboratory results indicated; • ESP is in strongly sodic in the topsoil layers and decreases with depth in the mound profile becoming sodic below 0.3 m. ESP is non-sodic in topsoil and increases to moderate with depth in the depression profile becoming sodic below 0.2 m. *GTE assessment - Erosion potential for dispersion is assessed as moderate. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.*

Item	Description
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: 0.00-0.20 mbgl (mound) and 0.00 mbgl (depression) Recommended topsoil use: Melon hole soils often vary considerably between mounds and depression positions. The flat areas between depressions (mounds) offer rehabilitation potential however the dark crusting clay depressions should be avoided. It is important that stripping does not go too deep as useable topsoil will be contaminated. The material is preferred on flatter rehabilitation areas and should ideally be placed to a depth of 20 cm or more. Recommended subsoil strip depth: Nil Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	841

Table 60: Soil Profile Description - Mound

Site 118	Depth (cm)	Description	pH
	0 – 20	A1, Brown (10YR5/3), fine sandy clay, 2 mm granular, no inclusions, dry, clear boundary change to,	6.5
	20 – 50	B21, Dark brown (10YR3/2), medium clay- sandy, 5-10 mm strong angular blocky, moist, clear boundary change to,	7.5
	50-100	B22, Yellowish brown (10YR5/4), medium heavy clay, 10-20 mm very coarse angular blocky, moderate calcareous concretions, moist. End of borehole.	8.5

Table 61: Soil Profile Description – Depression

Site 223	Depth (cm)	Description	pH
	0 – 3	A1, Dark Brown (10YR3/2), fine sandy clay, 2-4 mm granular, field pH 6.5, no inclusions, dry, Cracking with weak sandy crust. medium heavy clay, granular, 10YR3/2 clear boundary change to,	8.0
	3 – 40	B21, Dark (10YR3/1), medium clay, 5 mm strong angular blocky, no inclusions, moist, clear boundary change to,	8.5
	40-100	B22, Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, 5% orange mottles. End of borehole.	8.5

4.1.27 SMU B5

Overview

This SMU consists of deep sandy clay loams with clay subsoils on gently undulating plains of tall woodlands.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture contrast deep sandy clay loams with clay subsoils;
- pH is alkaline and levels increase with depth;
- very low levels of chloride increasing slightly at 0.80 mbgl; and
- topsoil is marginally moderately sodic with levels decreasing to non-sodic in subsoils.

Representative Site

Site N43 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

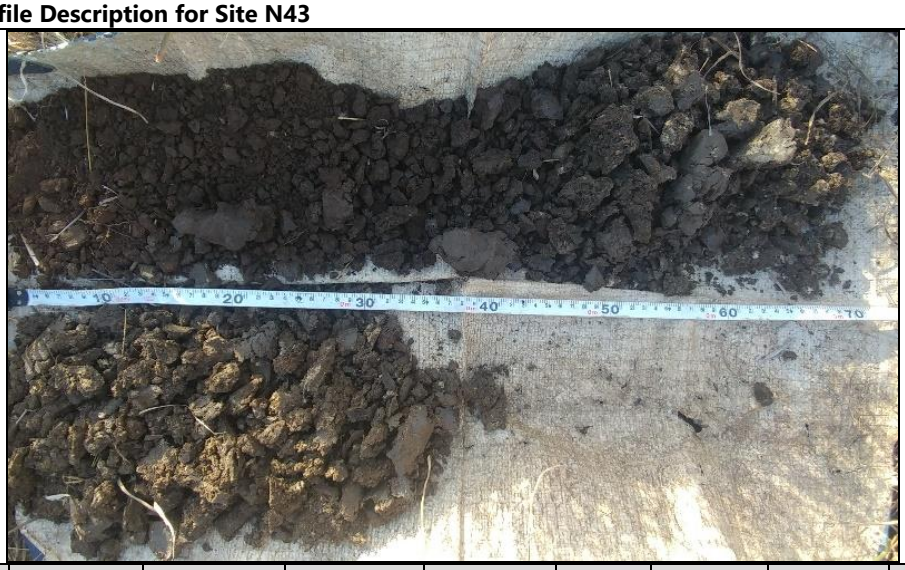
A land summary is presented in Table 62, and a soil profile description summary is presented in Table 63. The soil chemistry results for the sites are presented in Appendix E.

Table 62: Land Summary

Item	Description
SMU	B5
Representative Site	N43
Representative Site photograph	
Location	643716mE 7513193mN
Current Use	Grazing
Site survey type	Detailed - 50mm hand auger
Vegetation	Eucalyptus species
Disturbance	Semi disturbed,
Landform element /pattern	Gently Undulating Plains, Upper slope
Micro relief	Nil microrelief
Erosion	Nil erosion
Slope (%)	<2 / <2
Drainage	Well to well-moderate
Surface coarse fragments	Nil coarse fragments
Surface condition	Firm
ASC Order (s)	Black Dermosol
Land suitability summary	**Estimated effective rooting depth**: 1.00 m **Estimated soil water storage:** 50 - 90 mm **Cropping suitability / Regional frameworks class**: 4 Rainfed suitability class: 4 **Grazing suitability class:** 3 **Agricultural Land Class**: B
Erosion potential	Laboratory results indicated. • ESP is non-sodic at surface, however, increases to sodic in subsoils Erosion potential is assessed as non-dispersive surface soils and potential dispersive in subsoils.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: Nil Recommended topsoil use: Not suitable due to structure grade (Massive). Soil amelioration and mixing of other suitable topsoils may improve soils to 0.00-0.20 mbgl

Item	Description
	Recommended subsoil strip depth: 0.20-0.60 mbgl Recommended subsoil use: Subsoils, unlike topsoil have value in they are assessed as suitable in 0.20-0.60 mbgl; suitable for support topsoil placement, slopes or level plains. Subsoils below 0.60 mbgl present increase salt content levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	32

Table 63: Soil Profile Description for Site N43

Site N43									
Horizon Depth (m), Bound-ary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregati-ons**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observa-tions**
A11 0.0 – 0.06 Abrupt	Sandy clay loam	Massive	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil
A12 0.06 – 0.20 Gradual	Sandy clay loam	Weak, sub-rounded peds <10 mm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.20 / 7.5		
B21 0.20 – 0.46 Gradual	Sandy clay loam	Subangular blocky, moderate, peds <20 mm, firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.30 / 7.5		
B22 0.46 – 1.00 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, firm	<20% calcium carbonate	10YR3/3 Dark reddish brown Nil mottles / bleaching	Dry, well – moderate drained	Present	0.60 / 7.5 0.90 / 7.5		

4.1.28 SMU E1

Overview

This SMU includes deep (>50 cm) uniform sands and sandy loam duplex soils with tall eucalypt woodlands on relic alluvial plains. This SMU is in the approximate centre and trends north of the Project Site. It is in the far western portion of the Project Site (Figure 1). The SMU includes unmappable minor areas of the red variant, E1r.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- very deep sandy duplex or uniform coarse sandy loam;
- pH is slightly alkaline becoming neutral;
- salts and sodium increasing to moderate levels by 80 cm;
- exhibits low overall fertility and very low Cation Exchange Capacity; and
- non-saline, sodic or dispersive throughout.

Representative Site

Site 173 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 64, and a soil profile description summary is presented in Table 65. The soil chemistry results for the sites are presented in Appendix E.

Table 64: Land Summary

Item	Description
SMU	E1
Representative Site Number	Site 173
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box, silver leaf ironbark, bloodwood and moreton bay ash
Location	636794E 7521234N
Disturbance	Open woodland
Landform element /pattern	Relic alluvial plain
Micro relief	Nil
Permeability	High
Slope (%)	<1.0
Drainage	Rapid
Surface coarse fragments	No coarse fragments reported
Surface condition	Loose, sandy
Substrate	Alluvium
ASC Order (s)	Yellow Chromosol
Land suitability summary	**Estimated effective rooting depth**: 1.20+ m **Estimated soil water storage:** 60 mm **Cropping suitability class**: 5 **Grazing suitability class:** 3 Preferred use: opportunistic cropping and grazing **Agricultural Land Class**: *GTE assessment - C2*
Erosion potential	Laboratory results indicated; • ESP is sodic in the topsoil and decreases with depth profile becoming non-sodic below 0.40 mbgl. • Calcium and magnesium ratio are high to very high. *GTE assessment - Erosion potential for dispersion is assessed as low decreasing with depth. Appropriate*

Item	Description
	management of bare topsoil earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended soil strip depth: 0.00-0.50 mbgl Recommended soil use: The loose surface topsoil for reuse in mine rehabilitation may be stripped moist or dry. These soils offer large quantities of good porous material with a variety of applications in mine rehabilitation. Stripping depth will normally exceed 60 cm. The material is suitable for use on most rehabilitation areas as it tends to infiltrate water rapidly and remain loose. It should ideally be placed to a depth of 20 cm or more Recommended subsoil strip depth: 0.50 – 1.00 mbgl Recommended subsoil use: Possibly strip further to 1.00 mbgl. *GTE recommendation – subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	1,271

Table 65: Soil Profile Description

Site 173	Depth (cm)	Description	pH
	0 – 30	A11, Fine medium brown (10.5YR5/3) loose sandy loam, massive, no inclusions, dry, gradual boundary to;	7.5
	30 – 120	B21, Pale yellowish brown (10YR6/5), coarse sandy loam, loose, no inclusions, moist. End of borehole.	8.0

4.1.29 SMU E1r

Overview

This SMU consists of a texture contrast sandy loams over red clay subsoils on cleared gently undulating plains.

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- texture contrast sandy loams over red clay subsoils;
- pH is neutral and levels increase to marginally strongly alkaline with depth; and
- very low levels of chloride.

Representative Site

Site 10-SCL was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 66, and a soil profile description summary is presented in Table 67. The soil chemistry results for the sites are presented in Appendix E.

Table 66: Land Summary

Item	Description
SMU	E1r
Representative Site	10-SCL
Representative Site photograph	
Location	642525mE 7510097mN
Current Use	Grazing
Site survey type	Detailed, 50 mm hand auger.
Vegetation	Buffel Grass
Disturbance	Extensive disturbance
Landform element /pattern	Very gently undulating plain, Mid-slope
Micro relief	Nil microrelief
Erosion	Nil erosion
Slope (%)	2.0/1.0
Drainage	Moderate
Surface coarse fragments	Nil coarse fragments
Surface condition	Soft
ASC Order (s)	Red Chromosol (Brown Chromosol sub-dominant)
Land suitability summary	**Estimated effective rooting depth**: 1.00 m **Estimated soil water storage:** 70-100 mm **Cropping suitability / Regional frameworks class**: 4 **Grazing suitability class:** 3 **Agricultural Land Class**: B
Erosion potential	Erosion potential is low based on surface conditions. Review of SCL Sites N41 and N42 indicate low ESP throughout the soil profile.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended topsoil strip depth: Nil Recommended topsoil use: Not suitable due to the texture grade (Sandy). Soil amelioration and mixing of other suitable topsoils may improve soils to 0.00-0.15 mbgl Recommended subsoil strip depth: 0.15-1.00 mbgl Recommended subsoil use: Subsoils, unlike topsoil have value in they are assessed as suitable in

Item	Description
	0.15-1.00 mbgl; suitable for support topsoil placement, slopes or level plains.
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	40

Table 67: Soil Profile Description for Site 10-SCL

Site 10-SCL									
Horizon Depth (m), Boundary (Bdy)	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH / EC dS/m**	**Samples (m)**	**Observations**
A1 0.00-0.13 Abrupt	Sandy clay	Moderate, firm, <10mm sub-angular	<1% calcium carbonate nodules	10YR3/2 Very dark greyish brown Nil mottles/ bleach	Dry, moderate	Few, fine	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil
A2 0.13-0.39 Abrupt	Light sandy clay	Moderate, firm, <10mm sub-angular	Nil inclusion or segregations	10YR3/3 Dark Brown Nil mottles/ bleach	Dry, moderate	Few, fine	0.30 / 7.0		
B21 0.39-0.84 Abrupt	Light sandy clay	Moderate, firm, <10mm sub-angular	<10% calcium carbonate nodules	5YR4/4 Reddish brown Nil mottles /bleach	Dry, moderate	Few, fine	0.60 / 7.5		
B22 0.84-1.00 EOBH	Light clay	Moderate, firm, <10mm sub-angular	<2% calcium carbonate nodules	10YR4/4 Dark yellowish brown Nil mottles/ bleach	Dry, moderate	Very few, very fine	0.90 / 8.5		

4.1.30 SMU E2

Overview

This SMU includes dark cracking clays on basalt with mixed Mountain Coolibah on undulating plains. This SMU is in the most southern area of the Project Site (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- black well-structured clay over weathered calcareous material and fresh basalt;
- areas of linear gilgai may occur;
- pH is alkaline;
- salts and sodium increasing to moderate levels by 80 cm;
- very high cation exchange capacity below surface layer; and
- low dispersive percentage.

Representative Site

Site 110-SCL was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 68, and a soil profile description summary is presented in Table 69. The soil chemistry results for the sites are presented in Appendix E.

Table 68: Land Summary

Item	Description
SMU	E2
Representative Site Number	Site 110-SCL
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Previously mountain coolibah
Location	644308E 7508055N
Disturbance	Cultivation
Landform element /pattern	Gently undulating plain, flat
Micro relief	Nil
Permeability	Moderate
Slope (%)	1.0
Drainage	Moderately well drained
Surface coarse fragments	No coarse fragments reported
Surface condition	Cracking, fine self-mulching.
Substrate	Weathered calcareous material and basalt
ASC Order (s)	Black Vertosol
Land suitability summary	**Estimated effective rooting depth**: 0.90-1.00 m **Estimated soil water storage:** 100+ mm **Cropping suitability class**: 2 **Grazing suitability class:** 2 **Regional Frameworks class**: 3 Preferred Use: Opportunistic Cropping and grazing **Agricultural Land Class**: *GTE assessment - A1*
Erosion potential	Laboratory results indicated; • ESP is non-sodic in the topsoil and increases with depth profile becoming sodic below 0.30 mbgl. • Calcium and magnesium ratio are high throughout.

Item	Description
	GTE assessment - Erosion potential for dispersion is assessed as low increasing potentially with depth. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended soil strip depth: 0.00-0 40 mbgl Recommended soil use: These soils are high quality clay soils with a high moisture retention capacity however the establishment of permanent pasture cover on rehabilitation may take considerable time as problems occur with germination of fine seeded plants in the shrinking and swelling medium. The soils are often saline below 50 cm depth, so a depth cut from 40 cm is nominated. The material is more suited for use on flatter rehabilitation areas as it tends to erode, and the establishment of a protective surface cover may take longer than expected. It should ideally be placed to a depth of 20 cm or more. Recommended subsoil strip depth: Nil Recommended subsoil use: The soils are often saline below 50 cm depth Nil, no stripping recommendations for subsoils provided. *GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.25 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	710

Table 69: Soil Profile Description

Site 10	Depth (cm)	Description	pH
	0 – 20	A1, Dark Brown (10YR3/2), light medium / sandy clay with medium self-mulch at surface progressing to stronger sub-angular blocky, field pH 8.0, small quantity <2% carbonate nodules, dry, clear boundary to;	8.0
	20 – 120	B21, Black (10YR3/1), medium clay (sandy), strong sub-angular blocky to lenticular, field pH 8.5, 5% carbonate inclusions, moist, no boundary recorded,	8.5
	120-130	BC Pale yellowish brown (10YR6/3), weathered basalt, pH 8.5. End of borehole.	8.5

4.1.31 SMU E3

Overview

This SMU includes a sandy duplex which is shallower (< 50 cm), usually bleached with coarse hard clay subsoils supporting poplar box. This SMU is in the centre area of the Project Site (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- duplex soil on level plains under Poplar Box woodland and occasional Moreton Bay Ash or Bloodwood.
- neutral pH becoming slightly alkaline in lower subsoil;
- electrical conductivity and chloride very low throughout very high cation exchange capacity below surface layer;
- very low CEC in surface soil and only marginally increases;
- exchangeable sodium percentage indicates non-sodic conditions in the A horizon but dispersive and sodic below 40 cm; and
- calcium to magnesium ratios in the subsoil indicate dispersive behaviour.

Representative Site

Site 169 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 70 and a soil profile description summary is presented in Table 71. The soil chemistry results for the sites are presented in Appendix E.

Table 70: Land Summary

Item	Description
SMU	E3
Representative Site Number	Site 169
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box and occasional moreton bay ash.
Location	644308E 7508055N
Disturbance	Limited clearing
Landform element /pattern	Level plain
Micro relief	Nil
Permeability	Very slow
Slope (%)	<1.0
Drainage	Imperfect
Surface coarse fragments	No coarse fragments reported
Surface condition	Sandy – firm to hard setting
Substrate	Mixed relic alluvial sediments
ASC Order (s)	Brown sodosol
Land suitability summary	**Estimated effective rooting depth**: 0.40 m **Estimated soil water storage:** 30 mm **Cropping suitability class**: 5 **Grazing suitability class:** 4 Preferred Use: Light grazing **Agricultural Land Class**: *GTE assessment – C3*
Erosion potential	Laboratory results indicated; • ESP is non-sodic in the topsoil and increases with depth profile becoming sodic below 0.40 mbgl. • Calcium and magnesium ratio is high and decreases to moderate in subsoils *GTE assessment - Erosion potential for dispersion is assessed as low increasing potentially with depth. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU*

Item	Description
	for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended soil strip depth: 0.00-0.20 mbgl Recommended soil use: Stripping of these soils should not proceed into the clayey subsoil as the material is hard, impervious and generally dispersive. It is preferable to take less soil than risk contamination with the poor subsoil. Use should normally be limited to rehabilitation of level sites. Recommended subsoil strip depth: Nil Recommended subsoil use: As per topsoil recommendation, the clayey subsoil as the material is hard, impervious and generally dispersive Nil, no stripping recommendations for subsoils provided. *GTE recommendation – reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	381

Table 71: Soil Profile Description

Site 169	Depth (cm)	Description	pH
	0 – 40	A1, Dark Reddish Brown (5YR3/3), sandy loam, massive, no inclusions, dry, clear boundary change.	5.5
	40 – 45	A2, Sporadic bleaching; abrupt boundary to;	5.5
	45-100+	B21. Yellowish brown (10YR5/6), sandy clay, mottled, moderate blocky structure, no inclusions, moist. End of borehole.	6.0

4.1.32 SMU T1

Overview

This SMU occupies large areas across the survey area and occurs on 0 - 2% slopes. This soil unit includes extensive areas of remnant vegetation which is generally in a sound condition. This SMU is in the most far north western area of the Project Site (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- hard setting sandy loam surface layer often with bleached A2 over hard, coarse structured medium yellow clay often heavily mottled;
- neutral pH;
- electrical conductivity is non-saline;
- cation exchange capacity is very low to low;
- exchangeable sodium percentage indicates marginal sodic conditions which increase to highly sodic in subsoils below 10 cm; and
- calcium to magnesium ratios are very high in topsoil but decrease in subsoils.

Representative Site

Site 51 was chosen as the most representative of this SMU and variant including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 72, and a soil profile description summary is presented in Table 73. The soil chemistry results for the sites are presented in Appendix E.

Table 72: Land Summary

Item	Description
SMU	T1
Representative Site Number	Site PD-51 Peak Downs Site
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box mixed woodlands with associated ironbark bauhinia, Brigalow, Dawson Gum and buffel grass.
Location	n/a
Disturbance	No erosion or disturbance
Landform element /pattern	Level plain, flat
Micro relief	Nil
Permeability	*GTE assessment – moderate*
Slope (%)	0.0
Drainage	*GTE assessment – well to moderate*
Surface coarse fragments	No coarse fragments reported
Surface condition	Sandy loam, firm
Substrate	n/a
ASC Order (s)	Brown sodosol
Land suitability summary	**Estimated effective rooting depth**: 0.15-0.25 m **Estimated soil water storage:** 25-50 mm **Cropping suitability class**: 5 **Grazing suitability class:** 4 Preferred Use: n/a **Agricultural Land Class**: C3
Erosion potential	Laboratory results indicated; • ESP is non-sodic in the topsoil and increases with depth profile becoming sodic to highly sodic below 0.10 mbgl. • Calcium and magnesium ratio are high and decreases to moderate in subsoils. *GTE assessment - Erosion potential for dispersion is assessed as low in topsoils increasing with depth.*

Item	Description
	Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended soil strip depth: 0.00-0.20 mbgl Recommended soil use: The upper sandy loam may be stripped to the harder pale coloured clay subsoil. In most cases 20 cm of soil would be available for stripping. The preferred rehabilitation application is Flat sites only due to high erosion potential. Recommended subsoil strip depth: Nil Recommended subsoil use: Nil, no stripping recommendations for subsoils provided. *GTE recommendation – reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	7

Table 73: Soil Profile Description

Site PD-169	Depth (cm)	Description	pH
	0 – 30	A1, Fine Sandy Loam, 10YR4/4, massive structure, nil inclusions	6.0
	30 – 80	B21, Sandy Clay, 10YR4/4, coarse angular blocky, poorly drained, manganese nodules. End of borehole	6.5

4.1.33 SMU T2

Overview

This SMU main feature is the deep sandy surface horizons which extend to about 60 cm. Below a well-drained sandy loam surface layer (to 20 cm) is very hard and dense fine sandy loam which overlies mottled brown clay. The soil occurs along gently undulating plains up to 2% slopes and supports strong buffel pasture. This SMU is in the most northern area of the Project Site (Figure 1).

Soil Characteristics and Chemistry

The major characteristics from the available data indicate that this SMU has:

- deep sandy duplex soils in undulating plains of Poplar Box and Ironbark woodland;
- pH is alkaline becoming neutral in subsoils;
- electrical conductivity is non-saline throughout;
- high CEC in topsoil decreasing to very low in subsoils;
- exchangeable sodium percentage indicates marginal sodic conditions in topsoil to very low in subsoils; and
- calcium and magnesium ratios are high to very high.

Representative Site

Site 21 was chosen as the most representative of this SMU including the major soil dominant attributes which define the SMU for chemical analysis.

A land summary is presented in Table 74, and a soil profile description summary is presented in Table 75. The soil chemistry results for the sites are presented in Appendix E.

Table 74: Land Summary

Item	Description
SMU	T2
Representative Site Number	Site PD-21
Representative Site photograph	
Site survey type	Detailed. Hand auger.
Vegetation	Poplar box with associated ironbark, whitewood and bloodwood.
Location	617341E 7547648N
Disturbance	Good condition with 60% buffel cover
Landform element /pattern	Level plain, flat
Micro relief	Nil
Permeability	*GTE assessment – moderate*
Slope (%)	0.0
Drainage	*GTE assessment – moderate to well drained*
Surface coarse fragments	No coarse fragments reported
Surface condition	Firm/hard setting sandy
Substrate	n/a
ASC Order (s)	Brown sodosol
Land suitability summary	**Estimated effective rooting depth**: 0.20-0.30 m **Estimated soil water storage:** 40-80 mm **Cropping suitability class**: 5 **Grazing suitability class:** 3 Preferred Use: n/a **Agricultural Land Class**: C2
Erosion potential	Laboratory results indicated; • ESP is marginally sodic in the topsoil and decreasing with depth profile becoming non-sodic below 0.60 mbgl. • Calcium and magnesium ratio are high to very high. *GTE assessment - Erosion potential for dispersion is assessed as low in topsoils decreasing with depth. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU*

Item	Description
	for rehabilitation activities.
Soil quality for mine rehabilitation (For areas outside SCAs)	Recommended soil strip depth: 0.00-0.20 mbgl Recommended soil use: The T2 SMU at 10 – 20 cm horizon is a well-drained and higher quality soil which overlies very dense fine sandy loam. It is expected to set hard and seal if placed over rehabilitation. The preferred rehabilitation application is Flat sites only due to high erosion potential. Recommended subsoil strip depth:.0.20 – 0.60 mbgl Recommended subsoil use: The use of this soil beneath this horizon is not recommended due to hard sealing, however the salinity and sodicity are not major issues for this horizon. If a significant topsoil deficit exists in this area, the use of the subsoil (to the clay layer) may be considered. It may be useful to establish a trial of this material on rehabilitation to better establish its worth. *GTE recommendation – subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.*
AASS/PASS Assessment	*GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS*
Total area (ha)	22

Table 75: Soil Profile Description

Site PD-21	Depth (cm)	Description	pH
	0 – 50	A11, Fine sandy loam, 5YR4/4, massive structure, no inclusions/mottles, slight change to;	n/a
	50 – 80	A12, Fine sandy loam, 5YR5/4, weak structure, moderate drainage, no inclusions/mottles. End of borehole	n/a

4.2 Land Suitability Assessment

The following section summarises and includes any further assessment for land suitability assessments.

A land suitability assessment evaluates the capacity of land to sustain specific land uses such as cattle grazing and rainfed cropping.

Land suitability classes can be applied to parcels of land and are useful in determining post-mining land use options. A land suitability assessment has been undertaken for the identified SMUs in the Project Site. It aims to evaluate the land suitability of the Project Site for rainfed cropping and suitability for beef cattle grazing on improved pastures as outlined in the land suitability classification in the semi-arid tropics of Queensland.

4.2.1 Soils and Land Suitability Survey

An assessment of data collected on the physical, chemical and nutritional characteristics of the soil has been made to rank the land according to a five-class system that applies to grazing, rainfed cropping and conservation as per DME (1995), Shields and Williams (1991) and updated to GALE (2015).

These classes are described in Table 76.

Table 76: Land Suitability Classes, GALE (2015)

Class	Suitability	Limitations	Description
1	Suitable	Negligible	Suitable land with negligible limitations which is highly productive requiring only simple management practices to maintain economic production.
2	Suitable	Minor	Suitable land with minor limitations which either reduce production or require more than the simple management practices of Class 1 land to maintain economic production.
3	Suitable	Moderate	Suitable land with moderate limitations which either further lower production or require more than those management practices of Class 2 land to maintain economic production.
4	Unsuitable	Severe	Marginal land with severe limitations which make it doubtful whether the inputs required to achieve and maintain production outweigh the benefits in the long term (presently considered unsuitable due to the uncertainty of the land to achieve sustained economic production).
5	Unsuitable	Extreme	Unsuitable land with extreme limitations that preclude its use for the proposed purpose.

Existing soils surveys have been assessed based on the LSAT (DME 1995) of suitability for rainfed broadacre cropping and suitability for beef cattle grazing on improved pastures consider the following parameters:

- water availability (m);
- nutrient deficiency (n);
- soil physical factors (p);
- soil workability (k);
- salinity (sa);
- rockiness (r);
- microrelief (g);

- wetness (w);
- water erosion (e);
- flooding (f); and,
- vegetation (v).

The following assessments were used to support the land suitability summary:

- BHP Billiton Mitsubishi Alliance (2012), Saraji East EIS Project, Chapter 4 Land Resources;
- BHP Billiton Mitsubishi Alliance (2012), Peak Downs High Wall Areas, Soil and Land Suitability Survey; and
- Emmerton, B (2005) Soil and Land Suitability Survey, in Potential Disturbance Areas in Advance of Mining, Saraji Mine 2004 Survey.

Existing SCL assessment, GT Environmental (2021) SCL Assessment, Saraji East Project did not include a land suitability assessment, therefore it has been undertaken with the following references;

- An assessment based on the cropping examples outlined in the suitability framework for the Inland Fitzroy and Southern Burdekin area for cropping based on six subclasses (crops selected from the regional frameworks; and,
- An assessment for rainfed cropping and beef cattle grazing using the superseded LSAT (DME, 1995) beef cattle grazing land suitability frameworks for semi-arid sub tropics of Queensland.

The land uses assessed included all thirteen crops nominated from the Regional Frameworks including barley (dryland), chickpea (dryland), cotton (furrow irrigated), Maize (dryland), millet (dryland) mungbean (dryland), oat (dryland), safflower (dryland), sorghum (dryland), soybean (dryland) sunflower (dryland) Triticale (dryland) and wheat (dryland).

The following land attributes have been considered where applicable based on available information, on the suitability of the Inland Fitzroy and Southern Burdekin area, include:

- Water erosion (E);
- Erosion hazard, subsoil erodibility (Es);
- Soil water availability (M);
- Narrow moisture range (Pm);
- Surface Condition (Ps);
- Rockiness (R);
- Microrelief (Tm); and,
- Wetness (W).

As outlined in the suitability frameworks, water erosion was assessed using slope as recorded by clinometer, ESP laboratory results where available for dispersion and soil structure.

The suitability assessment of each SCL SMU for the various land management options have been summarised in Tables D-1 to D-12 and presented in Appendix G.

4.2.2 Land Suitability Summary

The suitability and major limiting factors of existing SMUs for rainfed cropping and grazing of improved pastures is shown in Table 77; this is based on the land suitability classes detailed in Table 76 and the parameters listed in Section 4.2.1.

SMUs and variants observed in SCL fieldwork have been assessed based on available soil data and are presented in Table 78, 79 and 80. These are presented in Figure 2 and Figure 3.

Table 77: Land Suitability Limitations and Classes

SMU	Rainfed Cropping		Grazing of Improved Pastures	
	Limitations	Suitability Class	Limitations	Suitability Class
2/20	m4, n2-3, p3 minor p2, k2, sa2, w3, e3	4	m3, n1-3, p2, w2, e2, v2	3
3	m5 slight m4, n4, p1-2, w3, e3 occasional e5	5	m3-4, n4, p1-2, w2, e2 minor e5, v2	4, minor 5 in eroded or drainage areas
4	m4, n1-2, p2-3, k2, sa3, g2, w2, e1-2	4	m3, n1 minor n3, p2, sa2, v2	3
5	m4, n2, p3, k2-3, sa3-4, w2-3, e3	4	m3, p2-3, sa2-3, w2, v2	3
8	m5, n2-3, p3, k2-3, sa1-4, e3-5	5	m4, n2, p2, sa1-3, w1-2, e4-5, v2	5
12	m4-5, n4, p1-2, w3, e2 occasional e5, f2 occasional f5	5	m3, n4, p1-2, w2, e1 occasional e5, some f2, v2	4 on levees, 5 on creek banks
13	m4 minor m5, n2-3, p3, k2, sa2-3, w3, e2 occasional e5, f2 occasional f5	4 on levees, 5 on creek banks	m3 minor m4, n1-3, p2, sa1-2, w2, e1 occasional e5, occasional f2, v3	3 on levees, 5 on creek banks
16/23	m4, n3, p3, k2, w2, f2, e2 occasional e5	4, minor 5 on stream banks	m3, n2-3, p2, w2, e1 occasional e4 and e5, v2	3, some 4 and 5 on stream banks and the overlain variant
17	m4-5, n2, p3, k3, sa1-3, w4	5	m3-4, n2, p3, sa1-2, w3	4
18	m4 minor m5, n3, e2-5, f2-5	4 on levees, 5 on creek banks	m3, n2-3, e1-4, f2, v1-2	3 on levees, 4 on creek banks
19	m4, n4, e2	4	m3, n2-3, v1-2	3
A1	m5, n2, e4	5	m3, n2, e3	3
A2	m5, f3, e3, p2, n2, t3	5	m3, f3, e3, p2, n2, t3	3
A3	m5, n4, p4, f5	5	m3, n3, p2, f2	3
B1	m2, n2, p2	2	m1, n1, p1	1
B2 & (B2V)	m4, k3, e2, n2	4	m2, e2, n2	2
B3	m4, k3, e2, n3, g4	4	m2/3, e2, n2, g3, v3	2
B4	m5, s5, n3, g5, k5, e3, w5	5	m3/4, s3, n3, g3, e3, w3, v3	3

SMU	Rainfed Cropping		Grazing of Improved Pastures	
	Limitations	Suitability Class	Limitations	Suitability Class
E1	m5, n5, n4	5	m3, n3, n3	3
E1r	m4	4	M3	3
E2	m2, n2, p2	2	m1, n1, p2	2
E3	m5, n5, e4, pd4	5	m4, n3, e3	4
T1	m5, e2, n3, p4	5	m4, e2, n2, p2	4
T2	m5, e2, n3, p4	5	m3, e2, n2, p2	3

Regional Frameworks Assessment

Review of the *Regional Land Suitability Frameworks for Queensland* (DNRM 2013) for the Inland Fitzroy and Southern Burdekin area indicates limitations relating to cropping land activities. Cropping land uses may include cotton, maize, mung bean, safflower, sorghum, soybean and sunflower. Marginal cropping land uses may include barley, chickpea, millet, oak and wheat. The ten additional SMUs and variants in the GTE SCL fieldworks were assessed against this framework.

The additional assessment of SMUs B1 and E2 based on their dryland broadacre grain cropping class was also completed. All other SMUs identified are considered suitability for suitable for beef cattle grazing activities and therefore not considered for review. These assessments are presented in Appendix G and summarised in Table 78.

Table 78: Land Suitability Classes, GTE SCL Regional Frameworks Assessment Summary

SMU	Suitability subclasses for different land use summary													
	Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat	Overall Class
A2g	4	4	3	3	4	3	4	3	3	3	3	4	4	3
A4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
A4c	5	5	4	5	5	5	5	5	5	5	5	5	5	5
A5	5	5	3	4	5	4	5	4	4	4	4	5	5	4
B2g	4	4	3	4	4	4	4	4	4	4	4	4	4	4
B2s	4	4	3	3	4	3	4	3	3	3	3	4	4	3
B2bl	5	5	3	4	5	4	5	4	4	4	4	5	5	4
B3bl	4	4	3	3	4	3	4	3	3	3	3	4	4	3
B5	4	4	3	4	4	4	4	4	4	4	4	4	4	4
E1r	5	5	3	4	5	4	5	4	4	4	4	5	5	4

SMU	Suitability subclasses for different land use summary													
	Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat	Overall Class
B1	4	4	3	3	4	3	4	3	3	3	3	4	4	3
E2	4	4	3	3	4	3	4	3	3	3	3	4	4	3

Land management options for SMUs and variants A2g, B1, B2s, B3bl and E2 are assessed as suitable to marginally suitable for multiple land uses outlined in the regional frameworks for the Project Site.

Land management options for SMUs and variants A5, B2g, B2bl, B5 and E1r are assessed as overall unsuitable for the majority of land uses, however are able to support cotton by furrow irrigation.

SMUs A4 and A4c are assessed as marginally or unsuitable for land uses outlined in the regional frameworks for the Project Site.

Review of rainfed cropping land suitability classes, LSAT

Review of the Project Site ten additional SMUs and variants identified in the GTE SCL fieldworks were assessed against this superseded suitability for rainfed cropping LSAT (DME 1995) presented in Table 79.

Table 79: SMU, Suitably for Rainfed Cropping Summary (LSAT [DME, 1995])

SMU	Water Availability	Nutrient Def	Physical Factors	Soil Workability	Salinity	Rockiness	Microrelief	Wetness	Topography	Water Erosion	Flooding	Rainfed Cropping Class
A2g	3	-	2	2	1	1	1	1[1]	2	1	3	3
A4	5	-	1	1	1	1	1	3	2	3	2	5
A4c	5	-	1	1	1	1	1	2	2	2	2	5
A5	4	-	1	1	1	1	1	2	1	1	1	4
B2g	4	-	1	1	1	1	1	1	1	2	1	4
B2s	3	-	1	1	1	1	1	2	1	2	1	3
B2bl	4	-	1	1	1	1	1	2[2]	1	2	1	4
B3bl	3	-	2	1	1	1	3	3	1	2	1	3
B5	4	-	1	1	1	1	1	1	1	2	1	4
E1r	4	-	1	1	1	1	1	1	1	2	1	4

1 – Assessment was undertaken using available on topography and similar SMUs with available ESP laboratory data.
2 – Assessment undertaken using analysed sites within the SCL map unit 6, which has ESP laboratory analysis.

SMUs A2g, B2s and B3bl were assessed as Class 3 with moderate limitations relating to water availability.

SMUs A5, B2g, B2bl, B5 and E1r were assessed as Class 4 with severe limitations relating to water availability. These limitations include water availability.

SMUs A4 and A4c were assessed as Class 5 with extreme limitations in water availability.

Review of beef cattle grazing land suitability classes, LSAT

Review of the Project Site ten additional SMUs and variants identified in the GTE SCL fieldworks were assessed against this superseded Suitability for Beef Cattle Grazing LSAT (DME 1995) presented in Table 80. This assessment will assist in specifically assessing the limitations for cattle beef grazing and assists in determining the ALC with the regional frameworks overall class.

Table 80: SMU, Suitably for Beef Cattle Grazing Summary (LSAT [DME, 1995])

SMU	Water Availability	Nutrient Def	Physical Factors	Salinity	Rockiness	Gilgai	pH	ESP	Wetness	Water erosion	Flooding	Beef Cattle Grazing Class
A2g	2	-	2	1	1	1	2	1	2	1	2	2
A4	5	-	1	1	1	1	3	1	2	1	2	5
A4c	4	-	1	1	1	1	3	1	2	1	2	4
A5	3	-	2	1	1	1	3	1	1	1	1	3
B2s	2	-	2	2	1	1	2	1	1	1	1	2
B2g	2	-	1	1	1	1	2	1	1	1	1	2
B2bl	3	-	3	1	1	1	3	1	1	1	1	3
B3bl	2	-	3	1	1	2	3	1	1	1	1	3
B5	2	-	1	1	1	1	3	2	1	2	1	3
E1r	3	-	2	1	1	1	2	1	1	1	1	3

SMUs A2g, B2s and B2g were assessed as Class 2 with minor limitations relating to water availability, physical factors, salinity, pH, wetness and flooding.

SMUs A5, B2bl, B3bl, B5 and E1r were assessed as Class 3 with moderate limitations. These limitations include water availability, physical factors and pH and.

SMUs A4c was assessed as Class 4 with severe limitations in water availability and SMU A4 was assessed as Class 5 with extreme limitations in water availability.

Agricultural Land Classes Summary

Agricultural land classes (ALC) based on guidelines in GALE (2015) relate to the suitability of land for specified agricultural uses. The classification rates the ability of land to maintain a sustainable level of productivity. The factors used to classify agricultural land suitability are the soil, topographic and climatic limitations. The classification ranges from A to D and the descriptions are detailed in Table 81.

Table 81: Agricultural Land Classes

Agricultural Land Class	Land Suitability (Cropping)[2]	Land Suitability (Grazing)[2]	Description[1]
A	-	-	Crop land - Land that is suitable for a wide range[3] of current and potential crops with nil to moderate limitations to production.
A1	1-3	1-3	Suitable for a wide range of current and potential broadacre and horticultural[4] crops.
A2	1-3	1-3	Suitable for a wide range of current and potential horticultural crops only.
B	3-4	1-3	Limited crop land - Land that is suitable for a narrow range[5] of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops
C	-	-	Pasture land - Land that is suitable only for improved or native pastures due to limitations that preclude continuous cultivation for crop production. Some areas may tolerate a short period of ground disturbance for pasture establishment.
C1	4-5	1-2	Suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils.
C2	4-5	3	Suitable for grazing native pastures, with or without the introduction of pasture species, and with lower fertility soils than C1.
C3	4-5	4-5	Suitable for light grazing of native pastures in accessible areas and includes steep land more suited to forestry or catchment protection.
D	5	5	Non-agricultural land[6] - Land not suitable for agricultural use, including land alienated from agricultural use.
A/C **A/D** **B/C** **C/D**	-	-	Land that is a complex of class A, B, C or D land where it is not possible to delineate the land class at the map scale. The dominant class is the first code in the sequence and is assumed to be >50% of the area, but <70%[7].

[1] Sourced from Guidelines for agricultural land evaluation in Queensland (2nd edn). DNRM (2015).
[2] Land suitability classes are a guide to assess ALC. Class 3/4 and 4/5 thresholds may be reviewed as either crisp (clear or distinct) boundaries or if results are marginal and show gradational characteristics, attributes are assessed as such.
[3] A wide range of crops is four or more crop types of local commercial significance.
[4] Horticulture includes intensively grown small crops (e.g. vegetables) as well as tree crops (e.g. grown for nuts, seeds or fruit). Silviculture (plantation forestry) is not included.
[5] A narrow range of crops is three or fewer crop types (broadacre or horticulture) of local commercial significance. Silviculture (plantation forestry) may be included. Crops with similar agronomic requirements e.g. maize and grain sorghum, peaches and nectarines are not generally regarded as different crop types. Different management regimes (including irrigation strategies) for the same crop do not increase the number of crops.
[6] Non-agricultural land includes land that cannot be placed in any of the other land classes and includes land such as urban areas and stream channels.
[7] In cases where two or more land classes are equally dominant, and none are greater than 50%, judgement is used to identify the most appropriate agricultural land class/es for the unit.

The GTES (2012) assessment did include a specific assessment of ALC in the land suitability section for SMUs T1 and T2 in accordance with the Planning Guidelines: The identification of Good Quality Agricultural Land (DLGP and DPI, 1993). Soil report assessments for Emmerton. B (2004) and GTES (2011) did not include a specific assessment of ALC in their associated land suitability sections.

GTE reviewed the information available in Tables 77, 78, 79 and 80 against the ALCs in Table 81 and provided the following assessment below for ALCs. The summary assessment and results for each SMU and variant is presented in Table 82 and Figure 4.

Table 82: Agricultural Land Assessment

Agricultural Land Assessment		
Agricultural Land Class	**Soil Mapping Unit (SMU)**	**Area (ha)**
A1	A2g, B1, B2s, B3bl and E2	1,904
A2	-	-
B	A5, B2g, B2bl, B5 and E1r	693
C1	2 (20), 4, 5, 19, B2 (B2v) and B3	2,452
C2	17, A1, A1v, A2, B4, E1 and T2	3,043
C3	8, A3, A4, A4c, E3 and T1	1,129
D	-	-
Complex Units		
C1/C2	18	33
C1/C3	13 and 16 (23)	132
C2/C3	3 and 12	117

Land management options for SMUs B1 and E2 (and variants A2g, B2s and B3Bl) are assessed as suitable to marginally suitable for land uses outlined in the regional frameworks and rainfed cropping (LSAT, 1994) for the Project Site with soil water availability being the greatest limitation. This limitation was based on the plant available water capacity (PAWC) attributes with the least acceptable PAWC for Class 3 cotton-furrow assessed at 75-100mm.

Cropping land uses may include cotton, maize, mung bean, safflower, sorghum, soybean and sunflower. Marginal cropping land uses may include barley, chickpea, millet, oak and wheat.

SMUs A5, B2bl, B2g, B5 and E1r were assessed as suitable for limited cropping, cotton by furrow irrigation due to PAWC limitations.

All other SMUs identified were considered were considered suitable for beef cattle grazing activities either as simple or complex (consisting of two classes) units.

4.2.3 Soils and Land Suitability Survey Project Site Summary

Table 83 summarises the Project Site SMUs cropping, grazing, ALCs and where relevant regional framework suitable subgroups.

Table 83: Land Suitability Summary for Project Site

Soil	Concept	Rainfed Cropping Class	Beef Cattle Grazing Class	ALC	Regional Frameworks
2/20	Light sandy clay loam duplex soils to non-cracking clays on unconsolidated Cainozoic sediments	4	3	C1	-
3	Sandy loam surfaced duplex soils on unconsolidated Cainozoic sediments	5	4, minor 5 in eroded or drainage areas	C2/C3	-
4	Cracking clays with minor gilgai supporting Brigalow and Dawson Gum	4	3	C1	-
5	Cracking and non-cracking clays supporting Dawson Gum and Brigalow on deep Tertiary clays	4	3	C1	-
8	Clay loam duplex soils on sediments supporting Dawson Gum and Brigalow (breakaway areas)	5	5	C3	-
12	Sandy loam surfaced duplex soils on reworked Cainozoic sediments supporting poplar box	5	4 levees, 5 on creek beds	C2/C3	-
13	Hard-set silty duplex supporting mixed species (heavy shrub layer)	4 levees, 5 on creek banks	3 levees, 5 on creek banks	C1/C3	-
16/23	Fine sandy loam to silt loam surfaced duplex and gradational soils (older alluvial duplex soils)	4, minor 5 on stream banks	3, some 4 and 5 on stream banks and overlain banks	C1/C3	-
17	Minor clay soils in anabranches	5	4	C2	-
18	Loamy sands, loams and gradational soils on stream banks and near stream levees	4 levees, 5 on creek banks	3 levees, 5 on creek banks	C1/C2	-
19	Loamy sand gradational soils present as relict alluvial levees	4	3	C1	-
A1 & A1V	Poplar box on deep duplex loams	5	3	C2	-
A2	Alluvial Brigalow clay drainage lines	5	3	C2	-
A2g	Variant of SMU A2, colour of soil profile is brown	3	2	A1	3
A3	Alluvial loamy creek channels	5	3	C3	-
A4	Dark brown sands with sandy loam subsoils near drainage lines	5	5	C3	5
A4c	Variant of SMU A4, texture includes higher clay percentage	5	4	C3	5
A5	Dark grey clay loams to grey brown clays in forested drainage line areas	4	3	B	4
B1	Undulating clay plains under Brigalow or belah	2	1	A1	3
B2 & B2V	Mixed Brigalow scrub on brown cracking clays	4	2	C1	-
B2g	Variant of SMU B2, colour of soil profile is black, with minor sub-dominant grey	4	2	B	4

Soil	Concept	Rainfed Cropping Class	Beef Cattle Grazing Class	ALC	Regional Frameworks
B2s	Variant of SMU B2, increase of salt content in subsoils	3	2	A1	3
B2bl	Variant of SMU B2, colour of soil profile is black	4	3	B	4
B3	Cracking dark Brigalow clays with gilgai	4	2	C1	-
B3bl	Variant of SMU B3, colour of soil profile is black	3	3	A1	3
B4	Melon holed Brigalow clay plains	5	3/4	C2	-
B5	Deep sandy clay loams with clay subsoils on gently undulating plains of tall woodlands	4	3	B	4
E1	Eucalypt woodlands on deep sandy loams	5	3	C2	-
E1r	Variant of SMU E1 over red clay subsoils on gently undulating plains	4	3	B	4
E2	Mt coolibah on dark basalt soils	2	2	A1	3
E3	Poplar box on shallower loams	5	4	C3	-
T1	Sandy hard duplex poplar box	5	4	C3	-
T2	Deep sandy duplex plains with poplar box and ironbark	5	3	C2	-

4.3 Topsoil and Subsoil Stripping Depth Assessment

Areas to be disturbed as a result of infrastructure facilities, water dams and rail line loop will require stripping of the topsoil and possibly subsoil, this will be segregated and stored for rehabilitation reuse. Therefore, all SMUs in the Project Site have been assessed as the reports have outlined their suitability for stripping and reuse for rehabilitation purposes.

Soil stripping, stockpiling and replacement will follow a detailed topsoil management plan which takes into account the areas to be disturbed, based on disturbance type, the volumes of soils required for eventual rehabilitation, the management of stockpiling soils, area of placement and volumes of topsoil material to be stripped.

4.3.1 Soil Stripping of Mapped SCL within and outside the Project Site.

Any disturbance or stripping of soil within SCA areas is only allowed as per the existing, approved Regional Interests Development Approval (RIDA), as outlined in the Restoration Plan to Support RIDA Application Saraji East Project (GTE, 2021) and RPI 19/001.

There are no further SCA areas that are approved by RPI 19/001, outside of the project site disturbance footprint that can be disturbed for stripping and stockpiling. Any disturbance of SCA not subject to an existing RIDA would require separate approval under the Regional Planning Interests Act (2014).

4.3.2 Existing soil mapping unit stripping recommendations

The Project Site contains soils from deep uniform to gradational loamy earths, duplex soils to uniform clay soils. The sections below give specific recommendations for the removal and management of each of the soils identified. These stripping depths are based on single stage stripping only as this has been the preferred method for maximum useable volumes of suitable rehabilitation resource.

The SMUs and recommended rehabilitation uses are provided in Table 84.

Table 84: Recommended Soil Rehabilitation Use and Stripping Depths

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
2/20	Strip the A horizon of the duplex soils (20 to 30 cm) avoiding the lighter coloured B horizon clays. Where clay soils are present, stripping should only take place to a maximum of 30 cm. Poorer surface structural characteristics are indicated and replacement should only be on relatively low slope angles	0.00-0.30	Nil do not strip the lighter coloured B horizon clays in duplex areas. *Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl*	0.00
3	Strip the upper A horizon (20 to 30 cm) avoiding the lighter coloured A2 or B horizon clays. Replacement should only be on very low slope angles as nutrition is low and structure is weak.	0.00-0.30	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl*	0.00
4	For use as topsoil, limit stripping to the surface 30 cm in most areas, (avoiding light brown subsoil materials). Patches of very dark clays containing carbonate could be taken to a total depth of 50cm. The soils are suitable for replacement on elevated slopes as good nutrition and reasonable structural characteristics are evident. Initial plant establishment may be slowed by salinity. GTE Assessment, to have a maximum of 0.30 mbgl of stripping depth	0.00-0.30	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*	0.00
5	Strip the surface 20 cm as topsoil and a seed source in most areas. In occasional areas depth may be as little as 10 cm (structure is poor, and the material should not be reused on steep slopes).	0.00-0.20	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*	0.00
8	The surface 10 to 15 cm (A horizon) may be useful on very	0.00-0.15	Nil, no stripping recommendations for subsoils	0.00

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
	flat areas, (do not strip the scalded areas).		provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*	
12	Strip the upper 40 cm, avoiding lower A2 or B horizon materials. Replacement should only be on very low slope angles as nutrition is low and structure is weak.	0.00-0.40	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as buried subsoils and capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*	0.00
13	Strip the A horizon (15 to 25 cm) avoiding B horizon clays which are generally dispersive. Only reuse the soil on almost flat areas (<0.5%) as the soil has very poor physical characteristics with low infiltration rates and is prone to surface sealing. If sufficient volumes of other soils are available for rehabilitation, the SMU may be better discarded.	0.00-0.25	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*	0.00
16/23	Strip the A horizon material (20 to 25 cm) avoiding bleached A2 material (where present) or B horizon clays. The material should only be used on flatter slopes as structural instability is indicated.	0.00-0.25	The material in the lower horizons is strongly slaking and some of this subsoil material is dispersive. *Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl*	0.00
17	Generally nil, minor SMU with little seed source	0.00	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl*	0.00
18	Strip the surface 50 cm as soil in most areas, however close to the creek systems; around 90 cm of useable material (essentially a germination medium for flatter slopes) may be present. Avoid the inclusion of lower clay layers as some of these materials in the Hughes and Spring creek areas may be very dispersive. Overall structure is weak and the material should not be reused on steep slopes.	0.00-0.50	The material in the lower horizons (below around 50cm) is strongly slaking and has little resistance to erosion but does not appear to be dispersive (some parent materials may be dispersive). Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive*	0.00

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
			attributes to a depth of 1.50 mbgl	
19	Strip the surface 50 cm as better quality soil.	0.00-0.50	If additional material is needed as a germination medium on very flat slopes strip down to 90 cm. Limit stripping depth to avoid inclusion of any heavier textured layers or any areas of mottling.	0.50-0.90
A1 & A1V	Topsoil may be retrieved for the major extent of the sandy A horizon. The material is suitable for use on all level to gently sloping rehabilitation areas.	0.00-0.40	The subsoil should not be incorporated due to hard setting tendency. Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 0.60 mbgl*	0.00
A2	Topsoil should only be retrieved from the upper 20 cm as salinity risk increases below this level. The material is suitable for use on lower sloping rehabilitation areas and should ideally be placed to a depth of 20 cm.	0.00-0.30	The subsoil should not be considered due to increased salinity levels. Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl*	0.00
A2g	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Recommended for slope and level plain application.	0.00-0.10	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Subsoils may be marginal for use as supporting subsoils on level plains. Additional laboratory analysis for dispersive (ESP) attributes may allow soils to be used on slopes. *Recommendation – Subsoils below 0.30 to 1.00 mbgl is suitable for capping waste rock due to strongly alkaline pH levels. Additional soil amelioration using powdered sulphur will reduce pH levels,*	0.00-0.30
A3	Topsoil strip depth may extend well past the nominated 50cm strip depth although more intensive testing for EC and structural assessments should be conducted beforehand. The sandy loam topsoil may be taken until hard clayey subsoil is	0.00-0.50	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20*	0.00

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
	encountered. The material is suitable for use on most level to gently sloping rehabilitation areas and should ideally be placed to a depth of 20 cm or more.		*mbgl*	
A4	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Not suitable due to texture grade of the surface.	0.00	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; *Recommended - Subsoils below 0.10 is suitable for capping waste rock due to increase in alkaline pH levels and sodic levels increasing from sodic to strongly sodic. Additional soil amelioration using powdered sulphur may reduce pH levels and fine grade gypsum may reduce sodicity.*	0.00
A4c	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Highly suitable - Recommended for slope and level plain application.	0.00-0.10	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; *Recommended - Suitable for support topsoil placement, slopes or level plains.* *Subsoils below 0.50 mbgl present strongly alkaline pH levels and force to disrupt peds greater than 3, suitable for capping waste rock.*	0.10-0.50
A5	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Suitable - Recommended for slope and level plain application.	0.00-0.10	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; *Recommended - Suitable for support topsoil placement, slopes or level plains.* *Subsoils below 0.50 mbgl present strongly alkaline pH levels, sodic soils and force to disrupt peds greater than 3, suitable for capping waste rock.*	0.10-0.45
B1	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Excellent quality topsoil which could be taken deeper than the 50 cm nominated depth (up to 90	0.00-0.50	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Further testing is recommended to check for saline and sodic subsoil, otherwise current	0.50-0.90

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
	cm) or double stripped. The material is suitable for use on all rehabilitation areas and should ideally be placed to a depth of 20 cm or more.		laboratory results suggest a subsoil stripping depth may be taken to 0.90 mbgl. *Recommendation – Subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.*	
B2 & B2V	Topsoil should not be taken deeper than the 30 cm nominated depth as below this depth the subsoil is quite hard and coarse structured which would seal if placed on rehabilitation. The material is suitable for use on flatter rehabilitation areas as it tends to erode. It should ideally be placed to a depth of 20 cm or more.	0.00-0.30	Subsoils are not saline or sodic but are still not very good quality for reuse on rehabilitation. *Recommendation – Subsoils may be used as supporting buried subsoils for topsoil placement or capping for waste rock to a depth of 1.00 mbgl*	0.00
B2g	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Not suitable due to texture grade of the surface.	0.00	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Subsoils, unlike topsoil have value in they are assessed as suitable in 0.20-0.30 mbgl; however, the sodic conditions beneath 0.30 mbgl suggests that stripping of this subsoil layer would be very difficult and risk contamination from the soil layers above and below. *Recommendation - Therefore, soils for the profile are recommended for capping waste rock unless soil amelioration to reduce sodicity (such as gypsum) is applied.*	0.00
B2s	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Highly suitable - Recommended for slope and level plain application.	0.00-0.15	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; *Recommendation - Suitable for support topsoil placement on level plains.* *Subsoils between 0.20-0.60 mbgl may benefit from a low dosage of gypsum if erosive or dispersive soil attributes are observed during stripping or stockpiling.*	0.15-0.60

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
			Subsoils below 0.60 mbgl present increase salt content levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.	
B2bl	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Suitable - Recommended for slope and level plain application.	0.00-0.10	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; *Recommendation - Suitable for support topsoil placement, slopes or level plains.* *Subsoils below 0.80 mbgl present increased salt content levels and strongly sodic levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.*	0.10-0.80
B3	These soils are traditionally variable in quality – particularly between mounds and depression positions. The mounds are better quality than many other melon hole situations and are not excessively saline or sodic above about 50 cm depth. Nevertheless, topsoil should not be taken deeper than the 30 cm because of the risk of contamination from saline subsoil. The material is suitable for use on flatter rehabilitation areas as it tends to erode. It should ideally be placed to a depth of 20 cm or more.	0.00-0.30	Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*	0.00
B3bl	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; Highly suitable - Recommended for slope and level plain application.	0.00-0.10	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; *Recommendations - Subsoils may be suitable for use as supporting subsoils on level plains. Additional laboratory analysis for dispersive (ESP) attributes may allow soils to be used on slopes.*	0.10-1.00
B4	Melon hole soils often vary considerably between mounds	0.00-0.20 (Mound)	Nil, no stripping recommendations for subsoils	0.00

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
	and depression positions. The flat areas between depressions (mounds) offer rehabilitation potential however the dark crusting clay depressions should be avoided. It is important that stripping does not go too deep as useable topsoil will be contaminated. The material is preferred on flatter rehabilitation areas and should ideally be placed to a depth of 20 cm or more.	0.00 (Depression	provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*	
B5	Not suitable due to structure grade (Massive). Soil amelioration and mixing of other suitable topsoils may improve soils to 0.00-0.20 mbgl	0.00	*Recommendation - Subsoils, unlike topsoil have value in they are assessed as suitable in 0.20-0.60 mbgl; suitable for support topsoil placement, slopes or level plains.* *Subsoils below 0.60 mbgl present increase salt content levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.*	0.20-0.60
E1	The loose surface topsoil for reuse in mine rehabilitation may be stripped moist or dry. These soils offer large quantities of good porous material with a variety of applications in mine rehabilitation. Stripping depth will normally exceed 60 cm. The material is suitable for use on most rehabilitation areas as it tends to infiltrate water rapidly and remain loose. It should ideally be placed to a depth of 20 cm or more.	0.00-0.50	Possibly strip further to 1.00 mbgl. *Recommendation – Subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.*	0.50-1.00
E1r	Not suitable due to the texture grade (Sandy). Soil amelioration and mixing of other suitable topsoils may improve soils to 0.00-0.15 mbgl	0.00	*Recommendations - Subsoils, unlike topsoil have value in they are assessed as suitable in 0.15-1.00 mbgl; suitable for support topsoil placement, slopes or level plains.*	0.15-1.00
E2	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; These soils are high quality clay soils with a high moisture retention capacity however the establishment of permanent	0.00-0.40	**Attention**: Areas located within SCA area not under approval for stripping. For areas outside of SCA; The soils are often saline below 50 cm depth Nil, no stripping recommendations for subsoils	0.00

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
	pasture cover on rehabilitation may take considerable time as problems occur with germination of fine seeded plants in the shrinking and swelling medium. The soils are often saline below 50 cm depth, so a depth cut from 40 cm is nominated. The material is more suited for use on flatter rehabilitation areas as it tends to erode, and the establishment of a protective surface cover may take longer than expected. It should ideally be placed to a depth of 20 cm or more.		provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.25 mbgl*	
E3	Stripping of these soils should not proceed into the clayey subsoil as the material is hard, impervious and generally dispersive. It is preferable to take less soil than risk contamination with the poor subsoil. Use should normally be limited to rehabilitation of level sites.	0.00-0.20	As per topsoil recommendation, the clayey subsoil as the material is hard, impervious and generally dispersive Nil, no stripping recommendations for subsoils provided. *Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl*	0.00
T1	The upper sandy loam may be stripped to the harder pale coloured clay subsoil. In most cases 20 cm of soil would be available for stripping. The preferred rehabilitation application is flat sites only due to high erosion potential.	0.00-0.20	Nil, no stripping recommendations for subsoils provided. *Recommendation –potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl*	0.00
T2	The T2 SMU at 10 – 20 cm horizon is a well-drained and higher quality soil which overlies very dense fine sandy loam. It is expected to set hard and seal if placed over rehabilitation. The preferred rehabilitation application is flat sites only due to high erosion potential.	0.00-0.20	The use of this soil beneath this horizon is not recommended due to hard sealing; however, the salinity and sodicity are not major issues for this horizon. If a significant topsoil deficit exists in this area, the use of the subsoil (to the clay layer) may be considered. It may be useful to establish a trial of this material on rehabilitation to better establish its worth. *Recommendation – Subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.*	0.20-0.60

4.3.3 Topsoil and Subsoil Stripping Methodology

Existing SMUs reviewed as part of the desktop assessment have had their topsoil and subsoils stripping depths assessed. These stripping depths and recommended rehabilitation use is outlined in Table 84.

SMUs and variants identified during GTE, 2019 SCL fieldworks have been assessed against stripping suitability criteria, Elliot and Veness (1981). This methodology presents criteria found to be useful in the Hunter Valley, NSW area, the criteria is a general guide towards assessing soil resources. Other attributes such as chloride, sodicity and other dispersive attributes shall be assessed as well. These are summarised in Table 85.

Table 85: Soil Stripping Methodology

Attribute	Criteria
Structure grade	>30% peds
Coherence	Coherent (wet and dry)
Mottling	Absent
Macrostructure	>10 cm
Force to disrupt peds	=<3 force
Texture	Finer than a fine sandy loam
Gravel and Sand Content	<60%
pH	4.5 to 8.4
Salt Content	<1.5 dS/m

4.3.4 New 2019 soil stripping assessment

The SMU suitability and stripping depths for SMUs added as a result of fieldworks in 2019 are assessed and referenced against the criteria outlined in Table 85. Topsoil stripping assessment is presented as highly suitable (no limitations), suitable (minor/marginal limitation) or unsuitable criteria (unsuitable limitation, further soil management, amelioration or treatment required).

These stripping depths are based on single stage stripping only as this has been the preferred method for maximum useable volumes of suitable rehabilitation resource. Table 86 summarises the topsoil stripping assessment and recommended depths. Table 87 summarises the subsoil stripping assessment and recommended depths.

Table 86: Topsoil Stripping Assessment, Elliot and Veness (1981)

SMU	Criteria									Suitability, Stripping Depth (mbgl)
	Structure grade	Coherence	Mottling	Macro-structure	Force to disrupt peds[1]	Texture	Gravel and Sand Content (%)	pH	Salt Content	
A2g	30-50% peds	Not required (n/r)	Absent	<10cm	<10cm	<FSL	<60	4.5-8.4	<1.5 dS/m	Suitable[2] 0.00-0.10
A4	Not suitable	-	-	-	-	-	-	-	-	Not suitable
A4c	>30% peds	Coherent	Absent	<10cm	=<3 force	<FSL	<60	4.5-8.4	<1.5 dS/m	Suitable 0.00-0.10
A5	>30% peds	Coherent	Absent	<10cm	=<3 force	<FSL	<60	4.5-8.4	<1.5 dS/m	Suitable 0.00-0.10
B2s	>30% peds	Coherent	Absent	<10cm	=<3 force	<FSL	<60	4.5-8.4	<1.5 dS/m	Suitable 0.00-0.15
B2g	>30% peds	Coherent	Absent	<10cm	=<3 force	Not suitable	-	-	-	Not suitable
B2bl	>30% peds	Coherent	Absent	<10cm	=<3 force	Marginal	<60	4.5-8.4	<1.5 dS/m	Suitable 0.00-0.10
B3bl	>30% peds	Coherent	Absent	<10cm	=<3 force	<FSL	<60	4.5-8.4	<1.5 dS/m	Suitable[2] 0.00-0.10
B5	Not suitable	-	-	-	-	-	-	-	-	Not suitable
E1r	>30% peds	Coherent	Absent	<10cm	=<3 force	Not suitable	-	-	-	Not suitable

1 – Force to disrupt peds based on Butler, 1955, as referenced A.Young, *Tropical Soils and Soil Survey (1980)*. Key is 1 is nil, 2 is very small, 3 is small moderate, 4 is strong, 5 is very strong.

2- No laboratory analysis for sodicity (ESP), as such SMU is recommended for level plains. Additional ESP (or dispersive) analysis may increase useability of topsoil for sloped areas.

The assessment found that three SMUs, A4, B2g, B5 and E1r presented criteria considered not suitable for topsoil stripping for rehabilitation reuse without further soil amelioration and treatments. SMU A5 and variant B2bl were recommended suitable due to marginal criteria levels, with the remaining SMUs and variants A2g, A4c, B2s and B3bl recommended as highly suitable.

Soil mapping unit subsoils horizons may provide potential rehabilitation use. Review of the soil chemistry may indicate if a subsoil may support regrowth of native vegetation and grasses for rehabilitation of areas that are relatively flat and sloped areas, support subsoils for topsoil placement or may be suitable for capping waste rock due to major limitations.

Table 85 has been used to assess the suitability of subsoils, as presented in Table 87.

Table 87: Subsoil Stripping Assessment

SMU	Subsoil Stripping Recommendation and Limitation Assessment	Subsoil Depth (mbgl)
A2g	Subsoils may be marginal for use as supporting subsoils on level plains. Additional laboratory analysis for dispersive (ESP) attributes may allow soils to be used on slopes. Subsoils below 0.30 to 1.00 mbgl is suitable for capping waste rock due to strongly alkaline pH levels. Additional soil amelioration using powdered sulphur will reduce pH levels,	0.10-0.30
A4	Subsoils below 0.10 is suitable for capping waste rock due to increase in alkaline pH levels. Additional soil amelioration using powdered sulphur may reduce pH levels.	-
A4c	Suitable for support topsoil placement, slopes or level plains. Subsoils below 0.50 mbgl present strongly alkaline pH levels and force to disrupt peds greater than 3, suitable for capping waste rock.	0.10-0.50
A5	Suitable for support topsoil placement, slopes or level plains. Subsoils below 0.50 mbgl present strongly alkaline pH levels and force to disrupt peds greater than 3, suitable for capping waste rock.	0.10-0.45
B2s	Suitable for support topsoil placement, slopes or level plains. Subsoils below 0.60 mbgl present increase salt content levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.	0.15-0.60
B2g	Subsoils, unlike topsoil have value in they are assessed as suitable in 0.20-0.30 mbgl; however, the sodic conditions beneath 0.30 mbgl suggests that stripping of this subsoil layer would be very difficult and risk contamination from the soil layers above and below. Therefore, soils for the profile are recommended for capping waste rock unless soil amelioration to reduce salt levels is applied.	-
B2bl	Suitable for support topsoil placement, slopes or level plains. Subsoils below 0.80 mbgl present increase salt content levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.	0.10-0.80
B3bl	Subsoils may suitable for use as supporting subsoils on level plains. Additional laboratory analysis for dispersive (ESP) attributes may allow soils to be used on slopes.	0.10-1.00
B5	Subsoils, unlike topsoil have value in they are assessed as suitable in 0.20-0.60 mbgl; suitable for support topsoil placement, slopes or level plains. Subsoils below 0.60 mbgl present increase salt content levels which may be marginally unsuitable for supporting topsoils. Recommendation is suitable for capping waste rock unless soil amelioration to reduce salt levels is applied.	0.20-0.60
E1r	Subsoils, unlike topsoil have value in they are assessed as suitable in 0.15-1.00 mbgl; suitable for support topsoil placement, slopes or level plains.	0.15-1.00

1 – pH field result (Raupach) assessed. GTE recommends pH laboratory analysis be conducted prior to stripping.

2 – Based on similar and surrounding SMUs, this analysis is assumed to be below 1.5 dS/m. GTE recommends EC laboratory analysis be conducted prior to stripping.

3 – Soil Profile 85 A horizon is reported at 0.0-0.90 mbgl, a conservative subsoil stripping depth until additional laboratory analysis is undertaken is 0.45-0.90 mbgl.

4 – Soil Profile 82 subsoil is assessed on a conservative approach with available data. Further laboratory analysis including EAT, ESP, pH and EC is recommended.

4.3.5 Summary of Recommended Soil Stripping Depths and Volumes Available

Table 88 presents the recommended stripping depths for each SMU and total estimated available topsoil and subsoil reserves in the Project Site. Topsoil stripping depths are shown in Figure 5.

These volumes do not include areas that have been confirmed as SCL for A2g, A4, A4c, A5, B1, B2bl, B2s, B3bl, E1r and E2 located in the southern portion of the project site.

With respect to the stripping of soil resources within SCAs (not within an existing RIDA) (Queensland Globe, 2022), these areas would require a separate approval under the Regional Planning Interests Act 2014, and therefore has not been included in Table 88.

As topsoil and subsoils stripping for areas that are mapped as SCA by the SCL Trigger Map are not recommended, these areas are not included in Table 88.

Table 88: Recommended Stripping Depths and Approximate Volumes Available

SMU	Recommended Topsoil Stripping Depth (mbgl)	Recommended Subsoil Stripping Depth (mbgl)	Soil Mapping Unit Area Outside of SCAs (ha)	Approximate Topsoil Volume (m^3)	Approximate Subsoil Volume (m^3)
2/20	0.00-0.30	0.00	221	663,000	-
3	0.00-0.30	0.00	115	345,000	-
4	0.00-0.30	0.00	42	126,000	-
5	0.00-0.20	0.00	137	274,000	-
8	0.00-0.15	0.00	181	271,500	-
12	0.00-0.40	0.00	2	8,000	-
13	0.00-0.25	0.00	17	42,500	-
16/23	0.00-0.25	0.00	115	287,500	-
17	0.00	0.00	4	-	-
18	0.00-0.50	0.00	33	165,000	-
19	0.00-0.50	0.50-0.90	59	295,000	236,000
A1 & A1V	0.00-0.40	0.00	463	1,852,000	-
A2	0.00-0.30	0.00	442	1,326,000	-
A2g	0.00-0.10	0.10-0.30	1	1,000	2,000
A3	0.00-0.50	0.00	454	2,270,000	-
A4	0.00	0.00	2	-	-
A4c	0.00-0.10	0.10-0.50	95	95,000	380,000
A5	0.00-0.10	0.10-0.45	7	7,000	24,500
B1	0.00-0.50	0.50-0.90	170	850,000	680,000
B2 & B2V	0.00-0.30	0.00	377	1,131,000	-
B2bl	0.00-0.10	0.10-0.80	585	585,000	4,095,000
B2g	0.00	0.00	24	-	-
B2s	0.00-0.15	0.15-0.60	5	7,500	22,500

SMU	Recommended Topsoil Stripping Depth (mbgl)	Recommended Subsoil Stripping Depth (mbgl)	Soil Mapping Unit Area Outside of SCAs (ha)	Approximate Topsoil Volume (m^3)	Approximate Subsoil Volume (m^3)
B3	0.00-0.30	0.00	1,616	4,848,000	-
B3bl	0.00-0.10	0.10-1.00	137	137,000	1,233,000
B4	0.00-0.20	0.00	841	1,682,000	-
B5	0.00	0.20-0.60	31	-	124,000
E1	0.00-0.50	0.50-1.00	1,271	6,355,000	6,355,000
E1r	0.00	0.15-1.00	40	-	340,000
E2	0.00-0.40	0.00	215	860,000	-
E3	0.00-0.20	0.00	381	3,676,000	-
T1	0.00-0.20	0.00	7	14,000	-
T2	0.00-0.20	0.20-0.60	22	44,000	88,000
TOTAL FOR PROJECT SITE			**8,055**	**28,218,000**	**13,580,000**

4.4 Regional Planning Interests Assessment

The RPI Act and Regional Planning Interests Regulation 2014 identify and protect areas of Queensland that are of regional interest. The RPI Act seeks to manage the impact and support coexistence of resource activities and other regulated activities in areas of regional interest. The RPI Act protects PLAs, PAAs, SEAs and SCAs. The Project Site was assessed against all four requirements.

4.4.1 Assessment of Strategic Cropping Areas

SCAs (as determined by the Queensland Government) are shown on the SCL Trigger Map. A review of the SCL Trigger Map indicates that there are areas identified in the southern area of the Project Site, as shown in Figure 6. As the Project Site encroaches on the mapped SCL a standalone SCL assessment has been conducted (GTE, 2021).

A summary of SMUs which intersect SCA is presented in Table 89.

Table 89: SMUs that intersect SCA

SMU located originally in SCA (Pre-2019)	Total SMU area (ha)	Area Intersecting SCA – Within SCL Trigger map (ha)	Area not Intersecting SCA – Outside SCL Trigger map (ha)
A2g	7	1	6
A4	10	2	8
A4c	96	95	1
A5	8	7	1
B1	711	170	541
B2s	8	5	3
B2bl	590	585	5
B3bl	468	137	331
E2	710	215	495

4.4.2 Assessment of Priority Agricultural Areas

PAAs are areas of regionally significant agricultural production that are identified in a regional plan. Identifying PAAs ensures that resource activities that seek to operate in these areas do not unreasonably constrain, restrict or prevent on-going agricultural operation.

A desktop review of the Queensland Government Development Assessment Mapping System concluded that the Project Site is not located in a PAA and is not likely to have an impact on a PAA.

4.4.3 Assessment of Strategic Environmental Areas

SEAs are areas identified containing regionally significant environmental attributes including but not limited to bio-diversity, water catchments and ecological function.

A desktop review of the Queensland Government Development Assessment Mapping System. concluded that the Project Site is not located in a SEA and is not likely to have an impact on a SEA.

4.4.4 Assessment of Priority Living Areas

PLAs are areas that have been established to safeguard areas required for the growth of towns form incompatible resource activities. They provide a community with a say about whether a resource activity is appropriate to operate in the proximity of their town.

A desktop review of the Queensland Government Development Assessment Mapping System concluded that the Project Site is not located in a PLA and is not likely to have an impact on a PLA.

4.5 Acid Sulfate Soils Assessment

Field observations of the SMUs undertaken during the previous soils and land suitability surveys were assessed by GTE.

These observations have been reviewed against the *State Planning Policy 2/02, Planning and Managing Development involving Acid Sulfate Soils*, (Queensland Government 2002), Appendix 2: Soil and Water Field Indicators.

4.5.1 Assessment of Actual and Potential Acid Sulfate Soils

Assessment of Project Site SMUs for AASS and PASS included the following indicators:

- Field pH;
    - AASS: field pH_F ≤4, when field pHF >4 but <5 may indicate some existing acidity;
    - PASS: field pH_F >4 and commonly neutral;
- Jarositic horizons or substantial iron oxide mottling in surface (AASS);
- waterlogged soils – unripe muds (soft, buttery, blue grey or dark greenish grey), silty sands or sands (mid to dark grey) or bottom sediments (dark grey to black e.g. monosulfides) (PASS); and
- Dead, dying, stunted vegetation scalded or bare low-lying areas (AASS).

Field and laboratory pH analysis were reviewed with other indicators outlined in available detailed sites. A summary of SMUs assessment is shown in Table 90.

Table 90: Assessment of Field Indicators for AASS/PASS

SMU	AASS / PASS Assessment	Overall Assessment
2/20	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
3	pH is acidic to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported.	Very low field indication of PASS. Nil field indicators of AASS.
4	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
5	pH is neutral to acidic, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
8	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
12	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
13	pH is acidic to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported.	Very low field indication of PASS. Nil field indicators of AASS.
16/23	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
17	pH is acidic to neutral/alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported.	Very low field indication of PASS. Nil field indicators of AASS.
18	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
19	pH is acidic to neutral, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported.	Very low field indication of PASS. Nil field indicators of AASS.
A1 & A1V	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
A2	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
A2g	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.

SMU	AASS / PASS Assessment	Overall Assessment
A3	Field pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
A4	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
A4c	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
A5	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B1	pH is alkaline to strongly alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B2 & B2V	pH is alkaline to strongly alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B2s	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B2g	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B2bl	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B3	pH is alkaline to strongly alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B3bl	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B4	pH is alkaline to strongly alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
B5	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
E1	pH is alkaline to neutral, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
E1r	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
E2	pH is strongly alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
E3	pH is acidic/neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
T1	pH is acidic, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.
T2	pH is neutral to alkaline, no observations of corroded shell, jarosite horizons, iron oxide mottling or water logged soils reported	Very low field indication of PASS. Nil field indicators of AASS.

Review of the SMUs and field indictors reported acidic to neutral pH as a field indicator for the majority except for SMU E2. It is strongly alkaline, though results were not below 4.0 pH for AASS. Review of the remaining indicators were not reported or observed; therefore, the SMUs were assessed based on the information presented as very low field indication of PASS with nil indicators of AASS.

5 IMPACTS, MITGATION AND RESIDUAL OUTCOMES

5.1 Potential Impacts

The potential impacts that are associated with the soils and land suitability of the Project Site include ASS, management of soil stripping and land proposed and post mining land use suitability and rehabilitation.

5.1.1 Disturbance Types Requiring Rehabilitation

The Project Site will require rehabilitation for areas which include active and passive disturbance. Active disturbance includes infrastructure related development (including the key activities below) and passive disturbance is indirect impact as a result of subsidence.

Key activities at the Project Site that will require rehabilitation works as a result of direct surface disturbance will include:

- coal handling and preparation plant (CHPP);
- rail loading balloon loop;
- mine industrial area;
- water dams;
- run of mine (ROM) pad;
- conveyor;
- construction and operations villages;
- access roads; and
- relocation of existing water and power infrastructure.

5.1.2 Topsoil and Subsoil Stripping Impacts

The mismanagement of topsoil associated with the Project Site may be a potential impact if assessment and recommendations based on the SMUs are not adhered to. Potential impacts may include but are not limited to:

- incorrect stripping depths of a SMU;
- mixing of higher quality soil with low quality during stockpiling phase;
- erosion of areas which have been stripped or stockpile areas;
- identification of rehabilitation soils and their maintenance;
- incorrect placement of soils.

5.1.3 Strategic Cropping Area Impacts

The SCL assessment undertaken by GTE (2020) indicated SCL in five SMUs: A2g, B1, B2s, B3bl and E2. These areas cover a small portion in the north-west and larger southern portion to the south, south-east of the SCL assessment area. The proposed infrastructure ETL intersects

each of these SMUs, therefore further government consultation and approvals will be required for these areas.

5.1.4 Acid Sulfate Soils Impacts

As discussed in Section 4.5, the desktop, field and laboratory observations of existing soils shows very low field indication of PASS with nil indicators of AASS.

5.2 Mitigation Measures and Recommendations

The mitigation measures are potential solutions to prevent or minimise the potential impacts listed above.

5.2.1 Land Use Recommendations

Post mining land use suitability is influenced by various factors including physical, biological and chemical changes of soil, depth of soil and slope gradient and length in the final landform design. Underground mining activities are expected to change the nature of the final land form and may affect suitability for land use activities.

Land disturbed by underground mining may be able to be reinstated to its previous pre-project land suitability or reduced to limited grazing based on available product stockpiles and final landform design. Disturbed areas not located on existing mining areas may require more intensive rehabilitation to retain the initial LSAT class.

The majority of the Project Site has the potential be reinstated to the pre-project land suitability class. Rehabilitation methods and post mining land suitability are described in the Rehabilitation Management Plan for the Project Site; overall concepts envisaged for specific disturbance types are summarised in Table 88.

Active Disturbed Areas

The general objective of rehabilitation of disturbed areas is to achieve the post-mining land use. The proposed final land form is suitable for both a post mining land use of grazing and native bushland.

With respect to the proposed active disturbed areas, their locations are overlaid on the operational Saraji Mine and unlikely to be rehabilitated to previous natural state. The objective would be to maintain the area in its current state. A review and downgrading from pre-project land suitability may be needed in some areas to ensure that long-term stability is ensured, and risks of potential downstream impact are minimal.

Proposed infrastructure that isn't permanent and located on areas of undisturbed land would be recommended that post mine suitability be reinstated to or as close to the previous land use. The proposed disturbed areas would be assessed on the impact of the disturbance type and proposed rehabilitation strategies for those areas.

Passive Disturbed Areas with No or Minor Disturbance

This type of passive disturbance consists mainly of subsided underground mining areas and areas not disturbed in the Project Site.

5.2.2 Mismanagement of Topsoil Stripping

Impacts from topsoil stripping are presented in Table 86. This focusses on areas of disturbance where soil is to be removed using the figures (Figure 5) provided. Key mitigation includes:

- Areas where soils may be stockpiled could be identified and logged in a register to prevent the mixing or cross contamination of higher quality soils with lower quality soils. A register would also maintain a record of the soils origin, its SMU classification, reduce the incorrect or mismanagement of placement of soils for rehabilitation use.
- Erosion of bare earths during stripping and stockpiles management can be mitigated by assessing the soils to be disturbed, the stockpile design and sediment and erosion control methods in place.
- A topsoil management plan would also expand on the information provided and provide a single brief report with further recommendations and tailored management procedures to follow.

5.2.3 Strategic Cropping Land Mitigation Measures

It is recommended that an assessment of the proposed activity and nature of disturbance in the areas of SMUs A2g, B1, B2s, B3bl and E2 (which were verified as SCL) be undertaken to assess if it will have a permanent and significant impact on the SCL status of these areas, as detailed in RPI Act Statutory Guideline 9/14. This will assist in assessing if the activity in the SCL may be exempt as outlined in RPI Act Statutory Guideline 3/14.

If the activity is not exempt, an assessment application for a regional interests development approval (RIDA) is required to be submitted to the Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) with reference to RPI Act Statutory Guideline 1/14.

If the activity will impact or is likely to impact SCL and is being carried out on a property in the SCA, the required outcome to be addressed by the applicant is Required Outcome 2 and Required Outcome 3 (RPI Act Statutory Guideline 3/14). These may be reviewed in Table 2 and Table 3 of RPI Act Statutory Guideline 3/14. For areas of land confirmed not to be SCL where the activity intersects, Required Outcome 1 in Table 1 of RPI Act Statutory Guideline 3/14 is to be addressed in the application.

5.2.4 Acid Sulfate Soils Mitigation Measures

Regular inspections of Project Site work when working with the surface and sub-surface soils will ensure that any potential ASS is identified. The inspections can include the AASS/PASS indicators assessed in Table 89 and include but not limited to the following;

- wet, waterlogged soils;
- strong odour of hydrogen sulfide (smell of rotten eggs) from soils due to the breakdown of organic materials and sulfur;
- colour of soil being pale to dark shades of blue grey (known as gley) to green colours;
- mottling of soils including yellow (jarosite) and orange (iron oxides) colours;
- vegetation near exposed areas of Project works in distress or dying;

- nearby areas of water, water runoff or drainage lines are unusually clear or blue-green in colour; and
- surface water appears to have an oily film present.

If inspections identify areas which are suspected to be PASS/AASS, field pH may be undertaken using a calibrated meter or very broad scale manutec field pH to determine if the soil is below pH 4.5. If so, soil sampling may be undertaken, and results sent away for field oxidised pH (pH_{FOX}) and Suspension Peroxide Oxidation Combined Acidity and Sulfur (SPOCAS) or Chromium Reducible Sulfur (SCR) may give accurate results.

Documents which will assist with identifying, sampling and analysing of ASS include but not limited to;

- guidelines for sampling and analysis of lowland acid sulfate soils (1998);
- Queensland acid sulfate soils technical manual: soil management guidelines (2014); and
- State Planning Policy 2/02 Guideline: planning and managing development involving acid sulfate soils.

5.3 Residual Impacts

The residual impacts for soils and land suitability would be associated with ongoing rehabilitation management of post mining land uses and the effectiveness of the mitigation measures outlined in Section 5.2.

Areas designated as permanent infrastructure or existing mining would not be considered to have major residual impacts relating to soils and land suitability.

Areas of subsidence and non-mining areas prior to the Project Site being established would potentially be impacted by residual impacts such as rehabilitation soil progression, erosion and sediment control, growth media management (existing seed bank in topsoil and the establishment of new seed) in the rehabilitation areas.

The success of the appropriate rehabilitation of the Project Site will be outlined in a rehabilitation monitoring program with objectives and targets to address areas of residual impacts.

Based on the likelihood and significance of the potential impacts identified and following the application of the proposed mitigation and management measures it is considered unlikely that the Project would have a significant impact on land and soil resources.

6 CONCLUSION

The following conclusions have been made for the baseline land resources and soils suitability assessment.

Twenty-six SMUs and eleven variants were identified across the Project Site, which is bound by EPC 837, EPC 2103, MLA 70383, MLA 70459, ML 1775, ML 70142, and ML 1782.

The Project Site includes areas of gently undulating plains with gradational to duplex sandy soils to uniform clays with microrelief to areas of drainage depressions near active alluvia areas.

Land use suitability assessment of the 26 SMUs, including 11 variants reported two SMUs and four variants suitable for cropping A2g, B1, E2, B2s and B3Bl) as Class A1. SMUs A5, B2bl, B2g, B5 and E1r were assessed as suitable for limited cropping, cotton by furrow irrigation due to PAWC limitations.

All other SMUs identified were considered were considered suitable for beef cattle grazing activities either as simple or complex (consisting of two classes) units.

In general, the topsoils for the majority of SMUs were assessed as suitable for rehabilitation activities, including as a growth medium for natural vegetation on flat to gently undulating plains. Any disturbance or stripping of soil within SCA areas is only allowed as per the existing, approved Regional Interests Development Approval (RIDA), as outlined in the Restoration Plan to Support RIDA Application Saraji East Project (GTE, 2021) and RPI 19/001.

There are no further SCA areas that are approved by RPI 19/001, outside of the project site disturbance footprint that can be disturbed for stripping and stockpiling. Any disturbance of SCA not subject to an existing RIDA would require separate approval under the Regional Planning Interests Act (2014).

Topsoil has been assessed as suitable for rehabilitation use for 23 SMUs, including 9 variants. Five SMUs and variants, 17, A4, B2g, B5 and E1r, were assessed as not providing any topsoil resource valuable for rehabilitation, without further soil management, amelioration or treatment.

Subsoils were generally assessed as sodic with SMUs 19, A2g, A4c, A5, B1, B2s, B2bl, B3bl, B5E1, E1r and T2 providing value to rehabilitation or supporting buried soils. All remaining SMUs and variants, were not suitable for rehabilitation reuse. They were assessed as potentially suitable for capping waste rock if stripping of the areas were required.

The Project Site is located in a Regional Planning Interests Areas of SCA. An assessment was undertaken to identify SCL in the Project Site. The SCL trigger map area is presented in Figure 6. The Project Site does not encroach on any PLAs, SEAs or PAAs.

Based on a review of the Project Site, soil survey data and very few to no field indicators of the SMUs, the assessment determined a very low probability of ASS. Potential impacts for the site included presence of ASS, mismanagement of topsoil and post mining land impacts. The following mitigation measures were presented to manage the potential impacts. It was recommended that environmental management of the site include site inspections for indicators that may indicate ASS. Mitigation measures for topsoil management includes development and implementation of a site-specific topsoil management plan.

Post mining land use recommendations are based on the active and passive disturbance of the Project Site and the previous land use, mining, agricultural or undisturbed land. It is envisioned that the majority of the Project Site could be reinstated to the pre-project land suitability class. Rehabilitation methods and post mining land suitability shall be refined in a Rehabilitation Management Plan for the Project Site.

7 GLOSSARY

The following abbreviations have been used in this document:

AASS - Actual acid sulfate soil. Soils which have undergone oxidation to produce acid, resulting in a soil pH less than 4.0.

Acid Sulfate Soils (ASS) - Acid sulfate soil is the common name for soils that contain metal sulfides. In an undisturbed and waterlogged state, these soils may pose no or low risk. However, when disturbed or exposed to oxygen, acid sulfate soils undergo a chemical reaction known as oxidation. Oxidation produces sulfuric acid which has led to these soils being called acid sulfate soils.

Alluvial - Describes material, sand, silt, clay, gravel or other material deposited by, or in transit in, flowing water.

ASC - Australian soil class

ASPAC - Australasian soil and plant analysis council.

Calcium and Magnesium Ratio (Ca:Mg) - A calculation of the Exchangeable Calcium to Exchangeable Magnesium ratio. Ca:Mg provides a guide to a soil's structure, which influences soil drainage, root development and plant growth. Well-structured soils have a Ca:Mg greater than 2:1. A ratio of greater than 10:1 indicates potential Mg deficiencies in cattle.

Cation Exchange Capacity (CEC) - The maximum positive charge required to balance the negative charge on colloids (clays and other charged particles). The units are milli-equivalents per 100 grams of material or centimoles of charge per kilogram of exchanger. CEC is often used as a measure of soil fertility and nutrient retention capacity.

Clay - A soil material composed of particles finer than 0.002 mm. When used as a soil texture group such soils contain at least 35% clay.

Dispersion - A process by which species in solution mix with a second solution, thus reducing in concentration. In the case of sodic soils it will predispose the soil material to lose structure and disseminate into the solution.

Dispersion Ratio (R1) - The measurement of soil dispersion when used in in conjunction with ESP and the Ca/Mg ratio for predicting soil physical behaviour

Effective Rooting Depth (ERD)- The depths of which vegetation roots may readily penetrate the soil profile and have access to water and nutrients.

EIS - Environmental Impact Statement.

Electrical Conductivity (EC) - The EC of water is a measure of its ability to conduct an electric current. The EC of soils will vary depending on the texture and amount of moisture held by the soil particles. Electrical conductance increases with soluble salt content and thus allows simple interpretation of salinity.

Erosion - The displacement of soil, rock or dissolved material by wind or water flow from one location on the earth and then travels to another location.

Exchangeable Sodium Percentage (ESP) - The amount of sodium as a proportion of all cations in a soil is termed the Exchangeable Sodium Percentage. It is calculated by dividing

the exchangeable sodium by the cation exchange capacity (CEC), multiplied by 100. ESP values greater than 6% are considered sodic, with values greater than 15% considered very sodic. ESP = (Exchangeable sodium (meq/100g)/Cation exchange capacity (meq/100g)) x 100

Field pH (Raupach pH)- The measurement of the pH in the field by utilising Manutec Pty Ltd, Soil pH Test Kit. This kit consists of pH dye indicator, Barium Sulphate and reference colour chart.

Field pH Peroxide Test - The pH Fox test is used to indicate the presence of iron sulfides or PASS. This test involves adding 30% hydrogen peroxide (pH adjusted to 4.5–5.5) to a sample of soil. If sulfides are present a reaction will occur.

Gradational - The lower boundary between soil layers (horizons) has a gradual transition to the next layer. The solum (soil horizon) becomes gradually more clayey with depth.

Gradient - The rate of inclination of a slope. The degree of deviation from the horizontal.

Horizon - An individual soil layer, based on texture and colour, which differs from those above and below.

Kandosol – SMUs that have well-developed B2 horizon in which the major part of the structure if massive or has only a weak grade of structure (compare with tenic B horizon and cemented pans) and has a maximum clay content in some part of the B2 horizon which exceeds 15% (i.e. heavy sand loam, Sandy Loam)

Loam - A medium textured soil of approximate composition 10-25% clay, 25-50% silt and >50% sand.

LSAT - Land Suitability Assessment Techniques.

Massive - Refers to the condition of the soil layer in which the layer appears to be as a coherent or solid mass which is largely devoid of peds.

Mottles - Areas of contrasting colour in the overall soil colour which are caused by anerobic conditions as a result of poor aeration. Usually an indicator of poor drainage and retention of water.

NATA - National Association of Testing Authority.

PASS - Potential acid sulfate soil. Soils which have been identified as containing attributes such as iron sulfides which have the potential to produce sulfuric acid if they are drained or excavated.

Ped - An individual natural soil aggregate. In an undisturbed state peds will group together to form larger aggregates.

pH - A logarithmic index for the concentration of hydrogen ions in an aqueous solution, which is used as a measure of acidity.

Representative Site - A location deemed very representative of the soil mapping unit for which detailed characterisation is to be done.

Rudusol - Soil with negligible (rudimentary) pedologic organisation apart from (a) minimal development of an Al horizon or (b) the presence of less than 10% of B horizon material (including pedogenic carbonate) in fissures in the parent rock or saprolite.

SMU - Soil mapping unit - Soils grouped into a single management unit on the basis of similar morphology, position on the landscape, substrate and chemistry.

Sodic - Also commonly referred to as a non-saline alkali soil - It is a soil that contains sufficient exchangeable sodium and does not contain appreciable quantities of soluble salts. A term given to soil with a level of exchangeable sodium cations greater than 10-15% of the soils cation exchange capacity (CEC), or soluble sodium cations greater than 10-15 times the square root of soluble calcium and magnesium cations.

Sodosols - Soils which display a strong texture contrast between surface (A) horizons and subsoil (B) horizons which are sodic.

Subsoil - Subsurface material comprising the B and C horizons of soils with distinct profiles. They often have brighter colours and higher clay content than topsoils.

Tenosol – Soils that differ from Rudosols in that they have either a more than weakly developed A1 horizon, an A2, or a weakly developed B horizon.

Texture - The size of particles in the soil. Texture is divided into six groups, depending on the amount of coarse sand, fine sand, silt and clay in the soil.

Topsoil - Part of the soil profile, typically the A1 horizon, containing material which is usually darker, more fertile and better structured than the underlying layers.

Vertosol - Soils that have a clay field texture of 35% or more clay throughout the solum except for thin, surface crusty horizons 0.03m or less thick, have open cracks at some time in most years that are at least 5mm wide and extend upward to the surface or to the base of any plough layer, self-mulching horizon, or thin, surface crusty horizon and at some depth in the solum have slicken sides and/or lenticular peds.

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9 FIGURES

Figure 1 **Soil Mapping Units**

Figure 2 **Pre-Mine Cropping (Rainfed & Regional Frameworks) Suitability**

Figure 3 **Pre-Mine Beef Cattle Grazing Suitability**

Figure 4 **Agricultural Land Classes**

Figure 5 **Topsoil Stripping Depth**

Figure 6 **Strategic Cropping Land**

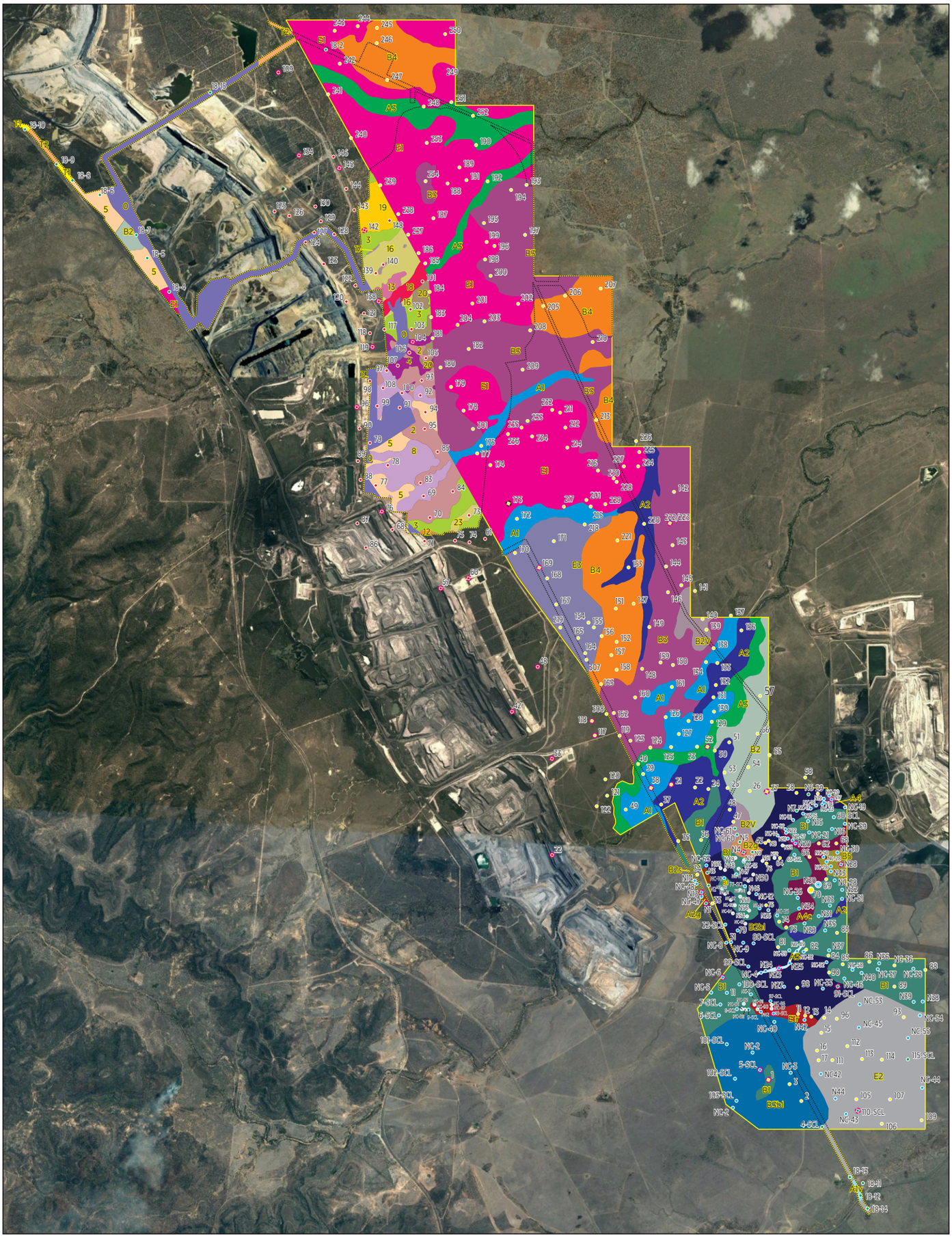


Figure 1: Soil Mapping Units

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0 2000
Metres

Soils and Land Suitability Assessment
SARAJI EAST PROJECT

Legend

- Project site
- Project footprint
- E1 Soil Mapping Unit name
- Soil survey site (GT Environmental, 2021)
- Soil survey site (GT Environmental, 2019)
- Soil survey site (GT Environmental, 2018)
- Soil survey site (GT Environmental Services, 2012)
- Soil survey site (Emmerton, 2005)
- Soil Mapping Unit Representative Site

GT Environmental (2019)

- A2g - Variant of SMU A2, colour of soil profile is grey
- A4 - Dark brown sands with sandy loam subsoils near drainage lines
- A4c - Variant of SMU A4, texture includes higher clay percentage
- A5 - Dark grey clay loams to grey brown clays within forested drainage line areas
- B2s - Variant of SMU B2, increase of salt content in subsoils
- B2g - Variant of SMU B2, colour of soil profile is black, with minor sub-dominant grey
- B3bl - Black clay soils with gilgai microrelief
- B5 - Deep sandy clay loams with clay subsoils on gently undulating plains of tall woodlands
- E1r - Variant of E1 over red clay subsoils on gently undulating plains

GT Environmental Services (2012)

- T1 - Sandy hard duplex Poplar Box
- T2 - Deep sandy duplex plains with Poplar Box and Ironbark

GT Environmental Services (2012)

- A1 & A1V - Sandy loam deep duplex
- A2 - Alluvial clay drainage lines
- A3 - Alluvial loamy creek channels
- B1 - Undulating clay plains under Brigalow or Belah
- B2 - Mixed Brigalow scrub on brown cracking clays
- B3 - Dark Cracking Brigalow clays with normal gilgai
- B4 - Melon holed Brigalow clay plains
- E1 - Eucalypt woodlands on deep sandy loams
- E2 & E2V - Mt Coolibah on dark Basalt soils
- E3 - Poplar box on sandy duplex

Emmerton (2005)

Soils in slightly elevated positions

- 2 - Deep sandy duplex plains with Poplar Box and Ironbark
- 3 - Sandy loam surfaced duplex soils on unconsolidated Cainozoic sediments
- 4 - Cracking clays with minor gilgai supporting Brigalow and Dawson Gum
- 5 - Cracking and non-cracking clays supporting Dawson Gum and Brigalow on deep tertiary clays
- 20 - Light sandy clay loam duplex soils to non-cracking clays on unconsolidated Cainozoic sediments, better variant

Soils in lower slope positions

- 8 - Clay loam duplex soils on sediments supporting Dawson Gum and Brigalow (Breakaway areas)

Soils in lower slope positions associated with alluvium

- 12 - Sandy loam surfaced duplex soils on reworked Cainozoic sediments supporting Poplar Box
- 13 - Hardset silty duplex supporting mixed species (heavy shrub layer)
- 16/23 - Fine sandy loam to silt loam surfaced duplex and gradational soils (older alluvial duplex soils)
- 17 - Minor clay soils in anabranches
- 18 - Loamy sands, loams and gradational soils on stream banks and near stream levees
- 19 - Loamy sand gradational soils present as relict alluvial levees
- 0 - No SMU concept identified due to disturbance observed within the area

GTenvironmental

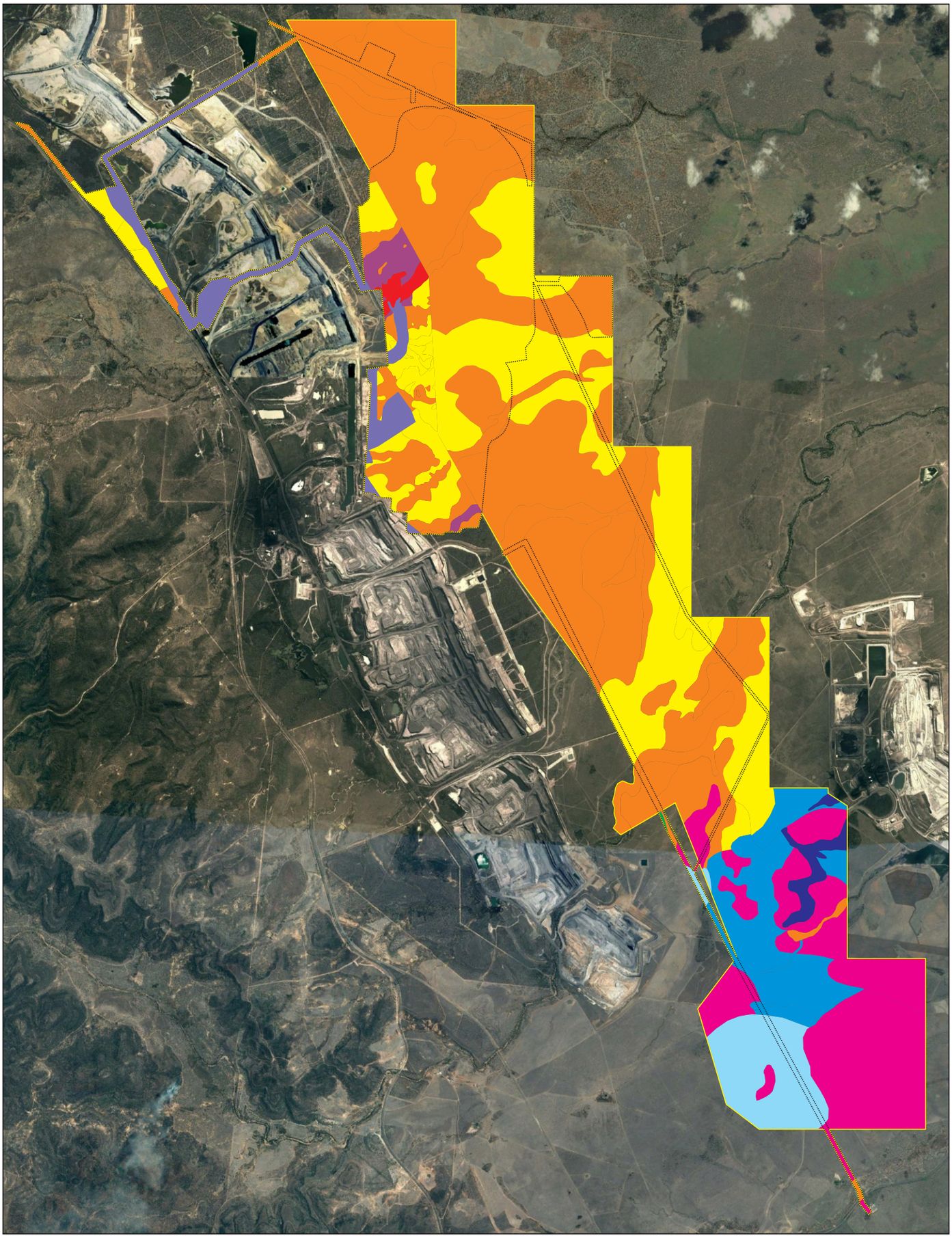


Figure 2: Pre-Mine Cropping (Rainfed and Regional Frameworks) Suitability

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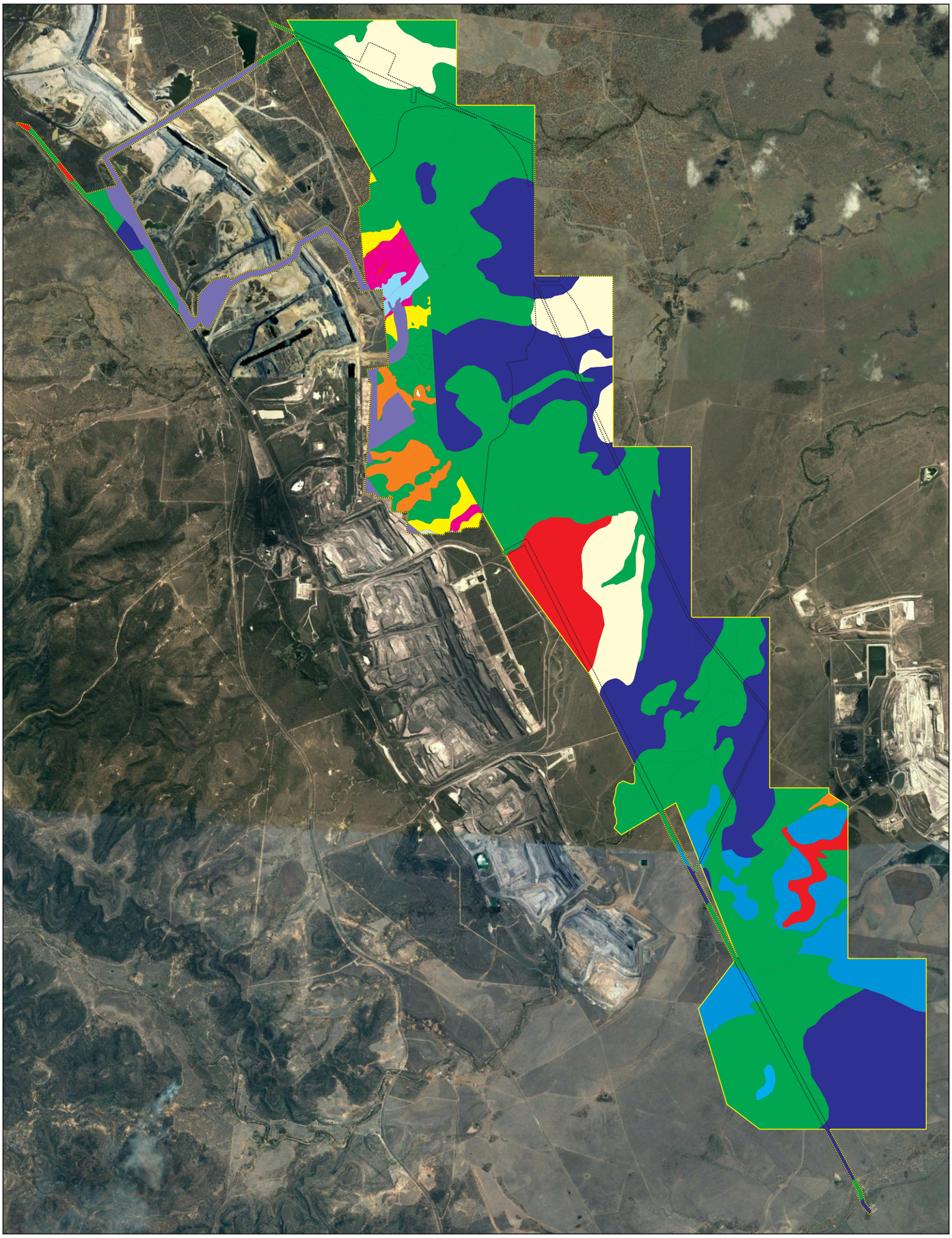


Figure 3: Pre-Mine Beef Cattle Grazing Suitability

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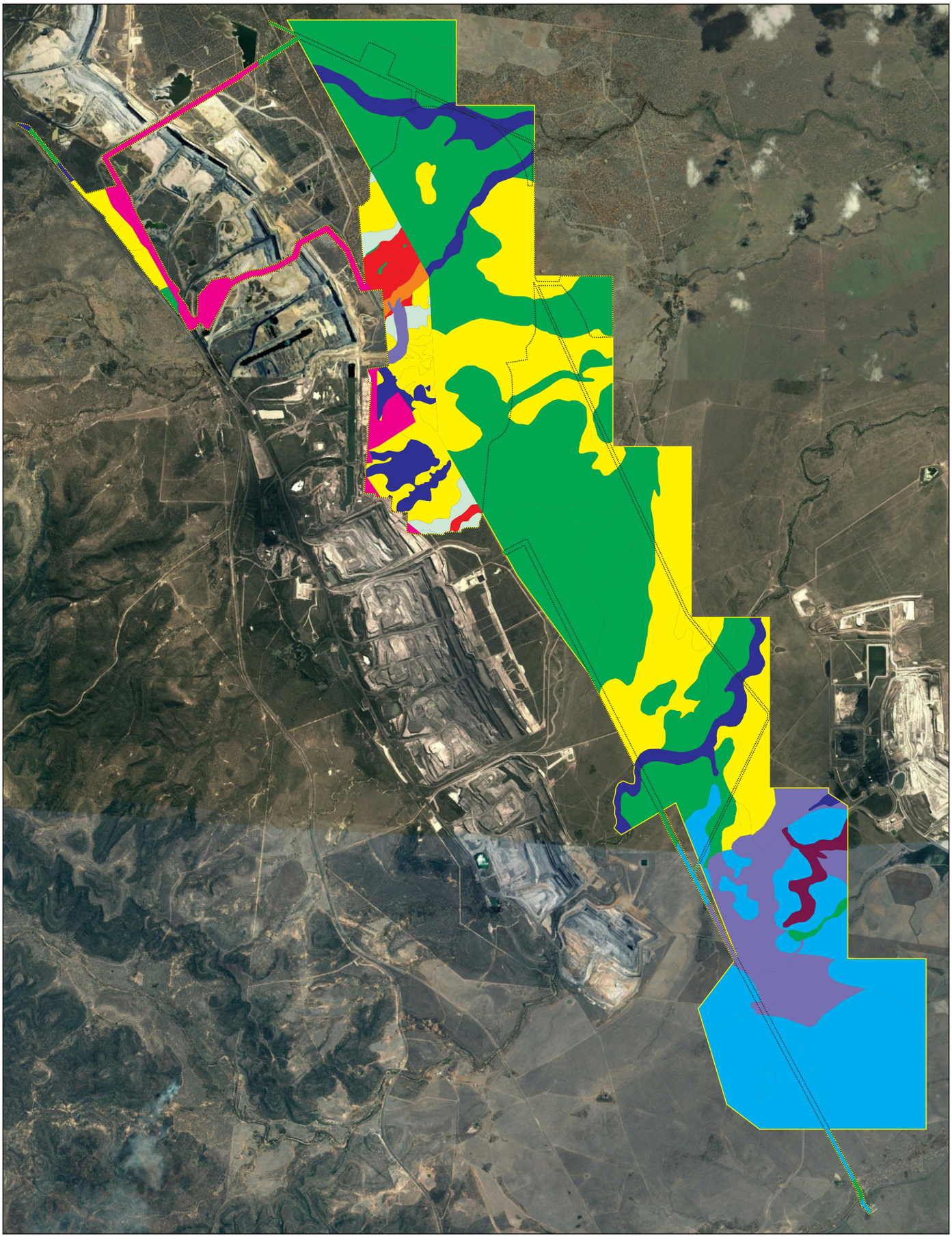


Figure 4: Agricultural Land Classes

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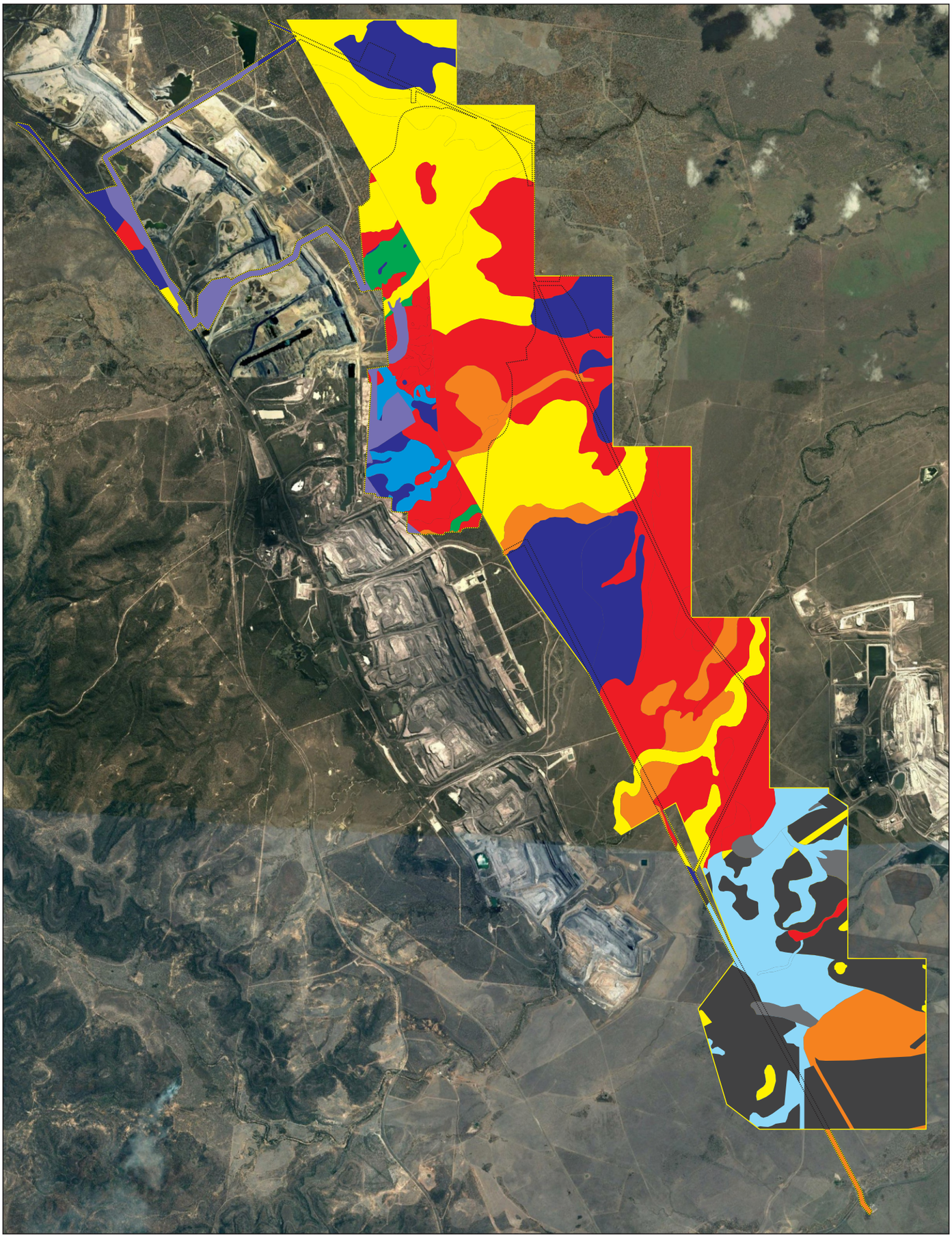


Figure 5: Topsoil Stripping Depth

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Figure 6: Strategic Cropping Land

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10 APPENDICES

Appendix A	**Emmerton, 2005 Observation site descriptions**
Appendix B	**GTES, 2012 Observation site descriptions**
Appendix C	**GTE, 2018 Observation Site Descriptions**
Appendix D	**GTE, 2019-2021 Observation Site Descriptions**
Appendix E	**Laboratory Data Summary**
Appendix F	**Laboratory Certificates**
Appendix G	**Regional Frameworks Land Suitability Limitations Review**

Site, description, pH, E.C. slake and dispersion index ratings for the soil profiles investigated in the Saraji 2004 (Emmerton, 2005) survey

22	■ 0 637 791E 7 513 604N (crusted scalded surface, hardset weak surface flake)				
0-10	Dark brown silty surfaced sandy clay loam A	6.3	285	0	0 (0)
10-20	Brown LC B21	6.2	135	0	0 (1)
20-30	As above	6.2	218	1	0 (0)
30-40	As above	7.3	270	1	0 (0)
50-60	Dark yellowish brown LC B22, some hard CO^3 present	8.4	190	1-2	0 (0)
33	■ 0 637 674E 7 515 738N (hardset surface)				
0-10	Dark brown sandy loam A1	6.0	55	0	0 (3)
10-20	As above	5.8	48	1	0 (3)
20-30	Brown sandy loam A2	5.7	45	2-3	0 (3)
30-40	As above to 35cm, mottled B21 below	5.8	50	2-3	0 (3)
50-60	Mottled greyish brown/yellowish brown sandy clay B21, not recoverable below 60cm	6.5	103	4	3 (3)
42	0 636 772E 7 516 760N (hardset, slightly flaking surface, an overlain variant)				
0-10	Hardset brown platey/angular fine sandy loam A11	6.9	173	0	0 (1)
10-20	As above	6.5	105	0	0 (2)
20-30	As above	6.3	81	0	0 (2)
30-40	Dark brown sandy clay loam A12 to 50cm	6.4	70	0	0 (2)
50-60	Brown very weakly cemented sandy loam A13	6.4	55	3	0 (2)
80-90	Mottled greyish brown/dark yellowish brown LMC B21 (no CO^3)	6.5	73	2-3	0 (2)
48	0 637 338E 7 517 603N (very hardset poached surfaced, possible pit water influence, prone to bulldust formation)				
0-10	Non cracking dark brown silty clay A	6.6	278	0-1	0 (2)
10-20	As above	6.9	226	0-1	0 (2)
20-30	Brown silty clay loam B21	7.1	175	0-1	1 (2-3)
30-40	As above	7.2	124	0-1	1 (2-3)
50-60	Mottled brown/yellowish brown silty clay loam B22	6.1	293	3	2 (2)
80-90	As above	6.0	436	3	0 (2)
110-120	As above, texture lightening and tending towards alluvium	-	-	-	-

57	1.1 0 635 281E 7 519 412N (hardset cracking surface)				
0-10	Dark grey platey/angular weakly consolidated silty clay A	5.3	85	2-3	0 (2-3)
10-20	As above	5.4	76	2-3	0 (2-3)
20-30	Dark grey/greyish brown weakly consolidated silty clay B21 (some ferric staining)	5.9	70	3	2 (2-3)
30-40	As above	6.5	92	3	2 (2-3)
50-60	As above	8.1	158	3	2 (2-3)
80-90	Grey/yellowish brown strongly mottled non consolidated MC (fine sandy) B3/PM	8.3	244	3	2 (2)
110-120	As above	8.3	371	3	2 (2)
140-150	As above	8.1	517	3	2 (2)
60	1.2 0 635 842E 7 519 633N (hardset surface, surface structural problems, prone to bulldust formation)				
0-10	Dark brown fine sandy loam A	7.2	101	0	0 (1)
10-20	As above	8.0	112	1	0 (0)
20-30	As above to 25cm, mottled SC B21 under	8.4	145	1	0 (0)
30-40	Mottled very dark greyish brown/brown SC B21(no CO^3)	8.5	145	1	0 (0)
50-60	As above	8.4	118	1	0 (0)
80-90	Mottled light yellowish brown/strong brown SC PM (high soft CO^3 present)	8.5	160	3	0 (2)
110-120	As above	8.6	123	3	0 (1-2)
61	■ 0 636 217E 7 520 539N (hardset surface, surface structural problems)				
0-10	Dark yellowish brown silty loam A1	5.3	56	0	0 (2)
10-20	As above	5.4	59	0	0 (2)
20-30	Brownish yellow A2	5.3	65	1	0 (2)
30-40	Weakly consolidated dark greyish brown/dark yellowish brown LMC B21(no CO^3)	5.1	71	3	0 (2)
50-60	As above	6.2	361	3	1-2 (2-3)
80-90	Mottled dark greyish brown/yellowish brown MC 3D	7.4	272	3	1-2 (2-3)
68	■ 0 634 233E 7 520 713N (duplex soil, hardset surface)				
0-10	Dark brown sandy loam A1	5.0	57	1	0 (1)
10-20	As above	4.8	47	1	0 (2)
20-30	Dark brown sandy loam A1 to 25cm, bleached A2 below	4.7	47	1	0 (2)

30-40	Mottled brown/strong brown MC B21, no CO^3 and some high laterite present	5.7	99	3	3 (3)
50-60	Whole coloured yellowish brown MC (sandy) B22, no laterite or CO^3	7.1	443	3	3 (3)
80-90	As above	7.0	397	3	3 (3)
70	■ 0 634 998E 7 520 878N (duplex soil, hardset surface)				
0-10	Brown sandy loam A1	4.9	49	2-3	0 (0-1)
10-20	As above	4.9	46	2-3	0 (1-2)
20-30	Brown sandy loam A1 to 25cm, bleached A2 below	5.1	45	2-3	1-2 (2)
30-40	Mottled dark greyish brown/yellowish brown LMC B21, no CO^3	6.2	97	3	2 (2-3)
50-60	As above	7.3	224	3	2 (2-3)
80-90	Whole coloured dark yellowish brown LMC B22, some hard CO^3 present	9.2	657	3	2 (2-3)
71	■ 0 634 950E 7 520 372N (hardset, some deposition and pit water influence)				
0-10	Dark brown loamy sand A11	6.3	112	0	0 (2-3)
10-20	As above	6.5	104	1	1 (2-3)
20-30	Slightly mottled dark greyish brown and brown loamy sand A12	6.5	94	1	1 (2-3)
30-40	As above	6.6	72	3	1 (2-3)
50-60	Brown sand A2	7.0	83	3	1 (2-3)
80-90	As above	7.4	121	3	1-2 (2)
110-120	Mottled grey/yellowish brown light sandy clay loam 2D/C	8.0	186	3	2-3 (2)
140-150	As above	7.9	326	3	2-3 (2)
73	■ 0 635 934E 7 520 944N (hardset surface, some pit water influence)				
0-10	Dark greyish brown silty clay loam eluviation layer	6.2	143	0	0 (2-3)
10-20	Dark greyish brown sandy clay loam A1	6.1	88	1	0 (2-3)
20-30	As above	5.8	92	1	1 (2-3)
30-40	Brown, weakly mottled/cemented sandy clay loam A2 (no CO^3)	5.6	88	1	1 (2-3)
50-60	Greyish brown whole coloured sandy clay B21	5.1	171	3	1 (2-3)
80-90	Mottled greyish brown/yellowish brown sandy clay B22/2D (no CO^3)	4.9	248	3	2 (2-3)
74	■ 0 635 775E 7 520 501N (hardset surface)				
0-10	Dark brown loamy sand A1	5.2	50	0	0 (1-2)
10-20	As above	5.0	46	0	0 (1-2)
20-30	As above	4.9	48	0	0 (1-2)
30-40	Brown loamy sand A2	5.1	50	0	0 (1-2)
50-60	Mottled dark greyish brown/dark yellowish brown SC B21	6.6	153	3	2 (2)
75	■ 0 635 385E 7 520 379N (hardset, slight pit water influence)				
0-10	Dark brown loamy sand A1	6.7	148	0	0 (2)
10-20	As above	6.7	99	0	0 (2)
20-30	As above to 25cm, brown loamy sand A2 below	6.6	74	0	0 (1-2)
30-40	Brown loamy sand A2	6.5	61	2	0 (1-2)
50-60	As above, brown whole coloured SC B21under	6.7	155	3	1-2 (1-2)
80-90	Mottled greyish brown LC (sandy) B22	6.5	843	3	2 (2-3)
110-120	As above	7.1	673	3	2 (2-3)
76	■ 0 634 028E 7 521 010N (firm surface noncracking, small surface silcrete and laterite)				
0-10	Dark brown LC A	5.6	148	1	0 (2-3)
10-20	As above to 15cm, darker brown LMC B21 below	5.5	164	1	0 (2-3)
20-30	Brown whole coloured LMC B21, no CO^3	5.6	161	1	0 (2-3)
30-40	As above	6.0	279	2-3	1-2 (2-3)

50-60	Dark brown LMC B22 (sandy), no CO^3	6.5	574	3	2-3 (2-3)
80-90	As above	4.8	960	3	2-3 (2)
110-120	Mottled dark brown/reddish brown MC (sandy) B3	4.5	1004	3	2-3 (2)
77	■ 0 633 898E 7 521 568N (hardset surface noncracking, small surface silcrete and laterite)				
0-10	Dark brown LMC A	6.1	100	0	0 (2-3)
10-20	As above	6.7	89	1	0 (2-3)
20-30	Dark reddish brown MHC B21, no CO^3, moderate ironstone	7.5	135	1	1 (2-3)
30-40	As above	7.6	328	3	2 (2-3)
50-60	As above, lesser ironstone	6.0	795	3	2 (2-3)
80-90	Dark reddish brown/reddish brown mottled MHC B22/B3	4.7	722	3	2 (2-3)
78	■ 0 634 157E 7 522 090N (intergrade, non-cracking shelf profile, hardset, gilgai to 50cm)				
0-10	Dark brown clay loam A	5.9	132	1	0 (2-3)
10-20	As above to 15cm, dark brown MC B21 below	6.1	128	1	0 (2-3)
20-30	Dark brown MC B21, CO^3 absent	6.5	166	1	0 (2-3)
30-40	As above	7.0	222	1	2 (2-3)
50-60	Whole coloured dark yellowish brown LMC B22, some CO^3 present	9.2	678	3	2 (2)
80-90	Yellowish brown LC (sandy) B3, no CO^3	8.8	909	3	2 (2)
79	■ 0 633 706E 7 522 541N (very hardset surface, duplex soil)				
0-10	Dark brown clay loam (fine sandy) A	6.2	94	1	1 (2-3)
10-20	As above to 15cm, mottled brown/yellowish brown LC below	6.3	77	1	1 (2-3)
20-30	Mottled brown/yellowish brown LC	5.6	210	1	1 (2-3)
30-40	As above	5.1	662	1	0 (2-3)
83	■ 0 634 802E 7 521 593N (duplex soil, hardset surface)				
0-10	Hardset dark brown loam (fine sandy) A	5.4	107	0	1 (2)
10-20	As above	5.6	111	2	1 (2)
20-30	Dark brown MC B21	6.1	222	3	2-3 (2)
30-40	As above	7.4	461	3	2-3 (2)
50-60	Dark yellowish brown MC B22, some soft CO^3	8.8	752	3	2-3 (2)
80-90	Strong brown MC B3, no CO^3 present, some tertiary influences	9.3	354	3	2-3 (2)
84	■ 0 635 621E 7 521 518N (hardset surface)				
0-10	Dark brown fine sandy loam A1	5.7	61	0	0 (2)
10-20	As above	5.7	53	0	0 (2)
20-30	Brown fine sandy loam A2 (some laterite to 25cm), underlain by mottled MC B21	5.4	50	1	0 (2)
30-40	Mottled greyish brown/yellowish brown MC B21	5.8	57	3	2 (2)
85	■ 0 635 250E 7 522 300N (duplex soil, hardset surface)				
0-10	Brown sandy loam A1	5.7	50	1	0 (1)
10-20	As above	5.7	47	1	0 (1)
20-30	As above to 25cm, grading to lighter A2, some laterite	5.7	49	1	0 (1)
30-40	Mottled greyish brown/yellowish brown SC B21	7.0	172	3	2 (2)
50-60	As above, grading to whole coloured B22	7.8	405	3	1 (2)
80-90	Dark yellowish brown SC B22, some CO^3 present	-	-	-	-
87	■ 0 633 492E 7 520 900N (cracking clay, weak, flake, firm surface, small surface ironstone and quartz present)				
0-10	Dark brown hard granular MC A	5.9	429	1-2	0 (2-3)
10-20	As above	6.0	509	1-2	0 (2-3)
20-30	Mainly dark red HC B21, no CO^3	5.7	678	1-2	1 (2-3)
30-40	As above	4.8	1016	3	0 (2-3)
50-60	As above	4.4	1269	3	0 (0)
80-90	Mottled dark red/greyish brown HC B22	4.1	1558	3	0 (0)

110-120	Dark red/grey parent clays	4.0	1567	3	0 (0)
88	■ 0 633 588E 7 521 768N (cracking puff profile, weak flake, firm surface, small gilgai to 50 to 60cm)				
0-10	Brown hard granular MC A	6.4	270	1	0 (2-3)
10-20	As above	6.6	383	1	0 (2-3)
20-30	Dark yellowish brown MHC B21	6.9	572	1	2 (2-3)
30-40	As above	7.2	936	3	2-3 (2)
50-60	Yellowish brown HC B22, no CO^3	5.9	1366	3	2-3 (2)
80-90	As above	5.3	1453	3	2-3 (1)
110-120	Slightly mottled yellowish brown/grey B3	5.0	1516	3	2 (1)
89	■ 0 633 495E 7 522 234N (hardset noncracking clay)				
0-10	Dark brown very hard LC A	6.2	142	1	0 (2-3)
10-20	As above to 15cm, dark brown MC B21 below	7.4	160	1	0 (2)
20-30	Whole coloured dark brown MC B21, very slight CO^3	9.3	300	2-3	0 (1-2)
30-40	Mottled dark brown/dark yellowish brown MC B22, no CO^3	9.4	701	3	2 (2)
50-60	Yellowish brown LMC (sandy) LMC (sandy) B23, no CO^3	8.4	1130	3	2 (2)
80-90	As above	7.8	1110	3	2-3 (2-3)
90	■ 0 633 499E 7 522 836N (duplex soil, hardset surface)				
0-10	Brown loam, fine sandy A	6.2	102	0	0 (2-3)
10-20	As above to 15cm, mottled LMC B21 below	6.4	76	0	2 (2)
20-30	Mottled dark greyish brown/dark yellowish brown LMC B21	7.2	99	0	2 (2)
30-40	Whole coloured dark yellowish brown LMC B22	8.2	163	1-2	2 (2)
50-60	As above	9.0	427	3	2-3 (2)
80-90	Dark yellowish brown LMC B3, some hard CO^3 present	9.4	687	3	2-3 (2)
91	■ 0 634 431E 7 523 277N (cracking puff profile, weak flake, firm surface, gilgai to 80cm)				
0-10	Very dark greyish brown hard blocky MC A	6.5	289	0	0 (2)
10-20	As above to 15cm, grading to MHC B21	6.5	437	2-3	1 (2)
20-30	Very dark greyish brown MHC B21	6.8	550	3	1 (2)
30-40	As above	6.8	919	3	2 (2)
50-60	Dark greyish brown MHC B22, no CO^3	5.6	1101	3	2 (2)
80-90	As above	5.1	1315	3	2 (2)
110-120	Mottled dark greyish brown/dark yellowish brown MHC B3, no CO^3, some coarse sand	4.9	1326	3	2 (2)
92	■ 0 634 806E 7 523 499N (cracking clay, lattice gilgai to 50cm, puff profile, firm surface flake)				
0-10	Very dark greyish brown MC A	6.4	252	1-2	0 (2)
10-20	Dark greyish brown/brown HMC B21, slight CO^3	7.3	420	1-2	0 (2)
20-30	As above	8.3	840	2-3	2 (2)
30-40	Brown HMC B22, no CO^3	-	-	-	-
50-60	As above	5.9	1554	3	2 (2)
80-90	As above	5.4	1565	3	2 (2)
110-120	As above, parent materials not encountered, very hard	4.9	1624	3	1 (2)
93	■ 0 634 892E 7 523 885N (duplex soil, hardset surface)				
0-10	Very dark greyish brown loam, fine sandy A	6.0	104	0	0 (1)
10-20	As above to 15cm, dark brown LMC B21 below	6.0	77	0-1	0 (2)
20-30	Dark brown LMC B21	6.6	96	3	0 (2)
30-40	Mottled dark grey/brown LMC B22, some hard and soft CO^3 present	7.3	132	3	1 (2)
50-60	As above	9.2	341	3	1 (2)
94	■ 0 634 967E 7 523 218N (hardset, poor structurally, high surface silcrete)				
0-10	Dark brown very hard, loam fine sandy A	5.7	90	0-1	0 (2)
10-20	Dark brown MC B21, no CO^3	5.8	217	0-1	0 (2)
20-30	As above	6.8	391	3	2-3 (2)

30-40	Brown LC (sandy) B22, no CO^3	8.2	745	3	2 (2)
50-60	As above	8.5	1043	3	2 (2)
80-90	Mottled brown/yellowish brown LC B3, no CO^3, possible sediment inclusion?	8.1	972	3	2 (2)
110-120	As above	7.4	979	3	2-3 (2)
95	■ 0 634 953E 7 522 907N (very hardset noncracking clay, alluvial influence)				
0-10	Dark greyish brown LMC A	6.0	142	1	0 (2-3)
10-20	As above	6.3	111	0-1	0 (2)
20-30	Weakly mottled dark grey/brown MC B21, slight CO^3	6.9	142	2-3	0 (2)
30-40	As above	8.6	253	3	1 (2)
50-60	As above	8.9	690	3	1-2 (2)
60-70	Dark grey LC (sandy) B3, containing large silcrete (stopped augering)	-	-	-	-
96	■ 0 633 481E 7 523 458N (hardset, semi disturbed surface)				
0-10	Dark brown fine sandy loam A1	6.3	99	1	0 (2-3)
10-20	As above	6.0	58	2-3	0 (2-3)
20-30	Brown fine sandy loam A2 (some laterite to 25cm, underlain by mottled MC B21	5.9	58	2-3	0 (2)
30-40	Mottled greyish brown/yellowish brown MC B21	5.8	80	3	0 (3)
98	■ 0 633 783E 7 523 731N (duplex soil, hardset surface)				
0-10	Dark brown loam, fine sandy A	6.6	127	0-1	0 (2)
10-20	As above	6.1	75	1	0 (2)
20-30	Very hard mottled brown MC B21	6.8	81	1-2	2 (2)
30-40	As above	7.7	120	1-2	2 (2-3)
99	■ 0 633 927E 7 523 352N (duplex soil, hardset sandy surface, shelf area within gilgaid complex)				
0-10	Dark brown clay loam A	6.0	147	0	0 (2-3)
10-20	Dark greyish brown LMC B21	6.6	105	0	0 (2-3)
20-30	As above	7.8	142	2-3	1 (2-3)
30-40	As above, grading to B22	9.1	263	2-3	2 (2-3)
50-60	Mottled dark greyish brown/yellowish brown LMC (sandy) B22, slight soft CO^3	9.4	727	3	2 (2-3)
80-90	Mottled dark greyish brown/yellowish brown LMC (sandy) B23, no CO^3	8.6	1028	3	3 (2)
100	■ 0 634 483E 7 523 599N (puff profile, hardset NCC)				
0-10	Dark yellowish brown LMC A	6.1	116	0	0 (1)
10-20	As above	6.8	107	1	0 (1)
20-30	As above to 25cm, MC B21 below	9.0	271	2-3	0 (0)
30-40	Dark yellowish brown MC B21, high soft CO^3 present	9.2	406	3	0 (0)
50-60	As above	9.2	554	3	1 (0)
102	■ 0 634 611E 7 525 401N (better quality variant, heavy belah understory, firm surface)				
0-10	Dark brown loam A1	6.2	76	0	0 (2-3)
10-20	As above	5.4	55	0	0 (2-3)
20-30	Slightly bleached A2 above weakly mottled dark greyish brown/dark yellowish brown MC B21 below 25cm	5.8	65	1	2 (2)
30-40	Weakly mottled dark greyish brown/dark yellowish brown MC B21	6.4	113	1	2 (2-3)
50-60	As above, whole coloured dark yellowish brown MC B22 with soft CO^3 below	8.4	401	3	2 (2-3)
80-90	Dark yellowish brown MC B3, soft CO^3 present	9.5	648	3	2 (2-3)
110-120	Mottled greyish brown/yellowish brown parent cainozoic	9.6	777	3	2-3 (2)
103	■ 0 634 686E 7 525 075N (firm surface)				
0-10	Dark brown sandy loam A1	6.8	86	1	0 (1)

10-20	As above to 15cm with bleached A2 under	5.6	46	0	0 (1)
20-30	Grey, dark yellowish brown/dark red LC (sandy) B21, no CO^3	5.5	45	0	0 (1)
30-40	As above	5.7	46	0	0 (1)
50-60	As above	5.9	57	3	0 (1-2)
80-90	As above	6.3	63	3	0 (1-2)
104	■ 0 634 714E 7 524 711N (better quality variant, heavy understory, duplex but occasional cracking and noncracking clays)				
0-10	Dark brown loam A to 5cm, LC B21 below	6.3	115	1	0 (2)
10-20	Dark brown LC B21	7.2	94	1	0 (2)
20-30	As above	7.6	83	1-2	0 (2)
30-40	As above	8.2	108	2-3	1 (3)
50-60	Dark brown LC B22 with soft CO^3 present (colour lightening)	9.6	475	3	2 (3)
80-90	Brown to strong brown MC (sandy) B3, high soft CO^3 present	9.2	1296	3	0 (1)
110-120	Brown to strong brown MHC cainozoic, high soft CO^3 present	9.3	1090	3	1-2 (2)
105	■ 0 634 986E 7 524 348N (intergrade to better quality variant, heavy understory, firm surface)				
0-10	Dark brown clay loam A	5.9	103	0	0 (2)
10-20	As above	6.3	79	2-3	0 (2)
20-30	Dark brown MC B21	7.0	116	3	1 (2-3)
30-40	As above	8.2	289	3	2 (2-3)
50-60	Brown MC B22 with soft CO^3 present	9.3	996	3	1-2 (1)
80-90	Mottled brown/strong brown parent cainozoic, soft CO^3 present	9.4	939	3	1-2 (1-2)
110-120	As above	-	-	-	-
106	■ 0 634 613E 7 524 473N (hardset surface)				
0-10	Very dark greyish brown sandy loam A1	5.8	89	0	0 (1)
10-20	As above	5.9	54	1	0 (1-2)
20-30	Bleached sandy loam A2 to 25cm, mottled LMC B21 under	6.2	76	1-2	1-2 (1)
30-40	Slightly mottled brown LMC B21	7.3	177	3	1-2 (2)
50-60	Mottled grey/brown LMC (sandy) B22, slight hard CO^3 present	9.4	893	3	2 (2)
80-90	Mottled grey/brown sandy clay cainozoic, some hard and soft CO^3 present	9.5	929	3	1-2 (2)
110-120	As above	-	-	-	-
107	■ 0 634 392E 7 524 205N (cracking clay, occasional gilgai present to 40cm, firm surface flake, non self-mulching, shelf profile)				
0-10	Very dark grey MC A	6.3	124	0	0 (2-3)
10-20	As above	6.6	118	0	0 (2-3)
20-30	As above to 25cm, with very dark grey MHC B21 with soft CO^3 present	7.9	384	1	0 (2-3)
30-40	Very dark grey MHC B21 with soft CO^3 present	8.7	659	3	0 (2)
50-60	As above	8.7	1033	3	1 (2)
80-90	Mottled very dark greyish brown/dark yellowish brown MHC B22	8.6	953	3	0 (2)
110-120	Brown LC (sandy) parent cainozoic, high CO^3	9.2	922	3	1 (2)
109	■ 0 631 776E 7 530 533N (soft surface)				
0-10	Dark brown fine loamy sand A11	6.3	86	0	0 (1)
10-20	As above	6.4	58	0	0 (1-2)
20-30	Dark yellowish brown fine loamy sand A12	6.4	55	0-1	0 (1-2)
30-40	As above	6.4	54	0-1	0 (1-2)

50-60	As above	6.3	58	2-3	0 (1-2)
80-90	Weakly cemented mottled brown/strong brown fine sandy loam to light sandy clay loam A13	6.6	62	3	0 (2)
110-120	Brown/strong brown sandy flow layer 2D	6.6	57	3	0 (1-2)
117	■ 0 634 080E 7 524 980N (firm surface)				
0-10	Dark brown sandy loam A1	8.6	100	0	0 (1-2)
10-20	As above	8.2	84	0	0 (1-2)
20-30	As above	7.1	64	1	0 (1-2)
30-40	As above, A2 under	6.6	52	1	0 (1-2)
50-60	Mottled greyish brown/yellowish brown LC B21	6.6	57	1	1 (1-2)
80-90	As above	6.3	64	1	2 (2)
118	■ 0 633 710E 7 524 893N (loose surface)				
0-10	Dark yellowish brown loamy sand A11	6.1	78	3	0 (1-2)
10-20	As above	6.5	90	3	0 (1-2)
20-30	As above	6.2	76	3	0 (1-2)
30-40	As above, grading to brown loamy sand A12	6.1	64	1	0 (1-2)
50-60	As above	6.0	57	1	0 (1-2)
80-90	As above	6.1	54	3	0 (1-2)
110-120	Weakly cemented mottled dark yellowish brown/yellowish brown light sandy clay loam B21/B3 (some laterite)	6.0	51	3	0 (1-2)
140-150	As above	5.9	51	3	0 (1-2)
119	■ 0 633 832E 7 524 606N (cracking clay, occasional gilgai present to 20cm, firm surface flake, non self-mulching, shelf profile)				
0-10	Very dark greyish brown LC A	6.3	174	0	0 (1-2)
10-20	Very dark greyish brown MC B21	6.6	185	1	0 (2)
20-30	Dark yellowish brown MC B22, soft CO^3 present	8.2	330	1	0 (0)
30-40	As above	8.8	457	3	0 (1)
50-60	As above, grading to brown B23/B3 below	8.8	928	3	1 (1-2)
80-90	Mottled brown/strong brown MC cainozoic, some slight CO^3 and coarser quartz present	8.8	1391	3	0 (2)
110-120	As above	8.9	1259	3	1 (2)
120	■ 0 633 287E 7 525 615N (hardset surface)				
0-10	Dark brown loam, fine sandy A	5.8	62	0	0 (1-2)
10-20	As above	5.6	53	0	0 (1-2)
20-30	As above to 25cm, dark brown LMC B21 below	5.5	49	0	0 (2)
30-40	Dark brown LMC B21	5.7	50	3	0 (2)
50-60	Brown LMC B22	6.3	57	3	0 (2)
80-90	Brown/strong brown sandy clay loam alluvium 2D	6.5	66	3	0 (2)
122	■ 0 633 456E 7 525 940N (firm surface)				
0-10	Dark brown fine sandy loam A1	6.7	99	0	0 (1-2)
10-20	As above	6.8	80	0	0 (1-2)
20-30	As above	6.9	74	2-3	0 (1-2)
30-40	Dark yellowish brown fine sandy loam A2, gradual interface to B21 below	6.8	66	0	0 (1-2)
50-60	Dark yellowish brown SC B21	6.3	93	3	0 (2-3)
80-90	As above, PM not encountered	6.3	162	3	0 (2)
124	■ 0 632 347E 7 526 952N (cracking clay, gilgai to 20cm, shelf profile, weak surface flake, some algal crust and hard CO^3 on surface)				
0-10	Greyish brown granular HC A underlain by blocky HC B21	8.2	352	0	0 (2-3)
10-20	Greyish brown hard blocky HC B21, some hard CO^3	8.3	350	0	1 (2-3)
20-30	As above	8.5	703	2	2 (2-3)
30-40	As above	8.2	1183	2	2 (2)

50-60	Dark greyish brown HC lenticular B22, slight hard CO^3 present	7.9	1995	2-3	2 (1)
80-90	As above	8.2	2397	2-3	2 (1)
110-120	Olive grey HC B3, slight hard CO^3 present	8.0	2503	3	2 (1)
140-150	Slightly mottled light olive brown HC PM, slight hard CO^3 present	8.1	2491	3	2 (1)
125	■ 0 631 825E 7 527 410N (hardset surface)				
0-10	Dark brown sandy loam A1	6.0	77	0	0 (2)
10-20	As above	5.5	53	0	0 (2)
20-30	As above	5.1	50	0	0 (1-2)
30-40	Dark yellowish brown weakly cemented sandy loam A2	5.0	49	0-1	0 (1)
50-60	Mottled dark greyish brown/dark yellowish brown SC B21	5.5	53	3	0 (1)
70-75	Mottled dark greyish brown/dark yellowish brown MC B22	6.5	142	3	1 (2)
126	■ 0 632 108E 7 527 125N (hardset surface)				
0-10	Very dark greyish brown light sandy clay loam A1	5.8	71	0	0 (2)
10-20	As above	5.5	50	0	0 (2)
20-30	As above, with a thin bleached A2 over mottled B21 under 28cm	5.5	45	1	0 (2-3)
30-40	Mottled greyish brown/yellowish brown MC B21	5.9	54	0	0 (2-3)
50-60	As above	6.3	75	3	0 (2-3)
80-90	As above	-	-	-	-
127	■ 0 632 594E 7 527 175N (cracking clay, gilgai to 20cm, shelf profile, hardset granular surface, some hard CO^3 on surface)				
0-10	Very dark greyish brown and dark olive brown HC A	7.5	240	3	1 (2)
10-20	As above	7.8	588	2	0 (2)
20-30	As above to 25cm, dark greyish brown HC B21 under	8.2	536	2-3	0 (2)
30-40	Dark greyish brown HC B21, slight hard CO^3	8.4	670	2-3	1 (1)
50-60	As above	8.2	1265	3	2 (1)
80-90	As above	8.2	1804	3	2 (1)
110-120	Mottled dark greyish brown/light olive brown HC B3, slight hard CO^3 present	8.2	2119	3	2-3 (1)
128	■ 0 633 014E 7 527 063N (firm surface)				
0-10	Very dark greyish brown sandy loam A11	6.4	102	1	0 (0-1)
10-20	As above	6.7	64	1	0 (1)
20-30	As above	6.6	58	0-1	0 (1)
30-40	Brown sandy loam A12	6.6	53	0	0 (1)
50-60	As above, weakly cemented A13 below	6.6	51	3	0 (1)
80-90	Mottled greyish brown/yellowish brown clay loam relict alluvium (no CO^3)	7.1	61	3	1 (2-3)
110-120	As above	8.0	95	3	0 (2-3)
129	■ 0 632 696E 7 527 347N (cracking clay, firm surface flake, non self-mulching)				
0-10	Very dark greyish brown friable MC A	5.9	168	0	0 (2)
10-20	As above	6.6	174	2	2 (3)
20-30	Dark brown hard blocky MHC B21	7.6	364	2	2-3 (3)
30-40	As above	7.7	631	2	2 (3)
50-60	Dark yellowish brown HC B22, slight soft CO^3 present	8.1	1465	3	0 (0)
80-90	As above, slight hard CO^3 present	8.6	1673	3	2 (0)
110-120	Mottled dark yellowish brown/dark grey MHC parent clays	8.1	1623	3	2 (2)
134	■ 0 632 696E 7 527 347N (cracking clay, firm surface flake, non self-mulching)				
0-10	Very dark greyish brown friable MC A	5.9	168	0	0 (2)
10-20	As above	6.6	174	2	2 (3)
20-30	Dark brown hard blocky MHC B21	7.6	364	2	2-3 (3)
30-40	As above	7.7	631	2	2 (3)

50-60	Dark yellowish brown HC B22, slight soft CO^3 present	8.1	1465	3	0 (0)
80-90	As above, slight hard CO^3 present	8.6	1673	3	2 (0)
110-120	Mottled dark yellowish brown/dark grey MHC parent clays	8.1	1623	3	2 (2)
138	■ 0 633 952E 7 525 593N (hardset surface, some algal crust structurally poor variant)				
0-10	Dark brown silty fine sandy loam A1	5.2	67	1	0 (1-2)
10-20	As above	5.2	142	1	0 (1-2)
20-30	Dark greyish brown silty fine sandy loam A2	5.4	218	2	0 (1-2)
30-40	Very dark greyish brown weaklier consolidated MC B21	6.4	511	2	2 (2-3)
50-60	As above	8.1	806	2	2-3 (3)
80-90	Weakly mottled dark greyish brown/olive brown MC B22, some hard CO^3	8.9	1061	3	2-3 (3)
110-120	Brown weakly mottled HC alluvium, with hard CO^3 present	9.1	973	3	2-3 (3)
142	■ 0 633 668E 7 527 125N (soft surface)				
0-10	Brown loamy sand A11	6.1	119	0	0 (1-2)
10-20	As above	6.6	111	1	0 (1-2)
20-30	As above	6.8	92	1	0 (1-2)
30-40	Strong brown loamy sand A12	6.8	91	1	0 (1-2)
50-60	As above	6.6	85	2	0 (2)
80-90	As above	6.9	89	3	0 (2)
110-120	Weakly cemented yellowish red sandy loam A13	6.4	57	3	0 (2)
140-150	As above	6.3	54	3	0 (1)
143	■ 0 633 493E 7 527 610N (loose surface)				
0-10	Dark brown loamy sand A11	6.0	68	0	0 (0)
10-20	As above	6.4	64	0	0 (0)
20-30	As above	6.5	59	1	0 (1)
30-40	Strong brown loamy sand A12	6.7	57	0	0 (1-2)
50-60	As above	6.7	55	1	0 (1-2)
80-90	As above, very weakly cemented below 60cm	6.6	50	3	0 (1-2)
110-120	Weakly cemented/mottled brown/yellowish brown sandy loam A13	6.6	56	3	0 (1-2)
144	■ 0 633 285E 7 528 032N (hardset surface)				
0-10	Dark brown sandy loam A1	6.3	67	0-1	0 (1)
10-20	As above	6.2	62	0-1	0 (1-2)
20-30	As above to 25cm, yellowish brown sandy loam A2 below	6.2	52	3	0 (1-2)
30-40	Yellowish brown sandy loam A2	6.3	52	3	0 (1-2)
50-60	Mottled greyish brown/ yellowish brown LMC B21, some hard CO^3	6.6	91	3	0 (2)
145	■ 0 633 147E 7 528 468N (firm surface)				
0-10	Dark brown loamy sand A11	5.7	57	3	0 (1-2)
10-20	As above	5.8	55	3	0 (1-2)
20-30	As above to 25cm, dark yellowish brown loamy sand A12 below	5.9	50	2	0 (1-2)
30-40	Dark yellowish brown loamy sand A12	6.0	56	2	0 (1-2)
50-60	As above	6.1	48	2-3	0 (1-2)
80-90	Mottled brown/yellowish brown sandy clay loam B21	5.5	49	3	0 (2)
110-120	Slightly mottled yellowish brown light sandy clay loam reworked cainozoic	5.4	47	3	0 (2)
140-150	As above	5.6	52	3	0 (2)
146	■ 0 632 940E 7 528 754N (hardset)				
0-10	Dark greyish brown loam, fine sandy (silty) A	6.0	133	1-2	0 (2)
10-20	As above	6.4	114	1-2	0 (2)
20-30	Dark brown HC B21	6.9	148	2	0 (2-3)
30-40	As above to 35cm, yellowish brown HC B22, slight hard CO^3 below	7.5	304	3	1 (2-3)
50-60	Yellowish brown HC B22, slight hard CO^3	8.9	683	3	1 (2)

80-90	Yellowish brown parent clays, high hard CO^3	9.0	1025	3	1 (1)
148	■ 0 634 213E 7 527 327N (soft surface)				
0-10	Dark brown loamy sand A11	5.7	63	3	0 (1-2)
10-20	As above	5.7	62	3	0 (1-2)
20-30	As above	6.0	58	1	0 (1-2)
30-40	Brown to strong brown loamy sand A12	6.2	58	1	0 (1-2)
50-60	As above	6.3	53	3	0 (1-2)
80-90	As above	6.4	64	3	0 (1-2)
110-120	Weakly cemented yellowish red loamy sand A13	6.5	75	3	0 (1-2)

APPENDIX B: SITE DESCRIPTION SUMMARY (GTES, 2012)

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
1	642377	7508687	B1	Gently undulating plain, slope 1%, 100% Buffel cover. Edge of Belah scrub. Surface is self mulching with few small rounded ironstone and minor cracking - overall lighter textured scrub soil – very good grazing but has cropping potential. Stripping depth at least 0-40cm. Substrate is mixed sediments. A1 0-0.05cm Brown (7.5YR4/2), light medium clay, strong granular, no inclusions, field pH 7.5. clear change to; B21 0.05-40cm Dark brown (10YR3/2), medium clay, angular blocky, field pH 7.5, no carbonate nodules, dry, clear change to, B22 40-100cm Dark brown (10YR3/2), medium heavy clay, strong lenticular structure, field pH 8.0, some carbonate nodules, moist, gradual change to, B23 100-120+cm Greyish brown (10YR4/3), medium heavy clay, coarse angular blocky, field pH 8.5, increasing carbonate nodules. Moist.
2	643015	7508252	E2	Same as site 1. Buffel >70% plus other grasses. Similar vegetation and slopes extending well nth and sth. (>100-200m at least).
3	642834	7508594	E2	Similar as site 1 & 2. Same either side >100m.
4				Site replaced
5				Site replaced
6				Site replaced
7				Site replaced
8				Site replaced
9				Site replaced
10				Site replaced
11	642998	7510094	B1	Reddish brown – gently sloping Buffel >70%. Occasional river worn gravel & rock on surface. Not self mulching.
12	643151	7510084	Bound.	Lower mid slope 2%. Boundary site from site 11 with sandy loam, light yellow to red brown. Buffel cover >70%. “angophora” type eucalypt. Casuarinas (bullock), unknown Salmon Gum.
13	643304	7510067	B1	Brigalow drainage line. (Whipstick). Dark brown – black clay. Not self mulching. Scattered river gravel (quartz & chert). Occasional Bulloak.
14	643537	7510038	E2	Upper mid slope 2-3% grade. Mt Coolibah soil with occasional Emu Apple. Buffel cover >70%. A1 0-5cm grey black medium clay, 10YR2/,1 pH 8.5, strong granular, cracking B21 5-90+cm grey black medium heavy clay 10YR4/1, carbonate nodules. pH 8.5, lenticular.
15	643504	7509700	E2v	Mt Coolibah soil on gentle 1% slope. Some red brown influence. Buffel >70% cover. Not self mulching, but quite friable.
16	643436	7509339	E2	Gently sloping drainage line, dark brown black clays. Course self mulching friable soil. Casuarinas, Wattle & Eucalypts and thick Buffel and Rhodes Grass.
17	643444	7509120	E2	Level plain. Cultivation immediately to east. Dark scrub soil like site 4. Heavy Parthenium infestation in cultivation. 0-5cm brown black organic layer 10YR2/1, pH 7.5 5-75cm grey black medium clay, 10YR2/,1 pH 8.5 75-90cm grey black medium heavy clay 10YR4/4, carbonate nodules. 90-120cm heavy black clay pH. 8.5
18				Site replaced
19				Site replaced
20				Site replaced
21	640296	7515046	A2	Level plain. Dark brown cracking clay with light surface crust. Probable strip depth 0-40cm. Buffel >50% cover A11 0 – 0.02 Weak sandy crust. Field pH 7.0 A12 0.02 - 10 Dark greyish brown (10YR4/3), sandy clay, strong sub-angular blocky, field pH 7.5, no inclusions, moist, clear change to; B21 10 – 50 Very dark greyish brown (10YR3/1), medium heavy clay sandy, coarse and hard angular blocky, field pH 8.0, no carbonate nodules, moist, gradual change to, B22 50 – 90+ Greyish brown (10YR4/4), medium heavy clay, coarse angular blocky, field pH 8.0, few mottles, dry.
22	640811	7515016	A2	Same as site 21. Dark cracking clay.
23	640875	7515900	A1	Poplar box alluvia.
24	641130	7515008	A2	Active drainage line. Black clay with red brown subsoil.

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
25	641551	7515049	B2	Light brown clay. Buffel >50%. Some surface rocks and gravels all river worn chert, sandstone, quartz, basalt and fossilised wood. Upper mid slope of undulating plain. Slope 2-3%. Cleared old brigalow blackbutt. Good grazing land. Substrate is mixed. 0 – 10cm Reddish brown (5YR4/4), fine sandy clay loam, weak blocky, field pH 6.5, no inclusions, 10 – 45cm Yellowish brown (10YR6/4), medium clay- sandy, strong blocky, field pH 8.5, trace soft carbonate, 45 -100cm Greyish brown (10YR5/4), medium heavy clay, coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist,
26	641972	7514944	B2	Brown light textured clay with small river worn gravels. Mid slope, undulating plain. Buffel 70%
27	642384	7514949	B2	Upper mid slope of undulating plain. Blade ploughed surface with some rounded ironstone. Slope 2-3%. Cleared old brigalow blackbutt. Good grazing land. Marginal cropping. Substrate is mixed sediments – calcareous Tertiary. AP 0 – 20cm Yellowish brown (10YR6/4), fine sandy clay, weak blocky, field pH 6.5, no inclusions, dry, clear change to, B21 20 – 40cm Yellowish brown (10YR6/4), medium clay- sandy, strong blocky, field pH 8.5, trace soft carbonate, moist, clear change to, B22 40 -120cm Greyish brown (10YR5/4), medium heavy clay, coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist, 3 Samples 0-10cm, 30-40cm, 80-90cm. Similar soil as sites 26 & 25.
28	642978	7514895	B2	Crest of undulating plain. Same soil as site 27. Yellow brown clay.
29	643489	7514869	B2	Same as site 28. Yellow brown clay scrub – soil. Buffel >50%. Good grazing country.
30				Site replaced
31	641554	7511674	B1	Dark brown cracking clay with very thin light sandy surface. Upper mid slope. Buffel >70%. On 3% slope. A1 0-25cm, light sandy clay, dark brown 10YR4/2, pH 8.5, no coarse frag B21 25-60cm, medium brown uniform clay 10YR4/1, pH 8.5, s/blocky strong, some carb nods, B22 60-120cm, 10yr5/2, lighter brown uniform clay, pH 8.5, carb
32				Site replaced
33	641157	7512519	Bound.	Boundary site from site 32, brown clay to darker brown-black alluvia in drainage line with Belah and Yellowwood.
34	640817	7513129	B1	Level plain. Brown friable clays like sites 31, 32 & 33 Colour 10yr4.2.
35	640421	7513876	B1	Dark brown clay on Level plain, but lower in landscape. Sandy surface cracking A1 0-25cm, medium clay, brown 7.5YR4/2, pH 7.5, no coarse frag B21 25-80cm, medium brown uniform clay 7.5YR4/3, pH 8.5, carb, B22 80-100+cm, 10YR5/2, brown med clay, pH 8.0
36	640933	7513900	B1	Dark brown clay - Same as site 35.
37	640042	7514670	A2	Brown clay with sandy influence.
38	639882	7515013	A1	Alluvial light brown sandy loam with red brown clay subsoil under mixed Brigalow and poplar box open forest on level alluvial plain. No microrelief or SCF's. Buffel >50%. Firm sandy surface – red brown. Not hard setting. Strips -30cm. A1 0 – 40cm Brown (7.5YR3/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 30 -90+cm Reddish brown (5YR4/6), sandy clay, moderate angular blocky, field pH 6.0, no inclusions, moist.
39	639700	7515327	A1	Alluvial light brown sandy loam with red brown clay subsoil - same as 38.
40	639573	7515552	A3	Phillips Creek. Deep alluvial sands and loams to coarse sands >1m. River Oak, Forest Red gum, Dawson Gum.
41				Site replaced
42	642930	7514290	B1	Dark brown to black clay with minor cracking, hard at surface and to depth. Some river gravels. Crest of broad ridge in undulating plain. Same as site 41. Some Brigalow regrowth on fence line.
43	642392	7513880	B1	Dark brown to black clay with minor cracking, hard at surface and top depth. Same as site 42. Brigalow regrowth on fence line. A1 0-20cm, medium sandy clay, Black 10YR2/1, pH 6.5, no coarse frag B21 20-80+cm, medium brown uniform clay 10YR3/3, pH 8.5, carb,
44				Site replaced
45	641856	7513636	B2v	Variant of sandy duplex rises Thin hard setting sandy loam surface layer. Old grey gum, occasional current bushes. Not a crop soil. OK grazing.
46	641790	7513853	B2v	Thin hard setting thin duplex sandy loam. Same as site 45. Not cropping soil. Very hard at surface. A1 0-5cm Fine sandy loam, reddish brown. pH 6.5, 5YR4/.3. B21 5-50 cm 7.5YR4/3, strong sub ang blocky, impeded drainage, pH 8.5 carbonate nodules. B22 50-90cm medium clay, coarse blocky, 7.5YR5/4, pH 8.5,
47	641640	7514302	A2	Dark deep cracking Brigalow or Brigalow scrub clays in drainage area. River worn gravels on surface including quartz and chert.

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
				A1 0-35cm, medium sandy clay pH 7.5 dark brown 10YR4/2, B21 35-60cm, medium clay 10YR4/3, carb, pH 8.5, B22 60-100cm, 10YR5/3, brown med heavy clay, pH 8.5,
48	641559	7514574	A2	Active creek channel. Dark sandy clay. Brigalow, grey gums in area 0-20cm hard setting massive sandy clay 7.5YR4/2 pH 6.5 50-60cm hard sandy clay 7.5YR4/4 pH 8 100-120cm hard setting massive sandy clay 7.5YR5/3 pH 8
49	639311	7514575	A1	Alluvial light brown sandy loam with red brown clay subsoil under poplar box open forest on level plain. Buffel >50%. Current bush, Buffel, poplar box. Sandy clay surface – red brown. Not hard setting. Could strip - 30cm. Like site 38.
50	641248	7515784	B2	Close to creek – but above on plain. Blade ploughed / rounded ironstone. Slope 2%. Cleared brigalow. Good grazing. Substrate is mixed sediments. AP 0 – 20 Brown (7.5YR4/4), sandy clay, weak S/A blocky, field pH 6.0, no inclusions, B21 20 – 50 Yellowish brown (7.5YR 6/4), sandy clay, strong blocky, field pH 8.5, few carbonate B22 50 - 90 Yellowish brown (10YR5/4), medium heavy clay, coarse angular blocky, field pH 8.5, moderate calcareous concretions,
51	641580	7516000	B2	Same as site 50.
52	641114	7515890	A3	Phillips Creek. Deep alluvial silty loam grading into sandy clays. Forest Red Gums & River Oaks. A11 0 – 50cm Loamy coarse sand, 7.5YR4/4, weak structure, loose sandy surface, pH 6.0, A12 50 – 140cm + Sandy clay loam alluvial banding evident, pH 7.0, 7.5YR5/6
53	641453	7515355	B2	Brown light textured clay with sandy surface small river worn gravels. Buffel 70% plus. Like site 26. Good grazing but not a cropping soil. 0-20cm Fine sandy clay, reddish brown. pH 6.5, 5YR4/.4. 20-60cm 5YR4/3, strong sub ang blocky, pH 8.5 carbonate nodules. 60-140cm hard medium clay, blocky, 7.5YRr5/4, pH 8.5, 140+cm Mottled pale yellow to grey clay below 1.4m
54	641958	7515474	B2	Brown clays above edge of creek line; 0-50/60cm brown clay. 60-70cm pale yellow to grey massive mottled clays. Some Brigalow regrowth.
55	642413	7515691	B2	Intersection of boundary fences. Light textured brown sandy clay. Buffel >50%. Upper mid slope of undulating plain.
56	642185	7516200	B2	Light textured brown sandy clay on mid slope of undulating plain. Noncracking, Buffel >50%. A1 0-20cm Fine sandy to silty medium yellow brown clay. pH 6.5, colour 10YR6.4. B21 20-40cm pH 8.5 colour 10yr6/4, strong sub ang blocky, soft carbonate present. B22 40-100cm pH 8.5, hard medium clay, blocky, colour 10yr5/4. (Similar to site 27).
57	642200	7517000	B2	Same as site 55 and like site 27.
58	643204	7515224	B2	Same as site 55 and like site 27. Mid slope of undulating plain.
59				Site replaced
60				Site replaced
61				Site replaced
62	643480	7513790	B1	Scrub soil with Brigalow and Blackbutt with understory spp.
63				Site replaced
64	642633	7513590	B1	Level plain. Buffel >70%. Dark brown clay “Non Cracking”.
65				Site replaced
66	643284	7513541	B1	Fine sandy light textured brown clay under Brigalow scrub with Belah and yellow wood. Buffel >70%. 0-30cm fine sandy light clay. 30-70cm course sandy medium dark brown clay. 70+cm reddish brown coarse sandy clay. Like site 4.
67				Site replaced
68	643860	7513800	B1	Brigalow and Dawson Gum.
69	643638	7513035	B1	Good cropping soil with contour banks. Mixed Brigalow softwood scrub soil with Yellow Wood, Casuarina, Sandalwood, Bonewood, Turkey bush and Blackbutt on 1-2% slope. Cropping immediately to south. A1 0-25cm, medium sandy clay, reddish brown 5YR4/2, pH 7.5, no coarse frag B21 25-80cm, medium brown uniform clay 10YR4/3, pH 8.5, carb, B22 80-120cm, 10yr4/2, brown uniform clay, pH 8.0
70	643305	7512780	B1	Same as site 69. Edge of cropping. Belah, soft wood spp. Buffel >70%. <1% slope.
71				Site replaced
72				Site replaced
73	642770	7512000	B1	Areas of red-brown clay variants. Immediately next to sorghum crops. Belah common. Buffel >70% on <3% slope. Contour banks Buffel grazing paddock, above cultivation. Slope 3%. Same as 72. A1 0-25cm, medium sandy clay pH 7.5 reddish brown 5YR4/2, B21 25-80cm, pH 8.5, medium brown uniform clay 10YR4/3, carb, B22 80-100cm, pH 8.0, 10YR5/3, brown uniform clay,
74	642623	7512120	B1	Upper mid slope – between contour banks. Reddish brown clays.
75				Site replaced

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
76				Site replaced
77				Site replaced
78	642345	7513388	B1	Dark soil.
79	641711	7511912	B1	Dark – black Brigalow soil on near level plain with areas of occasional red brown clay variants and occasional shallow Gilgai, <25cm deep. ,
80				Site replaced
81	642583	7511577	B1	Dark chocolate brown non cracking clay with Brigalow regrowth on fence line. Contour banks present. An old cultivation area. AP 1 0-30cm, Light sandy clay, Brown 7.5YR5/2, pH 8.5, carb nods, strong sub ang blocky, B21 30-90cm, 10YR5/3, blocky firm, medium clay, pH 8.5, carb,
82	643164	7511500	B1	Dark brown cropping soil immediately below cultivation on 3% slope. >70% Buffel.
83	643870	7511850	B1	Same as above - site 82.
84	643678	7511400	B1	Dark brown to black friable clay on level plain. Immediately adjacent to cultivation. Softwood scrub on fence line including Brigalow, Bonewood, Yellow wood. Same as site 82 & 83.
85	643981	7511200	B1	Dark brown to black friable clay on level plain. Immediately adjacent to cultivation. Belah, softwood scrub. Near level. Buffel >70%. Cultivation immediately to North.
86	644550	7511230	B1	Dark brown to black friable clay. Like site 85 etc. – but more undulating. Occasional Gilgai <40cm deep. Yellow wood. Buffel >70%.
87				Site replaced
88	645782	7511025	B1	Dark brown to black friable clay. Same as site 85, 86 & 85 etc.
89	645114	7510700	B1	Dark brown to black friable clay Brigalow, Softwood scrub soil. Regrowth (TTW)
90	643681	7511000	B1	Dark scrubs soil >1m thick. Belah (cleared). Level plain. Buffel >70%.
91				Site replaced
92				Site replaced
93	645300	7510028	E2	Dark clay with fine self-mulch. Level plain. Cultivation - Good cropping area. Buffel >70%.
94				Site replaced
95				Site replaced
96	643842	7510016	E2	Dark clay with fine self-mulch. Mt Coolibah soil with reddish influence.
97				Site replaced
98	643001	7510703	B1	Dark grey brown clay soil on level plain. Same as site 97. (Probably cleared soft wood scrub area).
99				Site replaced
100				Site replaced
101				Site replaced
102				Site replaced
103				Site replaced
104	641420	7507260	E2	Mt Coolibah and Belah growing area.
105	644275	7508280	E2	As above - Soft wood scrub soil.
106	644840	7507750	E2	Softwood scrub soil. Cracking self mulch. Soft surface. Carb nodules. A1 0 – 10cm Dark brown (10YR4/2), light medium clay, granular strong mulch, field pH 8.0, no inclusions, dry, clear change to, B21 10 – 60cm medium clay, strong blocky, Very dark (10YR3/1), field pH 8.5, some carbonate nodules, moist, B22 60 -100cm Lighter brown (10YR4/3), medium heavy clay, angular blocky, field pH 8.5, calcareous concretions, moist, BC 100 cm basalt
107	645000	7508230	E2	Dark grey brown clay soil. Cultivation.
108				Site replaced
109	645710	7507750	E2	Dark grey brown clay soil. Cultivation. (same as site 107/108).
110				Site replaced
111	643763	7509115	E2	Deep dark brown black friable clay soil with fine surface mulch and cracking on level plain. Cultivation. A1 0-5cm Coarse sandy clay loam 10YR3/2, granular, carb nods, pH 8.0, B21 5 – 75cm black 10YR4/1, medium clay, lenticular structure, no mottles, carb nods, pH 8.5, B22 75 – 90cm weathered basalt increasing.
112	644075	7509400	E2	Deep (>90cm) dark brown black friable clay soil with fine surface mulch and cracking on level plain – like 110 and 111.
113	644390	7509125	E2	Deep dark brown friable cropping clays same as sit 110/111. Mt Coolibah.
114	644859	7509124	E2	Deep dark brown friable clay soil. Same as sites 110/111 etc. Mt Coolibah.
115				Site replaced
116	645402	7509600	E2	Dark brown clay soil - Mt Coolibah on lower slope.
117	638626	7516181	B4	Melon holes in cleared Brigalow area quite deep up to 1.0mt. Sample site 0.7m. Melon holes dominate landscape in this area (50%). Grey brown clays. (wet from rain). Depression, cracking, crusting, No surface coarse fragments

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
				A1 0 – 3Dark Brown (10YR3/2), fine sandy clay, 2-4mm granular, field pH 6.5, no inclusions, dry, Cracking with weak sandy crust. medium heavy clay, pH 6.5, granular, 10YR3/2 clear change to, B21 3 – 40 Dark (10YR3/1), medium clay, 5mm strong angular blocky, field pH 6.5, no inclusions, moist, clear change to, B22 40 -100+ Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, field pH 5.5, 5% orange mottles.,
118	638593	7516484	B4	Relic alluvial plain with grey brown clay with melon holes 90cm deep on mixed sediments. Pastures with minor Brigalow regrowth. Site on puff. Very slow poorly drained. Slope <0.5%. Surface non cracking with minor gravels. Buffel 50%. This is representative of a very large area. A1 0 – 20cm Brown (10YR5/3), fine sandy clay, weak blocky, field pH 5.5, no inclusions, dry, clear change to, B21 20 – 50cm Dark brown (10YR3/2), medium clay- sandy, strong blocky, field pH 6.5, trace soft carbonate, moist, clear change to, B22 50 -100cm Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, field pH 6.5, no concretions, moist,
119	639190	7516190	B3	Grey brown Brigalow clay with melon holes like site 118. This is representative of a very large area.
120	638840	7515235	BOUND	Boundary site between Brigalow soil and Poplar box sandy loam.
121	638900	7514850	B3	Grey brown Brigalow clay with melon holes. Level plain. A1 0 – 15cm. Brown (10YR4/3), Sandy clay, weak structure, field pH 8.0, no inclusions, B21 15 – 55cm. Dark Brown (10YR3/2), medium clay, strong sub blocky, pH 8.5, carbonate, B22 55 -80cm. Yellowish brown (10YR5/4), medium heavy clay, hard.
122	638647	7514664	B3	Undulating close to Phillips Ck. Blackbutt, Brigalow and Poplar Box, Belah, Bauhinia.
123	639383	7516066	B3	Grey brown Brigalow clay with normal gilgai and some deeper melon holes Level plain with small Brigalow regrowth. Buffel >50%.
124	639820	7515896	B3	Brigalow, Box area (small regrowth). Very close to Phillips Ck. Riparian veg.
125	640300	7515900	A1	Sandy loam under Poplar Box on gentle rise near Phillips Ck. A1 0– 40 Brown (7.5YR3/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 40 -90+ Reddish brown (5YR4/6), sandy clay, moderate angular blocky, field pH 6.0, no inclusions,
126	640180	7516550	A1	40cm thick sandy loam duplex with Poplar Box. Very gentle rise near Phillips ck.
127	640458	7516152	A1	Sandy loam duplex in clay intergrades area.
128	640700	7516463	A2	Grey brown Brigalow clay (like site 118). Buffel >70%.
129	641176	7516430	BOUND	Boundary site edge of Brigalow/Box + riparian species near Phillips Ck.
130	641213	7516685	BOUND	Dark clay loam 10cm over dark clay to 50cm, then reddish brown clay. Poplar box & Brigalow. Close to exploration drill hole sump.
131	641216	7516958	A1	Sandy loam with Poplar Box on small rise. Near level. 0 – 45cm, Sandy loam, massive, no bleach, 7.5YR3/4, pH 6.0, no inclusions, 45 -100+cm reddish colour (5YR4/6), sandy clay, hard angular blocky, pH 6.0, no inclusions,
132	641254	7517243	A2	Deep uniform Brigalow clays on level plain. Weak crust & cracking. Cleared Brigalow area. Buffel >70%. Close to exploration drill sump. 0-40cm dark chocolate brown clay. 7.5YR3/2, sub ang blocky 40-100cm reddish brown medium clay. 8.5, carb, hard angular
133	641300	7517736	A2	Deep uniform Brigalow clays on level plain. Occasional Poplar Box. Same soil as site 132. Buffel >70%.
134	641065	7517743	A1	40 cm Poplar Box sandy loam duplex soil on slight rise. Buffel >50%.
135	641413	7518194	A1	Poplar Box sandy loam duplex – Poplar box trees. Buffel >70%. Current bush. 0-50cm sandy loam, firm surface, 55% cover, 7.5YR5/2, pH 5.0, 50 – 90cm Sandy clay, whole coloured reddish brown (5YR4/4), no mottles, well drained. pH 6.0
136	641830	7518423	A2	Old cleared Brigalow area with occasional Melon hole.
137	641600	7518750	A1	Sandy loam with old stand of Poplar Box on a slight rise.
138	641220	7518040	BOUND	Boundary site. Brigalow Clay and Poplar Box sandy loam. Level. Buffel >70%.
139	641092	7518462	E3	Brown sandy surface with small clumps of Poplar Box nearby. A1 0 – 45cm Reddish Brown (5YR4/3), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 45 -100+cm Yellowish brown (10YR5/4) sandy clay, moderate angular blocky, field pH 8.0, no inclusions,
140	641019	7518696	B3	Cracking Clay. Some Gilgai. 0 – 20cm Brown (10YR5/3), fine sandy clay, weak blocky, field pH 7.5, no inclusions, dry, clear change to, 20 – 50cm Dark brown (10YR3/2), medium clay- sandy, strong blocky, field pH 7.5, trace soft carbonate, moist, clear change to,

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
				50 -100 Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist,
141	640835	7519308	E3	Cleared Poplar Box on Gentle rise. Buffel >40%. Grazed down.
142	640400	7521450	B3	Normal Gilgai and occasional melon hole, Brigalow regrowth. Mound is sandy N/C A1 0 – 25cm. Brown (10YR4/4), Sandy clay, weak blocky structure, field pH 6.0, B21 25 – 60cm. dark brown (7.5YR3/2), medium clay, strong blocky, field pH 8.5, carbonate, B22 60 -90cm. Greyish brown (10YR5/4), medium heavy clay, coarse angular blocky, field pH 8.5,
143	640373	7520310	B3	Melon hole, Brigalow regrowth.
144	640203	7519790	B3	Melon hole, Brigalow regrowth.
145	640546	7519410	B3	Small Melancholy (Gilgai). Brigalow regrowth. Cracking depressions 0 – 35cm. Brown (10YR4/3), Sandy clay, weak structure, field pH 8.0, no inclusions, 35 – 65cm. Dark Brown (10YR4/2), medium clay, strong sub blocky, pH 8.5, carbonate, 65 -80cm. Yellowish brown (10YR5/4), medium heavy clay, hard.
146	640227	7519295	B3	Brigalow regrowth (small) with Gilgai (shallow).
147	639512	7519041	B4	Brigalow regrowth (small) with larger Gilgai. Sample site in melon hole (depression 60cm deep). crusty cracking dark. Bare surface crusting very poor drainage, A1 0 – 2cm crust of grey/ brown (10YR5/2), fine sandy clay, weak blocky, field pH 8.0, no inclusions, B21 2 – 60cm Dark brown (10YR3/2), sandy medium clay, strong angular blocky, field pH 8.5, trace soft carbonate, B22 60 -100+cm Greyish brown (10YR4/4), medium heavy clay, coarse angular blocky, field pH 8.5,
148	639662	7517583	B3	Brigalow and small Gilgai.
149	639820	7518500	A2	Brigalow clay with sandy surface variant.
150	640326	7517712	B3	Shallow Gilgai.
151	639107	7518898	B4	Melon hole. Crust 0 – 0.5cm dark Grey Brown (10YR5/2), fine sandy clay, weak blocky, field pH 6.5, no inclusions, B21 0.5 – 50cm Dark brown (10YR3/2), medium clay- sandy, strong blocky, field pH 7.5, carbonate nods, B22 50 -100 cm Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist,
152	639109	7518206	B4	Melon hole phase
153	639403	7519826	A2	Brigalow clay with sandy surface variant – prob. Alluvial.
154	638500	7518637	E3	Brigalow, Box. Thin duplex with pale subsoil.
155	638633	7518488	E3	0-40cm Sandy loam, 7.5YR4/4, massive, sporadic bleach, 40-80+cm yellow brown mottled clay. .
156	638782	7518334	B4	Melon hole with yellow brown clay.
157	639028	7517911	B4	Melon holes with yellow brown clays. Cleared brigalow 0 – 30cm Brown (10YR5/3), fine sandy clay, weak blocky, field pH 5.5, no inclusions, dry, clear change to, 30 – 50cm Dark brown (10YR3/2), medium clay- sandy, strong blocky, field pH 6.5, trace soft carbonate, moist, clear change to, 60 -100cm Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, field pH 5.5, no concretions, moist,
158	639133	7517580	B4	Sodic yellow brown clay to 120+. Deep melon holes. Drill Pit.
159	640111	7517773	B3	Shallow Gilgai with sandy puffs and black clay depression. (site in depression) Strip to 10cm. 0-30cm light to medium sandy clay, pH 8.0, colour 10yr4.3. Carbonate nodules. 30-80cm pH 8.0 colour 10yr3/1 medium heavy clay 80-100cm pH 8.0 colour 10yr3/2 heavy clay.
160	639507	7516965	B3	Clay soil with Gilgai. (Not deep melon holes). Buffel >70%. Level.
161	640282	7517209	BOUND	Boundary site. Poplar Box sandy loam and Brigalow soil. Again, Box confined to low rise areas and Brigalow in lower areas.
162	639080	7516618	B3	Brigalow clay with small Gilgai to 30cm deep (Site on mound. Noncracking sandy with ironstone gravels. A1 0 – 0.05cm. Brown (7.5YR5/4), Sandy clay loam crust, weak structure, field pH 7.0, no inclusions, dry, clear change to, B21 0.05 – 50cm. Brown (10YR4/3), medium clay, hard blocky, field pH 8.5, trace soft carbonate, B22 50 -90cm. Greyish brown (10YR5/4), medium heavy clay,
163	638755	7517277	B4	Brigalow clay with Melon holes.
164	638410	7517927	BOUND	Boundary Brigalow clays with melon holes and Poplar box soils. slight rise to Poplar Box. Buffel >70%.
165	638255	7518280	E3	Poplar Box sandy loam duplex on pale clays. 0 – 45 Brown (7.5YR3/3), sandy loam, massive, pH 5.0,

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
				45 -90+ Yellowish brown (10YR5/4), sandy clay, mottled, subangular blocky, field pH 6.0, no inclusions, moist.
166	637049	7519554	E3	Poplar Box sandy loam duplex soil on pale clays. Buffel >50%. Level.
167	637850	7519000	E3	Poplar Box sandy loam duplex - Level. A1 0 -40cm Reddish Brown (5YR4/3), sandy loam, massive, field pH 5.5, no inclusions, B21 40 -90+cm Yellowish brown (10YR5/6), sandy clay, mottled, hard angular blocky, field pH 7.0,
168	637610	7519622	E3	Poplar Box sandy loam duplex. Level.
169	637440	7519798	E3	Level plain with Poplar Box and Buffel 50%, occasional Brigalow. Rise of gently undulating plain. Close to exploration drill pit. A1 0 – 40cm Dark Reddish Brown (5YR3/3), sandy loam, massive, field pH 5.5, no inclusions, dry, clear to; A2 40-45cm sporadic bleach; field pH 5.5; abrupt to; B21 45 -100+cm Yellowish brown (10YR5/6), sandy clay, mottled, moderate blocky, field pH 6.0, no inclusions, moist. Strip 0-40cm.
170	636903	7520111	E3	Duplex sandy loam with occasional Brigalow. Level plain. Buffel >50%
171	637765	7520421	E3	Scattered Poplar Box. Level plain Buffel >50% A horizon 0 -45cm pale sandy loam 7.5YR6/4, no bleach, pH 5.5, 45 – 90+cm hard mottled sandy clay, 7.5YR5/2, pH 8.0,
172	636980	7520875	A1	Level ridge. Deep duplex sandy loam in nearby drainage area. A1 0 – 50cm Brown (7.5YR4/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 50 -80+cm Darker brown (7.5YR4/3), sandy clay, moderate angular blocky, field pH 6.0,
173	636794	7521234	E1	Flat to gently undulating plain with tall open woodland of Poplar Box, Moreton Ash, Buffel 70%. Old alluvial plain, 1% slope. No SCF's & loose sandy surface. Rapid drainage. Buffel. 40-50%. A1 0 -30cm medium Brown (7.5YR3/4), sandy loam, loose, field pH 7.5, no inclusions, dry, B21 30 -120+cm Reddish brown (5YR4/6), sandy loam, field pH 8.0, no inclusions, moist. Samples 0-10cm 30-40cm 90-100cm. (Also close to red brown areas of very similar duplex soils)
174	636426	7521993	E1	Sandy Loam Poplar Box soil on level ridge.
175	636205	7522441	A1	Deep alluvial sandy duplex with Blackbutt, Belah and Grey gums and occasional Poplar Box.
176	636030	7522800	E1	Poplar Box sandy loam duplex in undulating area. Buffel >80%.
177	636150	7522320	A2	Brown Clay soils with Brigalow regrowth.
178	635831	7523200	B3	Brown Brigalow clays with river worn chert and quartz on surface. Brigalow regrowth. Buffel >70%. Also, Current Bush.
179	635579	7523725	BOUND	Boundary – Melon hole to West, Box to East. (Poplar Box is normally confined to rises.
180	635353	7524183	B3	Brigalow clay soil 0 – 35cm. Brown (10YR4/3), Sandy clay, weak structure, field pH 8.0, no inclusions, 35 – 65cm. Dark Brown (10YR4/2), medium clay, strong sub blocky, pH 8.5, carbonate, 65 -80cm. Yellowish brown (10YR5/4), medium heavy clay, hard.
181	635142	7524768	B3	Dark clays with Brigalow and Belah.
182	635900	7524550	B3	Dark clays with Brigalow
183	635115	7525265	E1	Sandy Loam duplex soil on undulating areas under Poplar Box with Belah, Blackbutt and Current Bush Duplex.
184	635090	7525772	E1	Yellow brown sandy loam duplex soil with river worn gravels
185	635016	7526356	E1	Yellow brown sandy loam duplex soil with river worn gravels in creek channel. A1 0 - 150cm Yellowish Brown (7.5YR4/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 150cm+ Reddish brown (5YR4/6), sandy clay, moderate angular blocky, field pH 6.0, no inclusions, moist. Casuarinas Tea Trees, Red Gums Moreton Bay Ash.
186	634831	7526625	E1	Duplex sandy loam on tall old original Poplar Box woodland with Buffel >40%. Level plain.
187	635177	7527400	E1	Duplex sandy loam supporting tall Poplar Box with occasional Silver Leaved iron bark and Blackbutt. Level. Buffel and native grasses >30%. A 10 – 80cm Brown (7.5YR3/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 80 -90cm+ Reddish brown (5YR4/6), sandy clay, moderate angular blocky, field pH 6.0,
188	635480	7528150	E1	Deep sandy loam drainage line with Dawson gum, Forest Red Gum.
189	635763	7528505	E1	Sandy loam under Silver Leaf Ironbark woodland. Good grazing country. Buffel >50%.
190	636138	7528973	E1	Sandy loam under Silver Leaf Ironbark with Poplar box, Forest Red gum. Buffel 70%. Close to drainage line/creek.

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
				0 – 70cm pale Yellowish Brown (7.5YR5/4), sandy loam, massive, field pH 5.5, no inclusions, dry, 70 -120cm+ Pale Brown (7.5YR6/4), sandy clay, field pH 6.0, no inclusions,
191	635921	7528200	E1	Sandy loam under Poplar box with Silver Leaf Ironbark and bloodwood. Level plain. Buffel >70%.
192	636368	7528193	A3	Deep alluvial sands >1.0m on creek crossing. Tee Trees, Forest Red Gum.
193	637220	7528090	E1	Sandy loam under Poplar Box and Silver Leaved ironbark.
194	636880	7527950	B3	Brigalow clay soil with thin reddish sandy veneer under Brigalow regrowth with melon holes.
195	636277	7527266	B3	Brigalow clay soil with thin reddish sandy veneer under Brigalow regrowth. Not cracking. A1 0 – 0.05cm. Reddish Brown (5YR4/4), Sandy clay loam surface layer, no structure, field pH 7.0, no inclusions, B21 0.05 – 30cm. Brown (7.5YR4/3), medium clay, strong blocky, field pH 8.5, trace soft carbonate, B22 30 -100cm. pale brown (10YR5/4), hard medium heavy clay, coarse angular blocky, pH 8.5, carb & mn nodules,
196	636500	7526767	E1	Sandy loam Poplar Box ridge surrounded by clays supporting Brigalow regrowth on slopes and depressions. A1 0 – 65 cm Brown (7.5YR3/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 65 -90cm+ Reddish brown (5YR4/6), sandy clay, moderate angular blocky, pH 6.0, no inclusions,
197	637180	7527050	B3	Brigalow regrowth.
198	636300	7526509	E1	Box
199	636340	7526880	BOUND	Boundary between Brigalow vegetation on clays and Poplar box on sandy loams
200	636410	7526153	B3	Brigalow on 2% slope.
201	636007	7525543	E1	Duplex sandy loam
202	637000	7525526	E3	Again, sandy loam duplex soils occupy rises and ridges. 0-20cm Yellow brown sandy loam, sporadic bleach, pH 6.0, 20 – 100 yellow brown sandy clay, mottled. pH 7.5. hard coarse structure.
203	636339	7525194	E1	Poplar Box sandy loam duplex. A1 0 – 55cm Pale Brown (7.5YR5/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 30 -90+cm Brown (7.5YR4/6), sandy clay, moderate angular blocky, field pH 6.0,
204	635685	7525053	E3	Brigalow and Poplar Box duplex.
205	637553	7525468	BOUND	Boundary site. Box and Brigalow. Box higher ground than Brigalow.
206	638005	7525680	B4	Brigalow regrowth with deep melon holes.
207	638800	7525820	B4	Brigalow regrowth with deep melon holes. Depressions mostly bare – probably very saline. 0 – 20cm Brown (10YR5/3), fine sandy clay, weak blocky, field pH 5.0, no inclusions, dry, clear change to, 20 – 50 Dark brown (10YR3/2), medium clay- sandy, strong blocky, field pH 5.5, trace soft carbonate, moist, clear change to, 50 -100 Dark brown (10YR5/2), heavy clay, very coarse structure, poor drainage, pH 5.5,
208	637251	7524950	BOUND	Brigalow – duplex boundary. Buffel >70%. 1% slope.
209	637110	7524119	B3	Brigalow
210	638654	7524680	B3	Brigalow clays cracking. Blade ploughed AP 0 – 25cm. Dark Brown (10YR4/2), Sandy clay, weak blocky, pH 7.0, no inclusions, B21 25 – 70cm. Brown (10YR4/3), medium clay, strong blocky, pH 8.5, carbonate, B22 70 -100cm. Greyish brown (10YR5/4), medium heavy clay, coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist,
211	637921	7523183	E1	Poplar Box stand. Flat to gently undulating plain Buffel 70%. 1% slope. No surface frags & loose sandy surface. Rapid drainage. 0 – 55 reddish Brown (5YR3/4), coarse sandy loam, massive, field pH 5.5, no inclusions, 55 - 90+ Reddish brown (5YR4/6), sandy clay loam, weak angular blocky, no mottles, field pH 6.0, no inclusions,
212	638050	7522877	E1	Deep brown coarse sandy loam - Poplar box duplex >70cm 0-80cm coarse sandy loam, pale reddish brown 80-100cm+ sandy light clay, 7.5YR5/4, weak structure
213	638713	7523017	B4	Brigalow regrowth
214	638053	7522444	E1	Blackbutt stand plus unusual eucalypts.
215	638558	7521159	E3	Box – Brigalow vegetation
216	638757	7521909	BOUND	Boundary site. Brigalow regrowth to north and unusual Tee Tree to south also Poplar box and White gum.
217	638000	7521105	E1	Duplex sandy loam under tall Poplar box on level plain. Buffel 50%. surface loose sandy surface. Rapid drainage. A1 0- 70cm Brown (7.5YR3/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 70 -90+cm Yellowish brown (7.5YR4/6), sandy clay, field pH 6.0, no inclusions,
218	638476	7520800	A2	Dark Brigalow clay drainage line.
219	637872	7518544	E3	Box soil. Level plain. Occasional Poplar box. Surface sandy hard setting 0-45cm

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
220	639754	7520772	A2	Thin red brown sandy surface on brown Brigalow clays supporting small Brigalow regrowth.
221	639150	7520399	B4	Thin red brown sandy surface on brown Brigalow clays supporting small Brigalow regrowth. Sample on mound (depressions 70cm deep). Very firm non-cracking dark brown. Relic alluvial plain slope < 0.5% with mixed sediments. very slow drainage, A1 0 – 25cm Brown (7.5YR4/4), fine sandy clay, weak blocky, field pH 8.0, some carb nods, B21 25 – 70cm Dark brown (10YR3/2), sandy clay, hard angular blocky, pH 8.5, carbonate, B22 70 -100+cm Pale Yellowish brown (10YR5/6), hard heavy clay, coarse angular blocky, field pH 8.5,
222	640305	7520766	B3 (puff)	Relic alluvial clay plain with Brigalow regrowth. Adjoins 221 but mound site. Normal gilgai 40cm deep. Very slow drainage. Slope <0.5%. Some mixed surface gravels which is firm and sandy noncracking. A1 0 – 0.05cm. Brown (10YR4/4), Sandy clay, weak structure, field pH 7.0, no inclusions, dry, clear change to, B21 0.05 – 40cm. Brown (10YR4/3), medium clay, strong blocky, field pH 8.5, trace soft carbonate, moist, clear change to, B22 40 -100cm. Greyish brown (10YR5/4), medium heavy clay, coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist,
223	640300	7520760	B3 (dep)	Sample site in Melon hole (depression 40cm deep). crusty cracking dark brown. Bare surface crusting and cracking with few quartzes rounded. Cleared brigalow. Relic alluvial plain slope < 0.5% with mixed sediments. very slow, poor drainage, A1 0 – 4cm dark brown (10YR3/2), fine sandy clay, weak blocky, field pH 8.0, no inclusions, dry, clear change to, B21 4 – 40cm Dark brown (10YR3/2), sandy medium clay, strong angular blocky, field pH 8.5, trace soft carbonate, moist, clear change to, B22 40 -100 cm Greyish brown (10YR4/4), medium heavy clay, coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist,
224	639623	7521989	B4	Boundary site - Brigalow clay – duplex intergrades area. Some Brigalow regrowth with occasional Poplar Box. Level site. Buffel >7%. Reddish brown coarse sandy loam >70cm deep.
225	639654	7522283	E1	Sandy duplex loam supporting Poplar box and Brigalow. Level.
226	639556	7522500	E1	Sandy loam supporting Poplar box open forest. Buffel >70%. Current bush. Level.
227	639326	7521933	E1	Yellow brown sandy loam duplex soil with occasional Poplar Box. More Poplar box and Moreton Bay Ash to West. A1 0 – 80 cm Yellow Brown (7.5YR5/4), sandy loam, massive, field pH 5.0, no inclusions, dry, B21 80 -120+cm Yellow brown (7.5YR6/4), sandy clay loam, field pH 6.0, no inclusions, moist.
228	639126	7521674	E1	Reddish brown sandy loam supporting Poplar box woodland. Buffel 50%.
229	638890	7521199	E1	Sandy loam duplex with Poplar Box regrowth plus small Brigalow and related spp.
230	639109	7521698	E1	Deep yellow brown sandy loam supporting tall open Poplar box with Buffel >50%. >90cm deep. Appears to be representative of a large area. Coarse sandy loam 0-30cm. Fine sandy loam 30cm -1.0+. (Near to site 227).
231	638505	7521290	E1	Yellow brown sandy loam supporting Poplar box on level area. Buffel 40-50%.
232	637776	7523232	E3	Dark reddish brown coarse sandy loam 0-40cm. >40cm hard brown sandy clay. Buffel >50%. Level plain. Current bush occasional Moreton Bay Ash.
233	637204	7523000	B3	Grey brown Brigalow clay with melon holes. Much like site 118.
234	637322	7522680	E3	Thin duplex intergrades 40cm yellow brown sandy loam on brown clay.
235	637101	7522868	E1	Sandy loam duplex soil on rise. Buffel >70%. 0-55cm sandy loam, yellowish red loose pH 5 55-100+cm sandy clay loam, Yellowish, pH 6
236	636770	7522691	E1	Crest of sandy loam duplex rise. Buffel >70%.
237	634600	7527038	E1	Reddish brown sandy loam with Poplar box on gentle rise. Buffel 40%.
238	634360	7527470	E1	Red brown sandy loam ridge under Poplar Box and Moreton Bay ash. Buffel 50-60%
239	634017	7528097	E1	Red brown sandy loam supporting Poplar Box open forest. Buffel 70%.
240	633445	7529157	E1	Yellow brown sandy loam supporting Poplar box on level area on rise. A10 – 40 cm Brown (7.5YR3/4), sandy loam, massive, field pH 5.5, no inclusions, dry, B21 30 -90+cm Reddish brown (5YR4/6), sandy clay, moderate angular blocky, field pH 6.0,
241	632950	7530052	E1	Reddish brown sandy loam supporting Poplar Box duplex. 0-65cm reddish brown, sandy loam, pH 5 65 – 90+cm sandy clay loam, yellowish red pH 6
242	633150	7530750	E1	Small patch of Brigalow on rise.
243	633087	7531471	E3	Thin reddish-brown sandy loam on crest of rise supporting Poplar Box. Buffel cover poor <20%. Some Brigalow regrowth. Some bullocks. Overall poor grazing capability. 0-10cm Fine Sandy loam, red brown. pH 6 10-12 cm small bleach. pH 5.5 12- 120cm + Yellowish brown clay, mottled.

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
244	633569	7531519	E1	Reddish brown sandy loam on rise with Poplar box.
245	634000	7531527	B4	Small stand of Brigalow and Blackbutt. Reddish brown clay loam. Buffel 40%.
246	634018	7531215	B4	Dark Cracking Clay soil with sandy veneer and deep > 0.5m melon holes Brigalow regrowth. Buffel 50%.
247	634226	7530375	B4	Dark cracking Brigalow clay with Brigalow regrowth. Buffel 60%. Gentle slope. Sample site in Melon hole (depression 90cm deep). crusty cracking dark brown. Bare surface crusting and cracking with few quartzes rounded. slope < 0.5% with mixed sediments. very slow, poor drainage, A1 0 – 0.5 cm Crust. Grey brown (10YR5/2), coarse sandy clay, field pH 8.0, no inclusions, B21 0.5 – 35cm Dark brown (10YR3/2), sandy medium clay, strong angular blocky, field pH 8.5, trace carbonate, B22 35 -100 cm Greyish brown (10YR4/4), medium heavy clay, coarse angular blocky, field pH 8.5, moderate calcareous concretions, moist,
248	635000	7529820	E1	Deeper reddish-brown sandy loam supporting Tall open Poplar Box.
249	635422	7530500	E1	Deeper reddish-brown sandy loam supporting Tall open Poplar Box. A1 0-90cm 5YR5/4, sandy loam, pH 6, A12 90+cm light sandy clay, 5YR4/4, no mottles,
250	635490	7531370	E1	Deeper reddish-brown sandy loam supporting Tall open Poplar Box.
251	635570	7529912	E1	Deeper reddish-brown sandy loam
252	636056	7529588	E1	Deep sandy loam in Creek line with Tee Trees, Forest Red Gums.
253	635037	7528990	E1	Red brown sandy loam supporting Poplar Box open woodland.
254	635011	7528230	B3	Cleared Brigalow. Sandy hard set surface 0-5cm sandy clay loam, hard and weak structure, 7.5YR5/4, pH 6.5, no gravels. 5-65cm hard sandy clay. 7.5YR4/3, pH 8.0, some carb, 65-100cm hard mottled yellowish-brown clay 10YR5/2, pH 8.0.

SITE 18-1

Site removed due to change in project site layout

SITE 18-2

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E1	632909 mE 7531055 mN	Chromosol	Surface and landscape observation	29/06/2018

Landscape





Surface



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plains Midslope 2%	Silver leaf ironbark, minor poplar box	Nil microrelief Nil disturbance Nil erosion	Sandy loam, no coarse fragments	-	-	-	-	-	-	-	-	N-	Nil additional observations

SITE 18-3

Site removed due to change in project site layout

SITE 18-4

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E1	629407 mE 7525818 mN	Chromosol	Surface and landscape observation	29/06/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain, midslope, 2%	Poplar box, Eucalyptus species	No microrelief Heavy disturbance between haul road and rail track	Firm <10% >0.60m <20% <0.02m coarse fragments	-	-	-	-	-	-	-	-	-	Nil additional observations

SITE 18-5

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
5	628878 mE 7526555 mN	Endohypersodic Brown Vertosol	Detailed - 50mm hand auger	29/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Very gently undulating, 2%	Mixed vegetation including brigalow	Nil microrelief Nil disturbance Nil erosion	Firm, some occasional 2-6mm cracking, very minor 6-10mm cracking	A1 0.0-0.20 Abrupt	Silty clay loam	Weak, firm	5% 2-6mm coarse fragments	10YR3/2 Very dark grey brown Nil mottles	Dry, moderate - imperfect	Few, fine	0.05 – 6.0	No samples	Nil additional observations
				B21 0.20-0.75 Abrupt	Medium clay	Moderate, strong, sub-angular 5-20mm	<2% calcium carbonate nodules <2% 2-6mm coarse fragments	10YR3/2 Very dark grey brown Nil mottles	Dry, moderate – imperfect	Very few, very fine	0.30 – 7.5 0.60 – 7.5		
				B22 0.75 – 10.00	Medium clay	Moderate, strong, sub-angular 5-20mm	-	10YR4/2 Nil mottles	Dry, moderate – imperfect	Very few, very fine	0.90 – 8.0		

SITE 18-6

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
5	627919 mE 7527968 mN	Endohypersodic Brown Vertosol	Detailed - 50mm hand auger	29/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Very gently undulating plains Midslope 1%	Eucalyptus species	Nil microrelief Very minor disturbance Nil erosion	Soft, no coarse fragments	A1 0-0.17 Abrupt	Silty clay loam	Weak, firm	Nil inclusions or segregations	10YR2/1 Nil mottles	Dry, imperfect	0.05 – 7.5	Few, very fine	No samples	Nil additional observations
				B2 0.17-1.00 End of borehole	Medium clay	Moderate, firm/strong	<2% calcium carbonate nodules	10YR2/1 Nil mottles	Dry, imperfect	0.30 – 7.5 0.60 – 7.5 0.90 – 7.5	Very fine, very few		

SITE 18-7

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2	628635 mE 7527125 mN	Brown dermosol	Surface and landscape observation	29/06/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plains, midslope 1%	Grasses	Nil microrelief, Extensively cleared, Water sheet erosion	Cracking clays	-	-	-	-	-	-	-	-	Nil samples	Nil additional observations

SITE 18-8

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
T1	627263 mE 7528282 mN	Brown sodosol	Surface and landscape observation	29/06/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
-	Boundary of Brigalow (to north) and mixed vegetation (eucalyptus species)	Nil microrelief, Nil disturbance, Nil erosion	-	-	-	-	-	-	-	-	-	Nil samples	Nil additional observations

SITE 18-9

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class:	Site Survey Type:	Survey Date:
T2	626891 mE 7528714 mN	Brown sodosol	Surface and landscape observation	29/06/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
-	Boundary of mixed vegetation (eucalyptus species) to the north and brigalow	Nil microrelief Nil disturbance Nil Erosion	Boundary	-	-	-	-	-	-	-	-	Nil samples	South of Creek

SITE 18-10

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class:	Site Survey Type:	Survey Date:
T1	626271 mE 7529415 mN	Brown sodosol	Surface and landscape observation	29/06/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
-	Boundary of brigalow (north) and mixed vegetation (eucalyptus species) (south).	Nil microrelief Nil disturbance Nil Erosion	Boundary	-	-	-	-	-	-	-	-	Nil samples	Nil additional observations

SITE 18-11

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A1V	644413 mE 7506526 mN	Red brown sodosol	Detailed – exposed soil profile	1/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Drainage line	Poplar Box, Eucalyptus species	Nil microrelief Nil disturbance Gully erosion	Firm, nil coarse fragments	0.00-0.25 Abrupt	Sandy loam	Weak, massive	Nil inclusions and segregations	10YR4/2 Nil mottles	Dry, rapid	Few fine	0.10 / 6.5	Nil samples	Nil additional observations
				0.25-0.70 Abrupt	Silty clay loam	Weak, massive	Nil inclusions and segregations	7.5YR4/2 Brown Nil mottles	Dry, rapid	Few fine	0.30 / 6.5 0.60 / 6.5		
				0.70-1.00	Light clay	Moderate, firm<30mm sub-angular	Nil inclusions and segregations	7.5YR4/2 Brown Nil mottles	Dry, moderate	Very fine, very few	0.90 / 6.5		

SITE 18-12

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A1V	644354 mE 7506225 mN	Brown sodosol	Detailed - 50mm hand auger	1/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain midslope 1.0/2.0	Poplar Box	Nil microrelief Nil disturbance Nil erosion	Firm to hard setting, nil coarse fragments	0.00-0.27 Abrupt	Sandy loam	Weak, massive	Nil inclusions and segregations	10YR4/2 Nil mottles	Dry, rapid	Very fine, very few	0.10 / 6.5	Nil samples	Nil additional observations
				0.27-0.68 Abrupt	Light clay	Moderate, firm<30mm sub-angular	Nil inclusions and segregations	7.5YR4/2 Brown Nil mottles	Dry, rapid	Very fine, very few	0.30 / 6.5 0.60 / 6.5		
				0.68-1.00	Light clay	Moderate, firm<30mm sub-angular	Nil inclusions and segregations	7.5YR4/2 Brown Nil mottles	Dry, moderate	Very fine, very few	0.90 / 6.5		

SITE 18-13

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E2	644134 mE 7506546 mN	Black vertosol	Surface and landscape observation	1/07/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
-	Semi cleared	Nil microrelief or erosion	Firm, dark brown-black, cracking surfaces 2-8mm	-	-	-	-	-	-	-	-	Nil samples	Nil additional observations

SITE 18-14

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E2	644491 mE 7505951 mN	Black vertosol	Surface and landscape observation	1/07/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
-	Mixed vegetation beside road, semi cleared in other areas	Nil microrelief or erosion	Firm, dark brown-black, cracking surfaces 2-8mm	-	-	-	-	-	-	-	-	Nil samples	Nil additional observations

SITE 18-15

Soil Mapping Unit	Location (GDA94 ZONE 56):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
0	630354 mE 7530169 mN	TBA	Surface and landscape observation	29/06/2018

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
-	-	Mining disturbance	-	-	-	-	-	-	-	-	-	Nil samples	Nil additional observations

SITE 18-16

Site removed due to change in project site layout

SITE 18-17

Site removed due to change in project site layout

SITE N1

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A2g	641005 mE 7512573 mN	Crusting Grey (minor black) Vertosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Gently undulating plains, Open depression 2.0/1.0	Mount coolabah, semi-cleared	Nil microrelief Semi-cleared Nil erosion	Cracking 2-6mm, crust Nil coarse fragments	A11 0.00-0.02 Abrupt	Light clay	Moderate, firm<10mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottles/bleach	Moderately moist, moderate	Few fine	0.02 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.02-0.10 Abrupt	Light clay	Moderate, firm10-30mm sub-angular	<1% calcium carbonate	10YR2/2 Very dark brown Nil mottles/bleach	Dry, moderate	Few fine	0.10 / 6.5		
				B21 0.10-0.70 Abrupt	Medium clay	Moderate, firm10-30mm sub-angular	2% calcium carbonate nodules	10YR2/2 Very dark brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 7.0 0.60 / 7.5		
				B22 0.70-1.00 EOBH	Medium clay	Moderate, firm10-30mm sub-angular	2% calcium carbonate nodules	10YR4/2 Dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 7.5		

SITE N2

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A2g	641096mE 7512914mN	Crusting Grey (minor black) Vertosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain 2.0/1.0	Various shrubs	Nil microrelief Nil disturbance Nil erosion	Cracking 2-6mm, crust Nil coarse fragments	A1 0.00-0.14 Abrupt	Light clay	Moderate, soft <10mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottles/bleach	Moderate moist, moderate	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B2 0.14-1.00	Medium clay	Moderate, firm <10mm sub-angular	<2% black nodules	10YR4/2 Dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0 0.90 / 7.5		

SITE N3

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A2g	641074mE 7513152mN	Crusting Grey (minor black) Vertosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain 2.0/1.0	Various shrubs	Nil microrelief Nil disturbance Nil erosion	Crusting with cracking 2-6mm, Nil coarse fragments	A1 0.00-0.16 Abrupt	Light clay	Moderate, soft <10mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottles/bleach	Moderate moist, moderate	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B2 0.16-1.00	Medium clay	Moderate, firm <10mm sub-angular	<2% black nodules	10YR4/2 Dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0 0.90 / 7.5		

SITE N4

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2g	641871mE 7513601mN	Black chromosol (with minor grey chromosol variant)	Detailed - 50mm hand auger	1/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain 2.0/1.0	Eucalyptus species	Nil microrelief Semi disturbed Nil erosion	Soft, <5% 2-6mm coarse fragments	A1 0.00-0.17 Abrupt	Sandy loam	Weak, soft <10mm sub-rounded	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleach	Moderate moist, rapid	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.17-0.44 Abrupt	Light clay with minor sand	Moderate, firm <30mm sub-angular	<2% pale red nodules	10YR4/2 Dark greyish brown Nil mottles/bleach	Moderately moist, moderate	Very fine, very few	0.30 / 7.5		
				B22 0.44-1.00 EOBH	Medium clay	Moderate, firm <30mm sub-angular	10-15% calcium carbonate nodules	10YR5/3 Brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.60 / 7.5 0.90 / 7.5		

SITE N5

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2g	641792mE 7513825mN	Black chromosol (with minor grey chromosol variant)	Detailed - 50mm hand auger	1/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain midslope 3.0/3.0	Sparse shrub species	Nil microrelief Nil disturbance Nil erosion	Soft, Nil coarse fragments	A1 0.00-0.12 Abrupt	Sandy loam	Weak, soft <10mm sub-rounded	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottles/bleach	Moderate moist, rapid	Few fine	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12-0.45 Abrupt	Light clay with minor sand	Moderate, firm <30mm sub-angular	Nil inclusions and segregations	10YR2/1 Black Nil mottles/bleach	Moderately moist, moderate	Very fine, very few	0.30 / 7.5		
				B22 0.45-0.80 Abrupt	Medium clay	Moderate, firm <30mm sub-angular	2% calcium carbonate nodules	10YR2/1 Black Nil mottles/bleach	Dry, moderate	Very fine, very few	0.60 / 8.0		
				B23 0.80-1.00	Medium clay	Moderate, strong <30mm sub-angular	2% calcium carbonate nodules	10YR3/3 Dark brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 8.0		

SITE N6

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	643271mE 7514881mN	Black chromosol (with minor grey chromosol variant)	Detailed - 50mm hand auger	1/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain midslope 3.0/3.0	Buffel grass	Nil microrelief Semi disturbed Nil erosion	Cracking, soft Nil coarse fragments	A1 0.00-0.17 Abrupt	Clay Loam	Moderate, firm<30mm sub-angular	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleach	Moderate moist, rapid	Few fine	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.77-0.87 0.90-1.00	Large root encountered at 0.60 mbgl
				B21 0.17-0.89 Abrupt	Medium clay	Moderate, firm<50mm sub-angular	5% calcium carbonate nodules	10YR3/1 Very dark grey Very dark grey Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 7.0 0.60 / 8.0		
				B22 0.89-1.00	Medium clay	Moderate, firm<50mm sub-angular	5% calcium carbonate nodules	10YR3/2 Very dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 8.5		

SITE N7

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	643071mE 7514453mN	Black chromosol	Detailed - 50mm hand auger	1/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain midslope 2.0/2.0	Buffel grass, nearby brigalow	Nil microrelief Nil disturbance Nil erosion	Firm, minor cracking, Nil coarse fragments	A1 0.00-0.15 Abrupt	Clay loam with minor sands	Moderate, firm<30mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Black Nil mottles/bleach	Moderate moist, rapid	Few fine	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.15-0.50 Abrupt	Light clay with minor sands	Moderate, firm<50mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 7.0		
				B22 0.50-0.70 Abrupt	Medium clay	Moderate, firm<50mm sub-angular	5% calcium carbonate nodules	10YR3/2 Very dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.60 / 8.0		
				B23 0.70-1.00	Medium clay	Moderate, firm<50mm sub-angular	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 8.0		

SITE N8

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	642368mE 7513895mN	Black chromosol	Detailed - 50mm hand auger	1/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain midslope 2.0/2.0	Buffel grass	Nil microrelief Extensively disturbed Nil erosion	Soft, cracking, <10% 10-15mm coarse fragments	A11 0.00-0.17 Abrupt	Sandy clay loam	Moderate, soft, sub-rounded	Nil inclusions and segregations	10YR3/1 Very dark grey Black Nil mottles/bleach	Moderate moist, rapid	Few fine	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.17-0.37 Abrupt	Clay loam	Moderate, soft, sub-angular	Nil inclusions and segregations	10YR4/1 Dark grey Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 7.5		
				B21 0.37-0.70 Abrupt	Medium clay	Moderate, soft, sub-angular	<2% calcium carbonate nodules	10YR3/1 Very dark grey Nil mottles/bleach	Dry, moderate	Very fine, very few	0.60 / 7.0		
				B22 0.70-1.00	Medium clay	Moderate, soft, sub-angular	Nil inclusions and segregations	10YR4/2 Dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 7.0		

SITE N9

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2g	642032mE 7513619mN	Black chromosol (with minor grey chromosol variant)	Detailed - 50mm hand auger	01/07/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Very gently undulating plain mid slope 2.0/2.0	Buffel grass, Brigalow, and belah on fence line, 100 m nearby	Nil microrelief Nil disturbed Nil erosion	Soft, moist, nil coarse fragments	A11 0.00-0.09 Abrupt	Sandy loam	Weak, loose	Nil inclusions and segregations	10YR2/2 Very dark brown Nil mottles	Moderate moist, rapid	Few fine	0.10 / 6.5	0.00-0.10 0.20-0.30 0.55-0.65 0.75-0.85 0.90-1.00	Nil additional observations
				A12 0.09-0.35 Clear	Sandy Loam	Weak, loose	Nil inclusions and segregations	10YR2/1 Black Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 7.5		
				B21 0.35-0.55 Abrupt	Medium clay	Moderate, strong, sub-angular <20 mm	Nil inclusions and segregations	10YR2/1 Black Nil mottles/bleach	Dry, moderate	Very fine, very few	-		
				B22 0.55-0.85 Abrupt	Medium clay	Moderate, strong, sub-angular <20 mm	<2% calcium carbonate nodules	10YR2/1 Black Nil mottles/bleach	Dry, moderate	-	0.60 / 8.5		
				B23 0.85-1.00	Medium clay	Moderate, strong, sub-angular <20 mm	Nil inclusions and segregations	10YR3/3 Dark brown Nil mottles/bleach	Dry, moderate	-	0.90 / 7.5		

SITE N10 removed

SITE N11

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	641522mE 7510593mN	Black Vertosol	Detailed - 50mm hand auger	04/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, Very gently undulating plain, mid-slope, 1% slope	Forage crops	Nil microrelief Extensively disturbed for cropping Nil erosion	Self-mulching with crust 2-6 mm thick, minor sand on surface. Coarse fragments<5 mm <5%	A1 0.00 – 0.12 Abrupt	Light clay, sandy	Subangular blocky, peds 10-30 mm, firm	Nil inclusions and segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.68 Abrupt	Medium heavy clay	Subangular blocky, peds 20-30 mm, strong	<5% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.30 / 7.0 0.60 / 6.5		
				B22 0.68 – 1.00 EOBH	Medium heavy clay, sandy	Subangular blocky, peds 40-60 mm, strong	<1% red nodules <2mm	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Nil	0.90 / 6.5		

SITE N12

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2s	640984mE 7512975mN	Black chromosol	Detailed - 50mm hand auger	05/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
GUP Mid-slope	Grasses	Nil microrelief Semi disturbance Nil erosion	Cracking, Nil coarse fragments	A1 0.00-0.11 Abrupt	Sandy clay loam	Weak to moderate. Soft, sub rounded <10mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, well	Present	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.11-0.62 gradual	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, moderate – well	Present	0.30 / 7.5 0.60 / 7.5		
				B22 0.62-1.00 EOBH	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, moderate – well	Present	0.90 / 7.5		

SITE N13

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2s	640940mE 7512735mN	Black chromosol	Detailed - 50mm hand auger	05/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
GUP Mid-slope <2.0/<2.0	Grasses	Nil microrelief Extensive disturbance Nil erosion	Cracking, Nil coarse fragments	A1 0.00-0.15 Abrupt	Sandy clay loam	Weak to moderate. Soft, sub rounded <10mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, well	Present	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.15-0.75 gradual	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, moderate – well	Present	0.30 / 7.5 0.60 / 7.5		
				B22 0.75-1.00 EOBH	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, moderate – well	Present	0.90 / 7.5		

SITE N14

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2s	640810mE 7512936mN	Black chromosol	Detailed - 50mm hand auger	05/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
GUP Mid-slope	Grasses	Nil microrelief Extensive disturbance Nil erosion	Cracking, Nil coarse fragments	A1 0.00-0.15 Abrupt	Sandy clay loam	Weak to moderate. Soft, sub rounded <10mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, well	Present	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.15-0.75 gradual	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, moderate – well	Present	0.30 / 7.5 0.60 / 7.5		
				B22 0.75-1.00 EOBH	Light clay	Weak to moderate. Firm, sub rounded <20mm	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles/bleaching	Dry, moderate – well	Present	0.90 / 7.5		

SITE N15

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643200mE 7514334mN	Black Vertosol	Detailed - 50mm hand auger	06/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, upper-slope, 1%/2% slope	Grasses	Nil microrelief Nil erosion Extensively disturbed	Self-mulching, cracking 2-6+mm	A1 0.0 – 0.15 Abrupt	Light clay	Moderate, Sub-rounded, peds <10 mm, soft	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles	Dry, well drained	Fine, very few	0.10 / 7.0	0.00-0.10 0.20-0.30 0.55-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.15 – 0.55 Abrupt	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	Nil inclusions or segregations	10YR2/1 Black 2% brown mottle	Dry, well drained	Very fine, very few	0.30 / 7.5		
				B22 0.55 – 1.00	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	<2% calcium carbonate	7.5YR3/2 Dark brown Nil mottles	Dry, moderately well drained	Nil roots	0.60 / 7.0 0.90 / 7.0		

SITE N16

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643734mE 7514136mN	Black Vertosol	Detailed - 50mm hand auger	06/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, upper-slope, 1%/1% slope	Grasses	Nil microrelief Nil erosion extensively disturbed	self-mulching, cracking 2-6+mm	A1 0.0 – 0.12 Abrupt	Light clay	Moderate, Sub-rounded, peds <10 mm, soft	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.40 Abrupt	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles	Dry, well drained	Very fine, very few	0.30 / 6.5		
				B22 0.40 – 0.50 Abrupt	Medium clay	Moderate, Subangular blocky, peds <20 mm, very firm	Nil inclusions or segregations	7.5YR3/3 Dark brown 5% brown mottle	Dry, well drained	Very fine, very few	0.45 / 7.0		
				B23 0.50 – 0.80 Abrupt	Medium clay	Moderate, Subangular blocky, peds <20 mm, very firm	<1% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles	Dry, moderately well drained	Nil roots	0.60 / 7.0		
				B24 0.80 – 1.00	Medium clay	Moderate, Subangular blocky, peds <20 mm, very firm	<2% calcium carbonate	10YR3/2 Nil mottles 5% brown mottle	Dry, moderately well drained	Nil roots	0.90 / 7.0		

SITE N17

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A4	643797mE 7514822mN	Black Dermosol	Detailed - 50mm hand auger	06/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Stream channel / Depression <2% / <2%	Brigalow, Mount Coolibah	Nil microrelief Nil disturbance Nil erosion	Soft, Nil coarse fragments	A1 0.00-0.10 Abrupt	Loamy sand	Massive, loose	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.10-0.20 0.20-0.30 0.50-0.60 0.80-0.88	Nil additional observations
				B21 0.10-0.20 Abrupt	Sandy loam	Moderate, very firm sub-angular <20mm	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Present	0.20 / 8.5		
				B22 0.20-0.47 Abrupt	Sandy loam	Moderate, very firm sub-angular <10mm	<10% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B23 0.47-0.88 EOBH	Sandy loam	Moderate, very firm sub-angular <10mm	<20% coarse fragments	10YR4/2 Brown Nil mottles / bleaching	Dry, well – moderate	Present – 0.60mbgl	0.60 / 8.5		

SITE N18

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A4	643600mE 7514680mN	Black Dermosol	Detailed - 50mm hand auger	06/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
GUP mid slope <1% / <1%	Brigalow, Mount Coolibah	Nil micro relief Nil disturbance Nil erosion	Soft, Nil coarse fragments	A1 0.00-0.14 Abrupt	Loamy sand	Massive, loose	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.14-0.32 Abrupt	Sandy loam	Moderate, very firm sub-angular <20mm	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Present	0.20 / 8.5		
				B22 0.32-0.60 Diffused	Sandy loam	Moderate, very firm sub-angular <10mm	<10% coarse fragments	10YR3/1 Very dark grey 2% 10YR6/4 mottle. Nil bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B23 0.60-1.00 EOBH	Sandy loam	Moderate, very firm sub-angular <10mm	<20% coarse fragments	10YR4/2 Brown Nil mottles / bleaching	Dry, well – moderate	Present – 0.60mbgl	0.60 / 8.5		

SITE N19

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A4	643668mE 7514813mN	Black Dermosol	Detailed - 50mm hand auger	06/06/2019

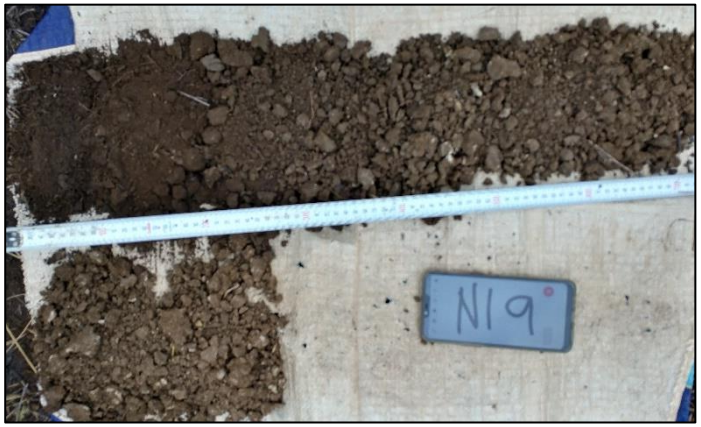
Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
GUP Upper slope <2% / <2%	Brigalow, Mount Coolibah	Nil micro relief Nil disturbance Nil erosion	Soft, Nil coarse fragments	A1 0.00-0.18 Abrupt	Loamy sand	Massive, loose	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-0.95	Nil additional observations
				B21 0.18-0.33 Abrupt	Sandy loam	Moderate, very firm sub-angular <20mm	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Present	0.20 / 8.5		
				B22 0.33-0.68 Diffuse	Sandy loam	Moderate, very firm sub-angular <10mm	<10% coarse fragments	10YR3/1 Very dark grey 2% 10YR6/4 mottle. Nil bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B23 0.68-1.00 EOBH	Sandy loam	Moderate, very firm sub-angular <10mm	<20% coarse fragments	10YR4/2 Brown Nil mottles / bleaching	Dry, well – moderate	Present – 0.60mbgl	0.60 / 8.5		

SITE N20

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A4c	642943mE 7513907mN	Black Dermosol	Detailed - 50mm hand auger	07/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Alluvial near stream channel 1% / 0%	Brigalow	Nil microrelief Nil disturbance Nearby sheet / gully erosion	Minor cracking Soft, <10% coarse fragments <5mm	A1 0.00-0.12 Abrupt	Sandy loam	Weak to moderate, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.75-0.85 0.90-1.00	Nil additional observations
				B21 0.12-0.37 Abrupt	Sandy loam	Moderate, firm sub-rounded <10mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.20 / 8.5		
				B22 0.37-0.68 Abrupt	Sandy loam	Moderate, firm sub-rounded <20mm	<2% calcium carbonate	7.5YR3/2 Dark brown Nil mottle / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B23 0.68-0.85 Abrupt	Sandy clay loam	Moderate, very firm sub-rounded <20mm	<20% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	-		
				B24 0.85-1.00 EOBH	Sandy clay loam	Moderate, very firm sub-rounded <20mm	<5% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate	-	0.90 / 8.5		

SITE N21

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A4c	642847mE 7513907mN	Black Dermosol	Detailed - 50mm hand auger	07/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Alluvial near stream channel 1% / 0%	Brigalow	Nil microrelief Nil disturbance Nearby sheet / gully erosion	Minor cracking Soft, <10% coarse fragments <5mm	A1 0.00-0.10 Abrupt	Sandy loam	Weak to moderate, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.10-0.40 Abrupt	Sandy loam	Moderate, firm sub-rounded <10mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.20 / 8.5		
				B22 0.40-0.58 Abrupt	Sandy loam	Moderate, firm sub-rounded <20mm	<2% calcium carbonate	7.5YR3/2 Dark brown Nil mottle / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B23 0.58-0.90 Abrupt	Sandy clay loam	Moderate, very firm sub-rounded <20mm	10% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	-		
				B24 0.90-1.00 EOBH	Sandy clay loam	Moderate, very firm sub-rounded <20mm	<5% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well – moderate				

SITE N22

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A4c	642838mE 7513991mN	Black Dermosol	Detailed - 50mm hand auger	07/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Depression <1% / <1%	Brigalow woodlands	Nil microrelief Semi disturbance Minor sheet erosion	Minor cracking Soft, <10% coarse fragments <5mm	A1 0.00-0.11 Abrupt	Sandy loam	Weak to moderate, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.11-0.48 Abrupt	Sandy loam	Moderate, firm sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B22 0.48-1.00 EOBH	Sandy clay loam	Moderate, very firm sub-rounded <20mm	<5% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well – moderate	Present	0.60 / 8.5 0.90 / 8.5		

SITE N23

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A5	642506mE 7511103mN	Grey Dermosol	Detailed - 50mm hand auger	07/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Depression Alluvial / stream channel nearby <1% / <1%	Mixed vegetation	Nil microrelief Cropping nearby disturbance Nil erosion	Cracking Firm Nil coarse fragments	A1 0.00-0.12 Abrupt	Clay loam	Weak, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12-0.48 gradual	Light clay	Weak to moderate, firm sub-rounded <10mm	<5% weathered rock	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B22 0.48-1.00 EOBH	Light clay	Moderate, very firm sub-rounded <20mm	<5% calcium carbonate	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.60 / 8.5 0.90 / 8.5		

SITE N24

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A5	642250mE 7511049mN	Grey Dermosol	Detailed - 50mm hand auger	07/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Depression Alluvial / stream channel nearby <1% / <1%	Mixed vegetation	Nil microrelief Cropping nearby disturbance Nil erosion	Cracking Firm Nil coarse fragments	A1 0.00-0.15 Abrupt	Clay loam	Weak, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.15-0.50 gradual	Light clay	Weak to moderate, firm sub-rounded <10mm	<5% calcium carbonate	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B22 0.50-1.00 EOBH	Light clay	Moderate, very firm sub-rounded <20mm	Nil inclusions / segregations	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.60 / 8.5 0.90 / 8.5		

SITE N25

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
A5	642810mE 7511185mN	Grey Dermosol	Detailed - 50mm hand auger	28/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Depression Alluvial / stream channel nearby <1% / <1%	Mixed vegetation	Nil microrelief Cropping nearby disturbance Nil erosion	Cracking Firm Nil coarse fragments	A1 0.00-0.12 Abrupt	Clay loam	Weak, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Present	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12-0.62 gradual	Light clay	Weak to moderate, firm sub-rounded <10mm	Nil inclusions / segregations	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.30 / 8.5		
				B22 0.62-1.00 EOBH	Light clay	Moderate, very firm sub-rounded <20mm	<5% calcium carbonate	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well – moderate	Present	0.60 / 8.5 0.90 / 8.5		

SITE N26

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	642370mE 7512434mN	Black Dermosol	Detailed - 50mm hand auger	28/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Lower slope 1% / 1%	Short grasses	Nil microrelief Extensive disturbance Nil erosion	Minor cracking	A1 0.00-0.14 Clear	Sandy clay	Weak, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles/bleach	Dry, moderate	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.14-0.33 clear	Medium clay	Weak to moderate, firm sub-rounded <10mm	Nil inclusions / segregations	10YR2/2 Very dark brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 6.5		
				B22 0.33-0.90 gradual	Medium clay	Moderate, firm sub-rounded <20mm	Nil inclusions / segregations	10YR3/3 Dark brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.60 / 7.0		
				B23 0.90-1.00 EOBH	Medium clay	Moderate, very firm sub-rounded <20mm	<2% calcium carbonate	10YR3/3 Dark brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 7.5		

SITE N27

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	642614mE 7510764mN	Black Dermosol	Detailed - 50mm hand auger	28/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Mid-slope, 1% slope	Forage cropping	Nil Microrelief Nil erosion Extensively cleared	Firm, cracking 2mm, Nil coarse fragments	A1 0.0 – 0.13 Abrupt	Sandy clay loam	Weak, sub-rounded peds 5-20 mm, firm	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.13 – 0.50 gradual	Sandy clay loam	Moderate, peds 30-40 mm, very firm	Nil inclusions or segregations	10YR2/1 Black Nil mottles	Humid, well drained	Nil roots	0.30 / 6.5		
				B22 0.50 – 0.75 clear	Light clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<2% calcium carbonate	10YR2/1 Nil mottles Black	Humid, moderately well drained	Nil roots	0.60 / 6.5		
				B23 0.75 – 1.00	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles	Humid, moderately well drained	Nil roots	0.90 / 6.5		

SITE N28

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B5	643924mE 7513310mN	Black Dermosol	Detailed - 50mm hand auger	28/07/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP lower slope <2% / <2%	Eucalyptus species	Nil microrelief Semi disturbed, contour banks nearby	Minor cracks, firm, Nil coarse fragments	A11 0.0 – 0.08 Abrupt	Sandy clay loam	Massive	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.5	0.00-0.05 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.08 – 0.35 gradual	Sandy clay loam	Weak, sub-rounded peds <10 mm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.20 / 7.5		
				B22 0.35 – 0.60 gradual	Sandy clay loam	Subangular blocky, moderate, peds <20 mm, firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.30 / 7.5		
				B23 0.60 – 1.00 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, firm	<15% calcium carbonate	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well – moderate drained	Present	0.60 / 7.5 0.90 / 7.5		

SITE N29

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643062mE 7512049mN	Black Vertosol	Detailed - 50mm hand auger	28/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP mid slope 2% / 2%	Cropping	Nil microrelief Extensive disturbed, contour banks nearby	Cracking, firm, Nil coarse fragments	A11 0.0 – 0.11 Abrupt	Light medium clay	Moderate, firm, sub-rounded peds <10 mm	<1% coarse fragments <2mm	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.11 – 0.35 Abrupt	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B22 0.35 – 0.66 Clear	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<30% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 8.0		
				B23 0.66 – 1.00 EOBH	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<20% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well-moderate drained	Nil	0.90 / 8.0		

SITE N30

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643464mE 7512936mN	Black Vertosol	Detailed - 50mm hand auger	29/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP upper slope 2% / 2%	Cropping	Nil microrelief Extensive disturbed, contour banks nearby	Cracking, firm, Nil coarse fragments	A11 0.0 – 0.11 Abrupt	Light medium clay	Moderate, firm, sub-rounded peds <10 mm	<1% coarse fragments <2mm	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.11 – 0.35 Abrupt	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B22 0.35 – 0.66 Clear	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<30% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 8.0		
				B23 0.66 – 1.00 EOBH	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<10% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well-moderate drained	Nil	0.90 / 8.0		

SITE N31

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:29
B1	643487mE 7512205mN	Black Vertosol	Detailed - 50mm hand auger	29/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP Lower slope / flat plain <1% / 1%	Cropping	Nil microrelief Extensive disturbed, contour banks nearby	Cracking, firm, Nil coarse fragments	A11 0.0 – 0.10 Abrupt	Light clay	Weak, firm, sub-rounded peds <10 mm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.11 – 0.50 Abrupt	Medium clay	Moderate - strong, firm, sub-angular peds <20 mm	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B22 0.50 – 1.00 EOBH	Medium clay	Moderate - strong, firm, sub-angular peds <20 mm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 7.0 0.90 / 7.0		

SITE N32

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	644077mE 7512794mN	Black Vertosol	Detailed - 50mm hand auger	29/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP Lower slope / flat plain <1% / 1%	Cropping	Nil microrelief Extensive disturbed, contour banks nearby	Cracking, firm, Nil coarse fragments	A11 0.0 – 0.10 Abrupt	Light clay	Weak, firm, sub-rounded peds <10 mm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.11 – 0.53 Abrupt	Medium clay	Moderate - strong, firm, sub-angular peds 20-40 mm	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B22 0.53 – 1.00 EOBH	Medium clay	Moderate - strong, firm, sub-angular peds 20-40 mm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 7.0 0.90 / 7.0		

SITE N33

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643707mE 7512426mN	Black Vertosol	Detailed - 50mm hand auger	29/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP Lower slope / flat plain <1% / 1%	Cropping	Nil microrelief Extensive disturbed, contour banks nearby	Cracking, firm, Nil coarse fragments	A11 0.0 – 0.12 Abrupt	Light clay	Weak, firm, sub-rounded peds <10 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.45 Abrupt	Medium clay	Moderate - strong, firm, sub-angular peds 20-40 mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B22 0.45 – 0.60 Abrupt	Medium clay	Moderate - strong, firm, sub-angular peds 30-60 mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 7.0		
				B22 0.45 – 0.60 Abrupt	Medium clay	Moderate - strong, firm, sub-angular peds 30-60 mm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well-moderate drained	Present	0.90 / 7.0		

SITE N34

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643069mE 7512379mN	Black Vertosol	Detailed - 50mm hand auger	29/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP mid slope 2% / 2%	Cropping	Nil microrelief Extensive disturbed, contour banks nearby	Cracking, firm, Nil coarse fragments	A11 0.0 – 0.20 Abrupt	Light medium clay	Moderate, firm, sub-rounded peds <10 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.20 – 0.46 Abrupt	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B22 0.46 – 0.80 Abrupt	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 8.0		
				B23 0.80 – 1.00 EOBH	Medium clay	Moderate - strong, firm, sub-rounded peds 20 mm	<2% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well-moderate drained	Nil	0.90 / 8.0		

SITE N35

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643659mE 7511986mN	Black Vertosol	Detailed - 50mm hand auger	29/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP mid slope 2% / 2%	Cropping	Nil microrelief Extensive disturbed, Nil erosion	Minor cracking, self-mulching, Nil coarse fragments	A11 0.0 – 0.04 Abrupt	Light medium clay	Moderate, firm, sub-rounded peds 20-50 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.04 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.04 – 0.20 Abrupt	Medium clay	Moderate, firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B21 0.20 – 0.45 Abrupt	Medium heavy clay	Moderate, -strong firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR2/1 Black Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 8.0		
				B22 0.45 – 1.00 EOBH	Medium heavy clay	Moderate, -strong firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR2/1 Black Nil mottles / bleaching	Dry, well-moderate drained	Nil	0.90 / 8.0		

SITE N36

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	644933mE 7511241mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP mid slope 2% / 2%	Cropping	Nil microrelief Extensive disturbed, Nil erosion	Minor cracking, self-mulching, Nil coarse fragments	A11 0.0 – 0.06 Abrupt	Light medium clay	Moderate, firm, sub-rounded peds 20-50 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.06 – 0.22 Abrupt	Medium clay	Moderate, firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B21 0.22 – 0.50 Abrupt	Medium heavy clay	Moderate, -strong firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR2/1 Black Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 8.0		
				B22 0.50 – 1.00 EOBH	Medium heavy clay	Moderate, -strong firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR2/1 Black Nil mottles / bleaching	Dry, well-moderate drained	Nil	0.90 / 8.0		

SITE N37

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643706mE 7511439mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2019

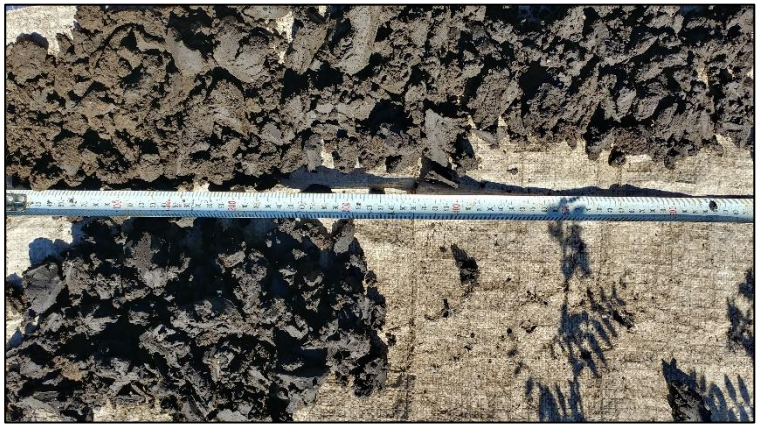
Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping / Grazing GUP mid slope 2% / 2%	Cropping	Nil microrelief Extensive disturbed, Nil erosion	Minor cracking, self-mulching, Nil coarse fragments	A11 0.0 – 0.04 Abrupt	Light medium clay	Moderate, firm, sub-rounded peds 20-50 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.04 – 0.23 Abrupt	Medium clay	Moderate, firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 8.0		
				B21 0.23 – 0.47 Abrupt	Medium heavy clay	Moderate, - strong firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR2/1 Black Nil mottles / bleaching	Dry, well-moderate drained	Present	0.60 / 8.0		
				B22 0.47 – 1.00 EOBH	Medium heavy clay	Moderate, - strong firm, sub-rounded peds 50-80 mm	Nil inclusions / segregations	10YR2/1 Black Nil mottles / bleaching	Dry, well-moderate drained	Nil	0.90 / 8.0		

SITE N38

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	645726mE 7510395mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Lower slope to depression 1% / 2%	Mixed vegetation, eucalyptus species, Grasses	Nil microrelief Semi disturbed, Nil erosion	Cracking, <2% coarse fragments <5mm	A11 0.0 – 0.12 Abrupt	Light clay	Moderate, firm, sub-angular <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.90 Abrupt	Medium clay	Moderate-strong, strong, sub-angular <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 7.5 0.60 / 7.5		
				B22 0.90 – 1.00 EOBH	Medium clay	Moderate-strong, strong, sub-angular <20 mm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.90 / 8.0		

SITE N39

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	645496mE 7510399mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Lower slope to depression 1% / 2%	Mixed vegetation, eucalyptus species, Grasses	Nil microrelief Semi disturbed, Nil erosion	Cracking, <2% coarse fragments <5mm	A11 0.0 – 0.13 Abrupt	Light clay	Moderate, firm, sub-angular <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.13 – 0.85 Abrupt	Medium clay	Moderate-strong, strong, sub-angular <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 7.5 0.60 / 7.5		
				B22 0.85 – 1.00 EOBH	Medium clay	Moderate-strong, strong, sub-angular <20 mm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.90 / 8.0		

SITE N40

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	644518mE 7510978mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2019

Landscape



Surface



Soil Profile

Picture not available

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP mid slope 1% / 2%	Mixed vegetation, eucalyptus species, Grasses	Nil microrelief Semi disturbed, Nil erosion	Cracking, <2% coarse fragments <5mm	A11 0.0 – 0.14 Abrupt	Light clay	Moderate, firm, sub-angular <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.14 – 1.00 EOBH	Medium clay	Moderate-strong, strong, sub-angular <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 7.5 0.60 / 7.5 0.90 / 8.0		

SITE N41

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E1r	642742mE 7510104mN	Red Chromosol	Detailed - 50mm hand auger	30/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Mid - lower slope <2% / <2%	Grasses	Nil microrelief Extensive disturbed, Nil erosion	Firm Nil coarse fragments	A11 0.0 – 0.12 Abrupt	Sandy loam	Weak-moderate, firm, sub-rounded <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.70 Abrupt	Sandy clay loam	Moderate, firm, sub-angular <20 mm	Nil inclusions / segregations	5YR4/3 Reddish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 7.0 0.60 / 7.5		
				B22 0.70 – 1.00 EOBH	Light clay	Moderate, v.firm, sub-angular <20 mm	<5% calcium carbonate	7.5YR4/4 Brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.90 / 7.5		

SITE N42

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E1r	642252mE 7510143mN	Red Chromosol	Detailed - 50mm hand auger	01/07/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Mid - lower slope <2% / <2%	Grasses	Nil microrelief Extensive disturbed, Nil erosion	Firm Nil coarse fragments	A11 0.0 – 0.14 Clear	Sandy loam	Weak-moderate, firm, sub-rounded <20 mm	Nil inclusions / segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.14 – 0.70 Abrupt	Light clay	Moderate, firm, sub-angular <20 mm	Nil inclusions / segregations	5YR4/3 Reddish brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.30 / 7.0 0.60 / 7.5		
				B22 0.70 – 1.00 EOBH	Light clay	Moderate, v.firm, sub-angular <20 mm	<5% calcium carbonate	7.5YR4/4 Brown Nil mottles / bleaching	Dry, well-moderate drained	Present	0.90 / 7.5		

SITE N43

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B3	643716mE 7513193mN	Black Dermosol	Detailed - 50mm hand auger	011/07/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP upper slope <2% / <2%	Eucalyptus species	Nil microrelief Semi disturbed, contour banks nearby Nil erosion	Minor cracking, firm, nil coarse fragments	A11 0.0 – 0.06 Abrupt	Sandy clay loam	Massive	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.06 – 0.20 gradual	Sandy clay loam	Weak, sub-rounded peds <10 mm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.20 / 7.5		
				B21 0.20 – 0.46 gradual	Sandy clay loam	Subangular blocky, moderate, peds <20 mm, firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.30 / 7.5		
				B22 0.46 – 1.00 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, firm	<20% calcium carbonate	10YR3/3 Dark reddish brown Nil mottles / bleaching	Dry, well – moderate drained	Present	0.60 / 7.5 0.90 / 7.5		

SITE N44

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E2	643817mE 7508323mN	Black Vertosol	Detailed - 50mm hand auger	01/07/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Lower slope 1% / 1%	Short grasses	Nil microrelief Extensive disturbance Nil erosion	Minor cracking	A1 0.00-0.15 Abrupt	Light clay	Weak, soft sub-rounded <10mm	Nil inclusions / segregations	10YR3/1 Very dark grey Nil mottles/bleach	Dry, moderate	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.15-0.45 Abrupt	Medium clay	Weak to moderate, firm sub-rounded <10mm	Nil inclusions / segregations	10YR2/2 Very dark brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 6.5		
				B22 0.45-1.00 EOBH	Medium clay	Moderate, firm sub-rounded <20mm	Nil inclusions / segregations	10YR3/3 Dark brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.60 / 7.0 0.90 / 7.0		

SITE N45

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B5	643622mE 7513388mN	Black Dermosol	Detailed - 50mm hand auger	01/07/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP upper slope <2% / <2%	Eucalyptus species	Nil microrelief Semi disturbed, contour banks nearby	Minor cracks, firm, Nil coarse fragments	A11 0.0 – 0.09 Abrupt	Sandy clay loam	Massive	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.09 – 0.25 gradual	Sandy clay loam	Weak, sub-rounded peds <10 mm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.20 / 7.5		
				B22 0.25 – 0.50 gradual	Sandy clay loam	Subangular blocky, moderate, peds <20 mm, firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Present	0.30 / 7.5		
				B23 0.50 – 1.00 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, firm	<20% calcium carbonate	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well – moderate drained	Present	0.60 / 7.5 0.90 / 7.5		

Site N46	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 641947 7512737	Australian Soil Class: Black Dermosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Mid-slope 2%/2%	Spear grass, sparse brigalow Nil microrelief Extensive clearing	Firm Nil coarse fragments	A1 0.00-0.12 Clear 20-50mm	Clay loam sandy	Moderate Firm Subangular blocky	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Common	6.0	0.00-0.10 0.20-030 0.50-0.60 0.70-0.80 0.90-1.00 Rainfall night before
			B21 0.10-0.46 Clear 20-50mm	Medium clay	Strong Very firm Angular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Common	7.5	
			B22 0.46-0.86 Clear 20-50mm	Medium clay	Strong Very firm	<2% calcium carbonate 2-6mm	10YR3/1 Very dark grey Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Few	7.5	
			B23 0.86-1.00 EOBH	Medium clay	Strong Strong	Nil inclusions or segregations	10YR4/2 Dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	

Site N47	Map Unit: B2	Location (mE/mS GDA94 ZONE 55): 641755 7513256	Australian Soil Class: Black self-mulching Vertosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat 0%/<1%	Brigalow nearby Nil microrelief Extensive clearing	Self-mulching Nil coarse fragments Moist	A1 0.00-0.08 Clear 20-50mm	Light clay	Moderate Firm Angular blocky	Nil inclusions or segregations	10YR2/1 Black Nil mottles or bleaching	Moist Well drained	Fine 1-2mm Few	7.0	0.00-0.08 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.08-0.40 Sharp <5mm	Medium clay	Moderate Strong Subangular blocky	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Moderately moist Well drained	Very fine <1mm Few	8.0	
			B22 0.40-0.80 Clear 20-50mm	Medium clay / medium heavy clay	Moderate Strong Subangular blocky	2-10% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	8.0	
			B23 0.80-1.00 EOBH	Medium clay	Strong Strong Subangular blocky	Nil inclusions or segregations	10YR3/3 Dark brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	8.0	

Site N48	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 641406 7513300	Australian Soil Class: Black Dermosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Undulating plain Mid-slope 2%/2%	Current bush, bull Mitchell grass Nil microrelief Extensive clearing	Firm Nil coarse fragments	A1 0.00-0.10 Clear 20-50mm	Sandy clay loam	Massive Weak	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Moderately moist Rapidly drained	Very fine <1mm Common	7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.10-0.30 Gradual 50-100mm	Sandy clay loam	Moderate Weak Subangular blocky	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Dry Well drained	Very fine <1mm Common	7.0	
			B22 0.30-0.45 Gradual 50-100mm	Sandy clay loam	Moderate Firm Subangular blocky	Nil inclusions or segregations	7.5YR3/4 Nil mottles or bleaching	Dry Well drained	Nil roots	7.5	
			B23 0.45-1.00 EOBH	Sandy loam / Sandy clay loam	Massive Weak Subangular blocky	2-10% coarse fragments	10YR3/4 Nil mottles or bleaching	Dry Rapidly drained	Nil roots	7.5	

Site N49	Map Unit: B1	Location (mE/mS GDA94 ZONE 55): 641677 7513512	Australian Soil Class: Black self-mulching Vertosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Upper slope 2%/2%	Current bush, Bull Mitchell grass Nil microrelief Extensive clearing	Self-mulching Nil coarse fragments	A1 0.00-0.13 Clear 20-50mm	Light clay	Moderate Very firm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Common	6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.13-0.61 Clear 20-50mm	Light medium clay	Moderate Firm	2-10% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	8.0	
			B22 0.61-1.00 EOBH	Clay loam	Moderate Firm	Nil inclusions or segregations	10YR4/2 Dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	8.0	

Site N50	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 642495 7513615	Australian Soil Class: Black Dermosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat 0%/0%	Grasses Nil microrelief Complete clearing, not cultivated	Firm Nil coarse fragments	A1 0.00-0.09 Abrupt 5-20mm	Clay loam, sandy	Moderate Firm Subangular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.0	0.00-0.09 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.09-0.31 Abrupt 5-20mm	Medium clay	Moderate Firm Angular blocky	<2% calcium carbonate <2mm	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	
			B22 0.31-0.62 Abrupt 5-20mm	Medium clay	Moderate Firm Angular blocky	<2% calcium carbonate 2-6mm	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	
			B23 0.62-0.85 Abrupt 5-20mm	Medium clay	Moderate Very firm Angular blocky	<2% calcium carbonate <2mm	10YR3/3 Dark brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	8.0	
			B24 0.85-1.00 EOBH	Medium clay	Moderate Very firm Subangular blocky	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Moderately moist Well drained	Nil roots	8.0	

Site N51	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 642242 7513413	Australian Soil Class: Black Dermosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat 0%/0%	Grasses Nil microrelief Complete clearing, not cultivated	Firm Nil coarse fragments	A1 0.00-0.09 Abrupt 5-20mm	Clay loam, sandy	Moderate Firm Subangular blocky	Nil inclusions or segregations	10YR2/1 Black Nil mottles or bleaching	Moderately moist Well drained	Fine 1-2mm Few	6.5	0.00-0.09 0.13-0.23 0.23-0.30 0.52-0.60 0.70-0.80 0.90-1.00
			B21 0.09-0.23 Abrupt 5-20mm	Medium clay	Moderate Strong Subangular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Moderately moist Well drained	Fine 1-2mm Few	8.0	
			B22 0.23-0.52 Abrupt 5-20mm	Medium clay	Moderate Strong Subangular blocky	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	8.0	
			B23 0.52-0.85 Abrupt 5-20mm	Medium clay	Strong Strong Subangular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Well drained	Nil roots	8.0	
			B24 0.85-1.00 EOBH	Medium clay	Strong Very firm Subangular blocky	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Moderately moist Well drained	Nil roots	8.0	

Site N52	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 642079 7513098	Australian Soil Class: Black Dermosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat 0%/0%	Grasses Nil microrelief Complete clearing, not cultivated	Firm Nil coarse fragments	A1 0.00-0.12 Clear 20-50mm	Clay loam sandy	Moderate Weak Subangular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Few	6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.12-0.45	Medium clay	Moderate Very firm Angular blocky	2-10% calcium carbonate 2-6mm	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Few	7.5	
			B22 0.45-0.65	Medium clay	Moderate Firm Angular blocky Possible lenticular	Nil inclusions or segregations	10YR3/3 Dark brown Nil mottles or bleaching	Dry	Fine 1-2mm Few	7.5	
			B23 0.65-0.80 Abrupt 5-20mm	Medium heavy clay	Strong Firm Subangular blocky	Nil inclusions or segregations	10YR4/2 Dark greyish brown Nil mottles or bleaching	Dry	Nil roots	8.0	
			B23 0.80-1.00	Medium heavy clay	Strong Very firm Subangular blocky	Nil inclusions or segregations	10YR4/3 Brown Nil mottles or bleaching	Dry	Nil roots	8.0	

Site N53	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 642729 7513832	Australian Soil Class: Black Dermosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat 0%/0%	Grasses Nil microrelief Complete clearing, not cultivated	Firm Nil coarse fragments	A1 0.00-0.12 Abrupt 5-20mm	Sandy clay loam	Weak Weak Angular blocky	Nil inclusions or segregations	10YR2/2 Very dark brown Nil mottles or bleaching	Moderately moist Well drained	Fine 1-2mm Common	7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.72-0.80 0.90-1.00
			B21 0.12-0.45 Abrupt 5-20mm	Medium clay	Moderate Very firm Angular blocky	<2% coarse fragments	10YR2/2 Very dark brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	
			B22 0.45-0.72 Abrupt 5-20mm	Medium clay	Moderate Very firm Sub-angular blocky	Nil inclusions or segregations	10YR2/2 Very dark brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	8.0	
			B23 0.72-1.00 EOBH	Medium clay	Moderate Very firm Sub-angular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderately well drained	Nil roots	7.5	

Site N54	Map Unit: B1	Location (mE/mS GDA94 ZONE 55): 641925 7512253	Australian Soil Class: Black self-mulching Vertosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat 0%/0%	Bull Mitchell grass, Nil microrelief Complete clearing, not cultivated	Self-mulching, cracking Nil coarse fragments	A1 0.00-0.12 Abrupt 5-20mm	Light medium clay	Moderate Very firm Angular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Common	7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.12-0.34 Clear 20-50mm	Medium clay	Strong Very firm Angular blocky	<2% calcium carbonate	10YR2/1 Black Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Few	8.0	
			B22 0.34-0.88 Clear 20-50mm	Medium clay	Strong Very firm Angular blocky lenticular	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Few	8.0	
			B23 0.88-1.00 EOBH	Medium heavy clay	Strong Very firm Angular blocky	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	7.5	

Site N55	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 641290 7513322	Australian Soil Class: Black Dermosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 01/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Undulating plain Mid-slope 2%/2%	Current Bush, Bull Mitchell grass Nil microrelief Extensive clearing	Firm Nil coarse fragments	A1 0.00-0.12 Gradual 50-100mm	Sandy clay loam	Massive Weak	Nil inclusions or segregations	10YR2/2 Very dark brown Nil mottles or bleaching	Moderately moist Rapidly drained	Very fine <1mm Common	6.5	0.00-0.10 0.15-0.25 0.25-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.12-0.25 Gradual 50-100mm	Medium clay	Moderate Strong Subangular blocky	Nil inclusions or segregations	10YR2/1 Black Nil mottles or bleaching	Dry Moderately well drained	Very fine <1mm Common	6.5	
			B22 0.25-0.85 Gradual 50-100mm	Medium clay	Moderate Strong Subangular blocky	<2% coarse fragments	10YR2/1 Black Nil mottles or bleaching	Dry Well drained	Nil roots	8.0	
			B23 0.85-1.00 EOBH	Medium clay to sandy clay loam	Moderate Very firm Subangular blocky	Nil inclusions or segregations	10YR3/3 Dark brown Nil mottles or bleaching	Dry Well drained	Nil roots	8.0	

Site N56	Map Unit: B1	Location (mE/mS GDA94 ZONE 55): 641970 7512389	Australian Soil Class: Black Self mulching Vertosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 02/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat 1%/1%	Bull Mitchell grass Nil microrelief Complete clearing, not cultivated	Self-mulching, cracking Nil coarse fragments	A1 0.00-0.10 Clear 20-50mm	Light clay	Moderate Firm	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Few	6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.10-0.65 Clear 20-50mm	Medium clay	Strong Very firm	<2% coarse fragments 6-20mm	10YR3/2 Very dark greyish brown Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Few	7.5	
			B22 0.68-0.85 Clear 20-50mm	Medium heavy clay	Strong Very firm	Nil inclusions or segregations	10YR4/2 Dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	
			B22 0.85-1.00 EOBH	Medium heavy clay	Strong Very firm	Nil inclusions or segregations	10YR4/3 Brown Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	

Site N57	Map Unit: B1	Location (mE/mS GDA94 ZONE 55): 641884 7513451	Australian Soil Class: Black self-mulching Vertosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 02/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Mid-slope 1.%/1.%	Sparse Brigalow nearby Nil microrelief Extensive clearing	Self-mulching Nil coarse fragments	A1 0.00-0.10 Abrupt 5-20mm	Light clay	Moderate Firm Angular blocky	Nil inclusions or segregations	10YR2/1 Black Nil mottles or bleaching	Moist Well drained	Fine 1-2mm Few	7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
			B21 0.10-0.50 Gradual 50-100mm	Medium clay	Moderate Strong Subangular blocky	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderate well drained	Very fine <1mm Few	8.5	
			B22 0.50-0.85 Clear 20-50mm	Medium heavy clay	Moderate Strong Subangular blocky	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderate well drained	Nil roots	8.5	
			B23 0.85-1.00 EOBH	Medium heavy clay	Moderate Strong Subangular blocky	Nil inclusions or segregations	10YR4/3 Brown Nil mottles or bleaching	Dry Moderate well drained	Nil roots	6.5	

Site N58	Map Unit: B2bl	Location (mE/mS GDA94 ZONE 55): 641792 7512652	Australian Soil Class: Black self-mulching Vertosol	Soil Survey Type: Detailed 50 mm hand auger	Survey Date: 02/05/2021

Landscape



Surface



Soil Profile



Land use / Landform Pattern / Element / Slope	Vegetation / Microrelief / Disturbance / Erosion	Surface condition / surface rock	Soil Profile Description								
			Horizon / Depth (m / Boundary	Field Texture	Structure / Strength / Pedality	Inclusions / Segregations	Colour / Mottle / Bleaching	Moisture / Drainage	Roots Size / Abundance	Depth (m) / Field pH	Sample (m) / Observations
Grazing Gently undulating plain Flat <1%/<1%	Bull Mitchell grass Nil microrelief Complete clearing, not cultivated	Self-mulching, cracking Nil coarse fragments	A1 0.00-0.11 Abrupt 5-20mm	Light clay	Moderate Firm Subangular blocky	Nil inclusions or segregations	10YR2/1 Black Nil mottles or bleaching	Moderately moist Moderately well drained	Fine 1-2mm Few	7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.66-0.76 0.90-1.00
			B21 0.11-0.45 Clear 20-50mm	Medium clay	Strong Very firm Angular blocky	<2% calcium carbonate 2-6mm	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	
			B22 0.45-0.76 Clear 20-50mm	Medium clay	Strong Very firm Angular blocky	2-10% calcium carbonate 2-6mm	10YR3/1 Very dark grey Nil mottles or bleaching	Dry Moderately well drained	Fine 1-2mm Few	7.5	
			B23 0.76-1.00 EOBH	Medium heavy clay	Moderate Very firm Angular blocky	<2% calcium carbonate 2-6mm	10YR4/2 Dark greyish brown Nil mottles or bleaching	Dry Moderately well drained	Nil roots	7.5	

SITE 4-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E2	643527mE 7507664mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Very gently undulating plains, upper slope, <1.0/1.0	Cleared, very sparse mixed regrowth	Nil microrelief Semi cleared, Nil erosion	Cracking 20-40mm, self mulching Nil coarse fragments	A1 0.00-0.14 Abrupt	Light clay	Weak, firm, <10mm sub-angular	Nil inclusion or segregations	10YR3/2 Very dark greyish brown Nil mottles/bleach	Dry, moderate	Fine, few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil additional observations
				B21 0.14-0.90 Abrupt	Medium clay	Moderate, firm <40% 20-60mm, <20% 60-100 sub-angular blocky peds	<1% calcium carbonate nodules	10YR3/2 Very dark greyish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.5		
				B22 0.90-1.00	Medium clay	Moderate, firm <40% 20-60mm, <20% 60-100 sub-angular blocky peds	2% calcium carbonate nodules	10YR4/2 Dark greyish brown Mottles 2% 10YR3/2 Very dark greyish brown Nil bleach	Dry, Imperfect	Very fine, very few	0.90 / 8.0		

SITE 5-SCL-Depression

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B3bl	642166mE 7508999mN	Black Vertosol	Detailed - 50mm hand auger	04/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Gently undulating plain 2.0/2.0	Grasses, recent regrowth and shrubs	Microrelief present – Depression <0.2m deep, 40% coverage Extensive clearing Nil Erosion	Self-mulching with cracking Nil coarse fragments	A1 0.00-0.17 Abrupt	Light medium clay	Weak, firm <20mm sub-angular	<1% Calcium carbonate <2mm	10YR3/1 Very dark grey Nil mottle / bleaching	Dry, Well drained	Common, medium	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B2 0.17-1.00 Abrupt	Medium heavy clay	Moderate, Very firm 20-40mm sub-angular	<2% Calcium carbonate <2mm	10YR3/2 Very dark greyish brown Nil mottle / bleaching	Dry, Moderate drained	Few, medium	0.30 / 6.5 0.60 / 6.5 0.90 / 6.5		

SITE 5-SCL-Mound

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class:	Site Survey Type:	Survey Date:
B3bl	642163mE 7508998mN	Black Vertosol	Detailed - 50mm hand auger	04/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Gently undulating plain, mid-slope 2.0/2.0	101	Microrelief present – Mound 40% coverage Extensive clearing Nil Erosion	Self-mulching with cracking Nil coarse fragments	A1 0.00-0.12 Abrupt	Light clay	Moderate, soft <20mm sub-angular	Nil inclusions and segregations	10YR2/1 Black Nil mottle / bleaching	Humid, Well drained	Common, medium	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12-0.60 Abrupt	Medium heavy clay	Moderate, Firm <30mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottle / bleaching	Humid, Well drained	Few, medium	0.30 / 7.0		
				B22 0.60-1.00	Medium heavy clay	Moderate, Firm <30mm sub-angular	<2% Calcium carbonate	10YR3/1 Very dark grey Nil mottle / bleaching	Humid, Well - moderate drained	Few, fine	0.10 / 7.0		

SITE 6-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class:	Site Survey Type:	Survey Date:
B1	641287mE 7510129mN	Black Vertosol	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid-slope, 2.0/2.0	Grasses	Nil microrelief Extensively disturbance Nil erosion	Humid self-mulching with crust 2-6 mm thick, minor sand on surface. Coarse fragments`<5 mm <5%	A1 0.00 – 0.15 Abrupt	Light clay, sandy	Weak, firm Subangular blocky, peds 10-30 mm,	Nil inclusions and segregations	10YR2/1 Black Nil mottles / bleaching	Humid, Well – moderate drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.15 – 0.30 Abrupt	Medium heavy clay	Weak, firm Subangular blocky, peds 20-30 mm,	Nil inclusions and segregations	10YR2/1 Black Nil mottles / bleaching	Humid, Well – moderate drained	Fine, very few	0.35 / 7.0		
				B22 0.30 – 0.80 Abrupt	Medium heavy clay	Weak to moderate, very firm Subangular blocky, peds 20-30 mm,	<5% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Humid, Well – moderate drained	Fine, very few	0.60 / 7.0		
				B23 0.80 – 1.00 EOBH	Medium heavy clay, sandy	Weak to moderate, very firm Subangular blocky, peds 40-60 mm,	Nil inclusions and segregations	10YR4/2 Dark greyish brown Nil mottles / bleaching	Humid, Well – moderate drained	Nil roots	0.90 / 7.5		

SITE 7-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class:	Site Survey Type:	Survey Date:
B1	641298mE 7510328mN	Black Vertosol	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, Very gently undulating plain, mid-slope, 1% slope	Forage crops	Nil microrelief Extensively disturbed for cropping Nil erosion	Self-mulching with crust 2-6 mm thick, minor sand on surface. Coarse fragments<5 mm <5%	A1 0.00 – 0.14 Abrupt	Light clay, sandy	Subangular blocky, peds 10-30 mm, firm	Nil inclusions and segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.14 – 0.70 Abrupt	Medium heavy clay	Subangular blocky, peds 20-30 mm, strong	<5% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.30 / 7.0 0.60 / 6.5		
				B22 0.70 – 1.00 EOBH	Medium heavy clay, sandy	Subangular blocky, peds 40-60 mm, strong	<1% red nodules <2mm	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Nil roots	0.90 / 6.5		

SITE 8-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	641694mE 7510274 mN	Black Vertosol	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, mid-slope, 2% slope	Forage crops	Nil microrelief Nil erosion Extensively disturbed for cropping	Humid, soft, cracking <2mm, occasional course fragments <5mm	A1 0.0 – 0.10 Abrupt	Medium Clay	Subangular blocky, peds 20-30 mm, firm	Nil inclusions and segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.10 – 0.70 Abrupt	Medium heavy clay	Subangular blocky, peds 20-30 mm, strong	Nil inclusions and segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.30 / 6.5 0.60 / 7.0		
				B22 0.70 – 1.00	Medium heavy clay	Subangular blocky, peds 40-60 mm, strong	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, well drained	Nil roots	0.90 / 6.5		

SITE 9-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E1r	641919mE 7510236mN	Red Chromosol (Brown Chromosol sub-dominant)	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, mid-slope, 2% slope	Forage crops	Nil microrelief Nil erosion Extensively disturbed for cropping	Self-mulching, Minor cracking <2mm, Nil course fragments	A1 0.0 – 0.07 Abrupt	Light clay, sandy	Subangular blocky, peds 20-30 mm, firm	Nil inclusions and segregations	10YR3/2 Greyish brown Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B2 0.07 – 0.60 Abrupt	Light clay, sandy	Subangular blocky, peds 20-30 mm, strong	20% calcium carbonate	10YR4/3 Brown Mottle: 5% 10YR6/4 light yellowish brown	Humid, moderately well drained	Fine, very few	0.30 / 7.0 0.60 / 7.0		
				B2 0.60 – 1.00	Medium clay	Subangular blocky, moderate, peds 40-60 mm, firm	Nil inclusions and segregations	10YR4/4 Dark yellowish brown Nil mottles / bleaching	dry, well drained	Nil roots	0.90 / 7.0		

SITE 10-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E1r	642525mE 7510097mN	Red Chromosol (Brown Chromosol sub-dominant)	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Very gently undulating plain, Midslope 2.0/1.0	Buffel grass	Nil microrelief Extensive cleared Nil erosion	Minor cracking 2-6mm, soft, Nil coarse fragments	A1 0.00-0.13 Abrupt	Sandy clay	Moderate, firm, <10mm sub-angular	<1% calcium carbonate nodules	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Few, fine	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	First borehole, 0.20 mbgl Second borehole 0.40 mbgl Refusal likely due to roots, no physical barrier
				A2 0.13-0.39 Abrupt	Light sandy clay	Moderate, firm, <10mm sub-angular	Nil inclusion or segregations	10YR3/3 Dark Brown Nil mottles / bleaching	Dry, moderate	Few, fine	0.30 / 7.0		
				B21 0.39-0.84 Abrupt	Light sandy clay	Moderate, firm, <10mm sub-angular	<10% calcium carbonate nodules	5YR4/4 Reddish brown Nil mottles / bleaching	Dry, moderate	Few, fine	0.60 / 7.5		
				B22 0.84-1.00 EOBH	Light clay	Moderate, firm, <10mm sub-angular	<2% calcium carbonate nodules	10YR4/4 Dark yellowish brown Nil mottles/bleach	Dry, moderate	Very few, very fine	0.90 / 8.5		

SITE 32-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	641452mE 7512060mN	Black Dermosol	Detailed - 50mm hand auger	05/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Upper-slope, 2% slope	Grasses, with Brigalow nearby	Nil Microrelief Nil erosion Extensively cleared	Firm, cracking 2mm, Nil coarse fragments	A1 0.0 – 0.12 gradual	Sandy clay loam	Weak, sub-rounded peds <10 mm, soft	Nil inclusions or segregations	10YR2/2 Very dark brown Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.22 gradual	Sandy clay loam	Weak, peds <10 mm, very firm	Nil inclusions or segregations	10YR2/2 Very dark brown Nil mottles / bleaching	Humid, well drained	Fine, very few	0.20 / 6.5		
				B22 0.22 – 0.55 gradual	Light clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.30 / 6.5		
				B23 0.55 – 1.00	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.60 / 7.0 0.90 / 6.5		

SITE 60-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643839mE 7514447mN	Black Vertosol	Detailed - 50mm hand auger	07/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, upper-slope, 0% / 2% slope	Grasses	Nil microrelief Nil erosion extensively disturbed	self-mulching, cracking 6+mm Nil coarse fragments	A1 0.0 – 0.13 Abrupt	Light clay	Moderate, Sub-rounded, peds <10 mm, soft	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Fine, very few	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.13 – 0.41 Abrupt	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	Nil inclusions or segregations	10YR2/1 Black Nil mottles / bleaching	Dry, well drained	Very fine, very few	0.30 / 7.5		
				B22 0.41 – 1.00	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	<2% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Dry, moderately well drained	Nil roots	0.60 / 7.0 0.90 / 7.0		

SITE 65-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	643019mE 7513552mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping Very gently undulating plain Flat plain 1.0/1.0	Cropping, Brigalow 100-200m nearby	Nil microrelief Cropping disturbance Nil erosion	Soft, loose, Nil coarse fragments	A1 0.00-0.11 Abrupt	Light clay	Moderate, weak <10mm sub-angular	Nil inclusions and segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.11-0.80 Abrupt	Medium clay	Moderate, weak <10mm sub-angular	Nil inclusions and segregations	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0		
				B22 0.80-1.00	Medium clay	Moderate, weak <10mm sub-angular	2% calcium carbonate nodules	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Very fine, very few	0.90 / 7.5		

SITE 77-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	641884mE 7512916mN	Black Dermosol	Detailed - 50mm hand auger	07/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, upper-slope, 1% / 2% slope	Grasses, with Brigalow nearby	Nil microrelief Nil erosion Semi disturbed	Firm with areas of self-mulching, cracking 2-6+mm	A1 0.0 – 0.13 Abrupt	Sandy clay loam	Weak, Sub-rounded, peds <10 mm, soft	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.13 – 0.39 graudal	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Very fine, very few	0.30 / 7.5		
				B22 0.39 – 0.90 clear	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderately well drained	Very fine, very few	0.60 / 7.0		
				B23 0.90 – 1.00	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	<2% calcium carbonate	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, moderately well drained	Very fine, very few	0.90 / 7.0		

SITE 80-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	642045mE 7511689mN	Black Dermosol	Detailed - 50mm hand auger	05/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Upper-slope, 2% slope	Grasses, with Brigalow nearby	Nil Microrelief Nil erosion Extensively cleared	Firm, cracking 2mm, Nil coarse fragments	A1 0.0 – 0.11 Abrupt	Sandy clay loam	Weak, sub-rounded peds <10 mm, soft	Nil inclusions or segregations	10YR2/2 Very dark brown Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A2 0.11 – 0.22 clear	Sandy clay loam	Weak, peds <10 mm, very firm	Nil inclusions or segregations	10YR2/2 Nil mottles / bleaching	Humid, well drained	Nil roots	0.20 / 6.5		
				B21 0.22 – 0.49 gradual	Light clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.30 / 7.0		
				B22 0.49 – 1.00 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<1% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.60 / 7.0 0.90 / 6.5		

SITE 91-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	643899mE 7510777mN	Black Dermosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Gently undulating plain, Midslope 2.0/1.0	Cleared, nearby remnant Belah	Nil microrelief Extensive disturbance Nil erosion	Minor cracking, firm, Nil coarse fragments	A1 0.00-0.12 Abrupt	Sandy Clay	Moderate, weak <20mm sub-angular	Nil inclusions and segregations	10YR2/1 Black Nil mottles / bleaching	Dry, moderate	Few, fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12-0.50 Clear	Light sandy clay	Moderate, firm 20-50mm sub-angular	Nil inclusions and segregations	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, moderate	Few, fine	0.30 / 6.5		
				B22 0.50-1.00 EOBH	Light clay	Moderate, firm 20-50mm sub-angular blocky	<2% calcium carbonate nodules	10YR3/3 Dark brown Mottles: <2% 10YR5/3 Brown Nil bleach	Dry, moderate	Very few, very fine	0.60 / 7.0 0.60 / 7.5		

SITE 97-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E1r	642351mE 7510427mN	Red Chromosol (Brown Chromosol sub-dominant)	Detailed - 50mm hand auger	04/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Mid-slope, 1% slope	Forage cropping	Nil Microrelief Nil erosion Extensively cleared	Firm, cracking 2mm, Nil coarse fragments	A1 0.0 – 0.08 Abrupt	Sandy loam	Weak, sub-rounded peds 5-20 mm, firm	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Fine, very few	0.05 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.08 – 0.47 Abrupt	Sandy clay loam	Moderate, peds 30-40 mm, very firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, well drained	Nil roots	0.30 / 6.5		
				B22 0.47 – 0.70 Abrupt	Light clay, sandy	Subangular blocky, moderate, peds <30 mm, very firm	<1% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.60 / 6.5		
				B23 0.70 – 1.00	Medium clay, sandy	Subangular blocky, moderate,	<10% calcium carbonate	10YR3/2 Very dark greyish brown	Humid, moderately well drained	Nil roots	0.90 / 6.5		

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
						peds <20 mm, very firm		Nil mottles / bleaching					

SITE 99-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B2bl	7510427mE 7511265mN		Detailed - 50mm hand auger	04/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Mid-slope, <1% slope	Forage cropping	Nil Microrelief Nil erosion Extensively cleared	Firm, cracking 2mm, Nil coarse fragments	A1 0.0 – 0.18 Abrupt	Sandy loam	Weak, sub-rounded peds 5-20 mm, firm	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.18 – 0.50 Abrupt	Sandy clay loam	Moderate, peds 30-40 mm, very firm	Nil inclusions or segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Nil roots	0.30 / 6.5		
				B22 0.50 – 1.00	Light clay, sandy	Subangular blocky, moderate, peds <40 mm, very firm	<5% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.60 / 6.5		

SITE 100-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B1	641820mE 7510822mN	Black Vertosol	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping, upper-slope, 1% / 2% slope	Forage crops	Nil microrelief Nil erosion Extensively disturbed for cropping	Self-mulching, minor crust, cracking 2-6+mm	A1 0.0 – 0.17 Abrupt	Light clay	Subangular blocky, weak, peds <20 mm, firm	<5% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B2 0.17 – 1.00	Medium clay	Subangular blocky, weak, peds <30 mm, very firm	<1% coarse fragments	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, Moderately well drained	Nil roots	0.30 / 7.0 0.60 / 7.0 0.90 / 6.5		

SITE 101-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B3bl	641451mE 7509683mN	Black Vertosol	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid-slope, 1% / 2% slope	Grasses, recent regrowth and shrubs	Normal gilgai <0.2 m deep, 30-40% coverage Nil erosion Extensively disturbed for cropping	Self-mulching, minor crust, cracking 2-6+mm	A1 0.0 – 0.13 Abrupt	Medium Clay	Subangular blocky, moderate, peds <20 mm, soft	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	No samples taken	Nil additional observations
				B21 0.13 – 0.62 Abrupt	Medium clay	Subangular blocky, moderate, peds <30 mm, firm	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Nil roots	0.30 / 7.0 0.60 / 7.0		
				B22 0.62 – 1.00	Medium clay	Subangular blocky, moderate, peds <30 mm, very firm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.90 / 6.5		

SITE 102-SCL-M (Gilgai mound)

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B3bl	641663mE 7508746mN	Black Vertosol	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid-slope, 2% / 1%	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.2 m deep, 30% coverage Nil erosion Extensively disturbed	Self-mulching, minor crust, cracking 2-6+mm Nil coarse fragments	A1 0.0 – 0.12 Abrupt	Light clay	Subangular blocky, moderate, peds <20 mm, soft	Nil inclusions or segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.50 Abrupt	Medium heavy clay	Subangular blocky, moderate, peds <30 mm, firm	Nil inclusions or segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.30 / 7.0 0.60 / 7.0		
				B22 0.50 – 1.00	Medium heavy clay	Subangular blocky, moderate, peds <30 mm, very firm	<2% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.90 / 6.5		

SITE 102-SCL-D (Gilgai depression)

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B3bl	641658mE 7508739mN	Black Vertosol	Detailed - 50mm hand auger	03/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid-slope, 2% slope, Gilgai depression	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.2 m deep, 30% coverage Nil erosion Extensively disturbed for cropping	Self-mulching, minor crust, cracking 2-6+mm	A1 0.0 – 0.10 Abrupt	Medium Clay	Subangular blocky, moderate, peds <20 mm, soft	Nil inclusions or segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.10 – 0.60 Abrupt	Medium heavy clay	Subangular blocky, moderate, peds <30 mm, firm	Nil inclusions or segregations	10YR2/1 Black Nil mottles / bleaching	Humid, well drained	Fine, very few	0.30 / 7.0 0.60 / 7.0		
				B23 0.60 – 1.00	Medium heavy clay	Subangular blocky, moderate, peds <30 mm, very firm	<2% calcium carbonate	10YR2/1 Black Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.90 / 6.5		

SITE 103-SCL-M (Gilgai mound)

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B3bl	641736mE 7508275mN	Black Vertosol	Detailed - 50mm hand auger	04/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid-slope, 2% slope, Gilgai depression	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.2 m deep, 50% coverage Nil erosion Extensively disturbed for cropping	Self-mulching, minor crust, cracking 2-6+mm	A1 0.0 – 0.12 Abrupt	Light clay	Subangular blocky, moderate, peds <10 mm, soft	Nil inclusions or segregations	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B21 0.12 – 0.60 Abrupt	Medium clay	Subangular blocky, moderate, peds <30 mm, firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, well drained	Fine, very few	0.30 / 7.0 0.60 / 7.0		
				B22 0.60 – 1.00	Medium heavy clay	Subangular blocky, moderate, peds <30 mm, very firm	<2% calcium carbonate	10YR4/2 Dark greyish brown Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.90 / 6.5		

SITE 103-SCL-D (Gilgai depression)

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
B3bl	641732mE 7508275mN	Black Vertosol	Detailed - 50mm hand auger	04/06/2019

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid-slope, 2% slope, Gilgai depression	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.22 m deep, 50% coverage Nil erosion Extensively disturbed for cropping	Self-mulching, minor crust, cracking 2-6+mm	A1 0.0 – 0.10 Abrupt	Light Medium Clay	Subangular blocky, moderate, peds <20 mm, weak	<1% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Humid, well drained	Fine, very few	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.83-0.90 0.90-1.00	Nil additional observations
				B21 0.10 – 0.83 Abrupt	Medium heavy clay	Subangular blocky, moderate, peds 20-40 mm, very firm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Fine, very few	0.30 / 6.5 0.60 / 6.5		
				B23 0.83 – 1.00	Medium heavy clay	Subangular blocky, moderate, peds 20-40 mm, very firm	Nil inclusions or segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderately well drained	Nil roots	0.90 / 6.5		

SITE 110-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E2	644310mE 7508052mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping Flat plain, level, 0.0/0.0%	Cropping	Nil microrelief Cropping disturbance Nil erosion	Cracking 20-40mm, fine surface mulch Nil coarse fragments	A1 0.0-0.13 Abrupt	Light clay	Weak, firm, <10mm sub-angular	2% 2-6mm coarse fragments	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Fine, few	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil additional observations
				B21 0.13-0.38 Abrupt	Medium clay	Moderate, firm <40% 20-60mm, <20% 60-100 sub-angular blocky peds	<1% black nodules <1% calcium carbonate nodules	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Very fine, very few	0.30 / 6.5		
				B22 0.38-0.82 Abrupt	Medium clay	Moderate, firm <40% 20-60mm, <20% 60-100 sub-angular blocky peds	<5% calcium carbonate nodules	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, moderate	Very fine, very few	0.60 / 8.0		
				B23 0.82 – 1.00	Light clay	Moderate, firm <20mm, sub-angular blocky peds	<2% calcium carbonate nodules	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, Imperfect	Very fine, very few	0.90 / 8.0		

SITE 115-SCL

Map Unit	Location (GDA94 ZONE 55):	Aust. Soil Class.:	Site Survey Type:	Survey Date:
E2	645410mE 7509123mN	Black Vertosol	Detailed - 50mm hand auger	30/06/2018

Landscape



Surface



Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Cropping Very gently undulating plain Flat plain 1.0/1.0	Cropping	Nil microrelief Cropping disturbance Nil erosion	2-5% medium pebbles >600mm Soft, loose	A1 0.00-0.16 Abrupt	Light clay	Moderate, weak <10mm sub-angular blocky	<2% calcium carbonate nodules	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Few fine	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				B2 0.16-1.00	Medium clay	Strong, firm <10mm sub-angular blocky	Nil inclusions and segregations	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0 0.90 / 7.5		

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-1	641651 7508111	B3bl	Gently undulating plain, lower slope, 1%, 2% Crabhole gilgai, 50% coverage <200 mm deep Surface – cracking and self mulching	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-2	641972 7509347	B3bl	Gently undulating plain, lower slope, 1% Crabhole and linear gilgai, 50% coverage 150-200 mm deep Surface – cracking and self mulching	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-3	642749 7508963	B3bl	Gently undulating plain, lower slope, 1% Normal gilgai, 40% coverage 150-200 mm deep Surface – cracking and self mulching	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-4	642189 7511009	A5	Wide depression, drainage line Cracking surface, with <2% <6mm coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-5	641073 7510547	B1	Gently undulating plain, Cropping, extensively disturbed, lower slope Surface cracking, light clay, no coarse fragments	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-6	641305 7510835	B1	Gently undulating plain, Cropping, extensively disturbed, lower slope Surface cracking, light clay, no coarse fragments	
NC-7	641985 7510605	B1	Gently undulating plain, Cropping, extensively disturbed, lower slope Surface cracking, light clay, no coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-8	641519 7511677	B2bl	Gently undulating plain, mid slope Surface 2 mm cracking, sandy clay loam, no coarse fragments	
NC-9	641777 7511708	B2bl	Gently undulating plain, mid slope, Brigalow Surface 2 mm cracking, sandy clay loam, no coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-10	641414 7513101	B1	Gently undulating plain, lower slope, 1%, 2% Grass, various trees regrowth Surface – cracking 2-6mm, light clay	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-11	641676 7513156	B1	Gently undulating plain, lower slope, 1%, 2% Limited disturbance, Brigalow Surface – cracking and self mulching, light clay	
NC-12	642118 7512668	B2bl	Gently undulating plain, flat plain Limited disturbance, Brigalow Surface – cracking and crusting, light sandy clay	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-13	641869 7513464	B1	Gently undulating plain, crest, 1%, 0% Limited disturbance, Brigalow Surface – cracking <2 mm, light clay	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-14	642641 7514052	B2bl	Gently undulating plain, crest, 1%, 0% Limited disturbance, Brigalow, Belah Surface – cracking <4 mm, clay loam 10YR3/1	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-15	643244 7514499	B2bl	Gently undulating plain, lower slope <2% Limited disturbance, Brigalow Surface – cracking 2-6 mm, light clay, no coarse fragments 0.00 – 0.11 m Clay loam Moderate, firm, peds <20 mm 10YR3/1 0.11 – 0.30+ m Medium clay Moderate, very firm, peds 20-40 mm 10YR2/1	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-16	642934 7514283	B2bl	Gently undulating plain, mid slope <2% Limited disturbance Surface – cracking 2-6 mm, light clay, no coarse fragments 0.00 – 0.11 m Clay loam Moderate, firm, peds <20 mm 10YR3/2 0.11 – 0.45+ m Medium clay Moderate, very firm, peds 20-40 mm 10YR2/1	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-17	643327 7514558	A4	Gully erosion, drainage line 0-0.30 m sandy loam 0.30-1.00 m + Sandy clay loam	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-18	643487 7514650	A4	Gully erosion, drainage line Gums Surface non-cracking	

NC-19	644123 7514610	B2bl	Gently undulating plain, upper slope 1%, 2% Limited disturbance, Surface – cracking <2 mm, and self mulching, light clay, no coarse fragments 0.00 – 0.11 m Clay loam Moderate, firm, peds <10 mm 10YR3/2 0.11 – 0.30 m Medium clay Moderate, subanglular blocky, peds <20 mm 10YR2/1 0.30 – 0.40+ m Medium clay with <2% calcium carbonate Moderate, subanglular blocky, peds <20 mm 10YR2/1	  

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-20	643734 7514870	A4	Gently undulating plain, lower slope 1%, 2% Limited disturbance, Surface – cracking <2 mm, and self mulching, clay loam, no coarse fragments Brigalow, Belah	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-21	643283 7514051	B1	Gently undulating plain, upper slope 1%, 2% Brigalow, Belah Limited disturbance, Surface – cracking 2-8 mm, and self mulching, sandy clay loam, no coarse fragments	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-22	642804 7514097	A4c	Gently undulating plain, lower slope 1%, 2% Wide depression, inactive drainage line Brigalow, Belah Surface – cracking 2-8 mm, and self mulching, sandy clay loam <2% coarse fragments <2 mm	 
NC-23	643584 7514647	A4	Gently undulating plain, lower slope 1%, Surface light clay, cracking 2-6 mm, no coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-24	642191 7512204	B2bl	Gently undulating plain, mid slope 1%, 1% Limited disturbance, Surface sandy clay loam 10YR3/1, cracking 2 mm, no coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-25	642541 7512279	B1	Gently undulating plain, flat plain Surface light clay, self mulching, no coarse fragments Cropping nearby	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-26	643047 7512703	B1	Gently undulating plain, lower slope 1%, Surface light clay, cracking 2-6 mm, self mulching, no coarse fragments Cropping nearby	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-27	643449 7512385	B1	Gently undulating plain, flat plain <1% slope Surface light clay, cracking 2-6 mm, no coarse fragments Cropping nearby	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-28	643790 7513018	B1	Gently undulating plain, lower slope 1%, Surface light clay, cracking 2-6 mm, self mulching, no coarse fragments Cropping nearby	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-29	643707 7513294	B5	Gently undulating plain, upper slope 2%, 2% Surface sandy clay loam, minor cracking 2 mm, no coarse fragments	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-30	643918 7513548	B5	Gently undulating plain, upper slope 2% Surface sandy clay loam, minor cracking <2 mm, <2% <2mm coarse fragments	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-31	643165 7511509	B2bl	Gently undulating plain, lower slope 1% Surface light clay, minor cracking 2 mm, some crusting, no coarse fragments Limited disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-32	643661 7511295	B2bl	Gently undulating plain, mid slope 1%, 1% Surface, soft, sandy clay loam, minor cracking 2 mm, no coarse fragments Forage cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-33	643394 7510738	B2bl	Gently undulating plain, upper slope 1%, 1% Surface, soft, minor cracking 2 mm, no coarse fragments Forage cropping disturbance 0.00 – 0.09 m Sandy loam, massive, weak, peds <100mm 10YR3/2 0.09 – 0.30+ m Sandy clay loam, peds <200mm 10YR3/2 	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-34	644122 7512307	B1	Gently undulating plain, flat plain Surface light clay 10YR3/2, cracking 2 mm, no coarse fragments Limited disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-35	644475 7511295	B1	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments Cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-36	645158 7511201	B1	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking <2 mm, self mulching, no coarse fragments Cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-37	644857 7511101	B1	Gently undulating plain, upper slope <2%, <3% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-38	645563 7511106	B1	Gently undulating plain, upper slope 2%, 2% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-39	642769 7511490	B1	Gently undulating plain, mid slope 2%, 2% Surface light clay 10YR3/2, self mulching, no coarse fragments Forage cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-40	642555 7510052	B3bl	Gently undulating plain, upper slope 1%, 1% Surface light clay 10YR3/2, cracking <2 mm, self mulching, no coarse fragments. Gilgai located in area, map boundary Limited disturbance 0.00 – 0.20 m Light clay, moderate, 10YR3/2 0.20 – 0.40+ m Medium clay, subangular blocky, 10YR3/1 	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-41	642161 7510152	E1r	Brown surface colour to the north, change to grey surface colour nearby towards the south Surface - firm, sandy loam, 10YR3/3 No course fragments, mid slope 1%	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-42	643510 7508834	E2	Gently undulating plain, upper slope 1%, 1% Surface cracking <2 mm, self mulching, no coarse fragments Cropping disturbance 0.00 – 0.10 m Light clay, 10YR3/2 0.10 – 0.35 m Medium clay, 10YR3/2 0.35 – 0.50+ m Medium clay, 10YR4/2 	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-43	644026 7507963	E2	Gently undulating plain, lower slope 2%, 2% Surface cracking 2-6 mm, no coarse fragments Cropping disturbance 0.00 – 0.07 m Light clay, 10YR3/2 Weak, peds <10 mm 0.07 – 0.50 + m Medium clay, 10YR3/2 Moderate, subangular blocky, peds <30 mm very firm 	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-44	645697 7508528	E2	Gently undulating plain, mid slope <2%, 1% Surface light clay 10YR3/2, cracking <2 mm, self mulching, <2% coarse fragments Cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-45	644367 7509819	E2	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking <2 mm, self mulching, <2% coarse fragments Cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-46	644024 7510908	B1	Gently undulating plain, lower slope 2%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, No coarse fragments	
NC-47	640942 7512659	B2s	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-48	640883 7512861	B2s	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments	
NC-49	642978 7511443	A5	Wide depression, drainage line, lower slope 2%, 1% Surface sandy light clay, cracking 2-6 mm, No coarse fragments Sheet erosion	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-50	643674 7513508	A4c	Wide depression, drainage line, lower slope 2% Surface sandy light clay, cracking 2-6 mm, No coarse fragments Sheet erosion	
NC-51	644005 7512609	B1	Gently undulating plain, lower slope 2%, 2% Surface light clay, cracking 2-6 mm, self mulching, no coarse fragments Cropping disturbance	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-52	643635 7512290	B1	Gently undulating plain, lower slope 2%, 2% Surface light clay, self mulching, no coarse fragments Cropping disturbance	 
NC-53	644440 7510181	E2	Gently undulating plain, lower slope 2%, 2% Surface light clay, cracking 2-6 mm, no coarse fragments Limited disturbance	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-54	645704 7510053	E2	Gently undulating plain, upper slope 1%, 1% Surface light clay, self mulching, no coarse fragments Cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-55	645506 7509704	E2	Gently undulating plain, upper slope 1%, 1% Surface light clay, self mulching, Some cracking 2-6 mm, No coarse fragments, Cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-56	643093 7510114	E1r	Gently undulating plain, mid slope 1% Surface - firm, sandy loam, 10YR3/3, no coarse fragments 0.00 – 0.10 m Sandy loam 10YR3/3 0.10 – 0.42 m Sandy clay loam 5YR4/3 0.42 – 0.65 + m Sandy clay loam 7.5Y4/4 <5% calcium carbonate	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-57	642985 7513858	A4c	Gently undulating plain, lower slope 1%, 2% Wide depression, inactive drainage line Brigalow, Belah Surface – firm, cracking 2 mm, sandy clay loam <2% coarse fragments <2 mm	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-58	644239 7511127	B1	Gently undulating plain, mid slope 2%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, No coarse fragments	
NC-59	644073 7514265	B1	Gently undulating plain, upper slope 1%, 2% Brigalow, Belah Limited disturbance, Surface – cracking 2-8 mm, and self mulching, sandy clay loam, no coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-60	641787 7514024	B2g	Same as sites N4 and N5, mid slope 2.0%, no erosion or microrelief, soft surface with no coarse fragments. Surface texture black sandy loam.	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-61	641691 7514197	B2g	Same as sites N4 and N5, mid slope 2.0%, no erosion or microrelief, soft surface with no coarse fragments. Surface texture black sandy loam.	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-62	641100 7512707	A2g	Wide depression, surface hard setting with cracking 2-6mm. Surface texture light clay.	
NC-63	641030 7513411	A2g	Wide depression, surface firm with cracking 2-6mm. Surface texture light clay.	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-64	641815 7512824	B1	Nil microrelief, extensive clearing Surface light clay with cracking, 10YR3/2 very dark greyish brown	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-65	642145 7512424	B1	Grazing, level plain, flat Normal gilgai observed, <20% coverage, area less than 10 ha, aggregated with Map Unit 20 Complete clearing Surface self-mulching with nil coarse fragments	
NC-66	642040 7512523	B1	Grazing, level plain, flat Nil microrelief Complete clearing Surface self-mulching with nil coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-67	642071 7512485	B1	Grazing, level plain, flat Nil microrelief in immediate area Normal gilgai begins to the east Complete clearing Surface self-mulching with nil coarse fragments	
NC-68	641951 7513006	B2bl	Grazing, gently undulating plain, flat, 0% / 1% slope Nil microrelief observed in area or along transect to site 77-SCL Surface texture, Clay loam sandy	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-69	641577 7513080	B2bl	Grazing, gently undulating plain, mid slope Brigalow regrowth, nil microrelief Surface firm, clay loam, sandy, 10YR3/2 very dark greyish brown	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-70	641635 7513191	B2bl	Grazing, gently undulating plain Surface firm, clay loam sandy	
NC-71	641749 7512962	B2bl	Grazing, gently undulating plain, upper slope <2% Surface firm, clay loam sandy	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-72	641914 7513441	B1	Grazing, gently undulating plain, upper slope Nil microrelief, complete clearing, not cultivated Surface firm, light clay, 10YR3/2 very dark greyish brown, self-mulching	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-73	641851 7513420	B1	Grazing, gently undulating plain, upper slope Nil microrelief, complete clearing, not cultivated Surface firm, light clay, 10YR3/2 very dark greyish brown, self-mulching	
NC-74	641503 7513177	B2bl	Grazing, gently undulating plain, mid slope Various regrowth, nil microrelief Surface firm, no cracking, clay loam sandy, 10YR3/2 very dark greyish brown	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-75	641318 7513030	B2bl	Grazing, gently undulating plain, simple slope 3% / 3% Nil microrelief, complete clearing, cultivated Surface firm, clay loam sandy	
NC-76	641267 7512983	B2bl	Grazing, gently undulating plain, lower slope <2%/3% Nil microrelief Surface firm, sandy clay loam, 10YR3/2 very dark greyish brown Boundary observed between NC-75 and NC-76	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-77	641559 7513265	B2bl	Grazing, gently undulating plain, simple slope 3%/3% Nil microrelief, complete clearing Surface firm • 0.00-0.10m, Clay loam, sandy, 10YR3/1 very dark grey • 0.10-0.30m+, Light clay, sandy, 10YR3/2 very dark greyish brown	  

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-78	641444 7513398	B2bl	Grazing, gently undulating plain, mid slope 2% Grasses Nil microrelief Complete clearing, not cultivated • A1, 0.00-0.12m, Sandy clay loam, 7.5YR3/3 dark brown • B21, 0.12-0.34+, medium clay, 10YR3/2 very dark greyish brown 	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-79	641336 7513255	B2bl	Grazing, gently undulating plain, mid slope Grasses, nil microrelief, complete clearing, not cultivated Surface firm, • A1, 0.00-0.12m, sandy clay loam 7.5YR3/3 dark brown B21, 0.12-0.34m+, medium clay, 10YR3/2 very dark greyish brown	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-80	641391 7512856	B1	Grazing, gently undulating plain, mid slope 2%/2% Nil microrelief, complete clearing, not cultivated Surface self-mulching cracking, light clay, 10YR3/1 very dark grey	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-81	641512 7512735	B2bl	Grazing, gently undulating plain, lower slope Bull Mitchell grass, mixed regrowth, extensive clearing Surface firm with no cracking or coarse fragments, sandy clay loam, 10YR3/2 very dark greyish brown	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-82	641616 7512602	B2bl	Grazing, gently undulating plain, mid slope <2% Nil microrelief, extensive clearing Surface firm, sandy clay loam, 10YR3/2 very dark greyish brown	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-83	641670 7512506	B1	Nil microrelief, extensive clearing Surface light clay with cracking and self mulching, 10YR3/2 very dark greyish brown	 
NC-84	641652 7512295	B2bl	Grazing, gently undulating plain, lower slope Surface firm with no cracking or coarse fragments, sandy clay loam, 10YR3/2 very dark greyish brown	
NC-85	641933 7512095	B2bl	Grazing, gently undulating plain, lower slope Surface firm with no cracking or coarse fragments, sandy clay loam, 10YR3/2 very dark greyish brown	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-86	642366 7510364	E1r	South of boundary, reddish brown surface colour begins towards to the south	

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-87	642365 7510309	E1r	Grazing, gently undulating plain, lower slope <2% Extensive disturbance, within existing power line easement Surface firm • 0.00-0.12m, sandy loam, weak, 10YR3/2 greyish brown • 0.12-0.40+m, Light clay, moderate 5YR4/3 reddish brown 	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-88	641880 7510244	B1	Forage cropping, surface firm, mid slope <2% • 0.00-0.10m, sandy clay loam, weak, 10YR3/2 greyish brown • 0.10-0.14m, light clay, weak, 10YR4/3 brown • 0.14-0.40+m, light clay, strong, 10YR4/3 brown, with 5% mottle 10YR4/4 dark yellowish brown As per site 9-SCL Aggregated with Map Unit 13 due to polygon size being less than 10 ha	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-89	642019 7510231	B1	Forage cropping, surface firm, flat Nil microrelief • 0.00-0.12m, sandy clay loam, weak, very firm 10YR3/2 greyish brown • 0.10-0.45m, light clay, moderate, firm, 10YR4/3 brown, nil mottles As per site 9-SCL Aggregated with Map Unit 13 due to polygon size being less than 10 ha	  

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-90	642122 7510236	E1r	Grazing, gently undulating plain, flat Extensive disturbance, forage cropping Surface firm • 0.00-0.12m, sandy loam, weak, 10YR3/2 greyish brown • 0.12-0.40+m, Light clay, moderate 5YR4/3 reddish brown	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-91	642063 7510332	E1r	Grazing, gently undulating plain, mid slope <1% Extensive disturbance, forage cropping Surface firm • 0.00-0.14m, sandy loam, weak, 10YR3/2 greyish brown • 0.14-0.40+m, Light clay, moderate 5YR4/3 reddish brown	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-92	641808 7510250	B1	Gently undulating plain, flat 1%/1% Nil microrelief, complete clearing, forage cropping Surface firm, nil coarse fragments • A1, 0.00-0.11m, Light clay, moderate, firm, 10YR2/1 Black, nil mottles, nil inclusions, moderately moist, moderately well drained, roots fine/few • B21, 0.11-0.40+m, Medium clay, moderate, firm, 10YR2/1 Black, nil mottles, nil inclusions, moderately moist, moderately well drained, roots fine/few 	 

Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-93	641880 7510362	B1	Gently undulating plain, mid slope 1% Nil microrelief, complete clearing, forage cropping Surface firm, nil coarse fragments • A1, 0.00-0.11m, Light clay, moderate, 10YR2/1 Black • B21, 0.11-0.40+m, Medium clay, moderate, 10YR2/1 Black	  

Appendix E – Soil Mapping Unit Laboratory Results Summary

SMU 2

Table 1: Soil Chemistry Results for Representative Site S40

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	6.2	6.4	8	8.5	9.3
Soil EC (decisiemens per metre [dS/m])	20	30	110	250	540
Soil Cl (milligram/kilogram [mg/kg])	12	13	94	254	487
SO4 (Unit not available [n/a])	8	5	14	26	12
ESP (Percent [(%])	<3	8	15	22	27
Ca/Mg (ratio)	2.2	1	0.5	0.6	0.6
Disp Ratio (%)	0.57	0.73	0.86	0.95	0.99
PSA – Coarse Sand (%)	31	33	27	28	27
PSA – Fine Sand (%)	49	47	36	40	39
PSA – Silt (%)	8	5	4	5	5
PSA – Clay (%)	15	18	62	28	29
CEC (n/a)	7	5	13	13	14
CEC/clay (n/a)	0.47	0.28	0.41	0.46	0.48
Organic Content (%)	0.8	---[1]	---	---	---
Ext P (microgram/gram [ug/g])	5	---	---	---	---
Total P (%)	0.012	---	---	---	---
NO3 (ug/g)	1	1	2	3	2
Total N (%)	0.04	---	---	---	---
K (milliequivalents of solute per litre of solution [meq])	0.12	0.04	0.06	0.06	0.05
Ca (meq)	3.8	2.4	4	4	7
Mg (meq)	1.7	2.4	7.8	8.8	11
Cu (ug/g)	0.4	---	---	---	---
Zn (ug/g)	0.4	---	---	---	---
Mn (ug/g)	9	---	---	---	---
Fe (ug/g)	18	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 2: Soil Chemistry Results for Representative Site J4

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	6.2	6.9	8.9	9
Soil EC (dS/m)	30	50	210	512
Soil Cl (mg/kg)	12	11	117	379

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
SO4 (n/a)	3	1	10	62
ESP (%)	1	4	17	23
Ca/Mg (ratio)	2.5	1	0.6	0.4
Disp Ratio (%)	0.54	0.61	0.87	0.87
PSA – Coarse Sand (%)	27	26	28	28
PSA – Fine Sand (%)	45	40	41	40
PSA – Silt (%)	7	8	5	9
PSA – Clay (%)	21	28	25	25
CEC (n/a)	14	17	13	15
CEC/clay (n/a)	0.67	0.61	0.52	0.4
Organic Content (%)	1.33	---[1]	---	---
Ext P (ug/g)	12	---	---	---
Total P (%)	0.027	---	---	---
NO3 (ug/g)	2	2	1	1
Total N (%)	0.1	---	---	---
K (meq)	0.31	0.15	0.08	0.09
Ca (meq)	8.5	8.4	5.6	4.6
Mg (meq)	3.4	8.3	10	11
Cu (ug/g)	1	---	---	---
Zn (ug/g)	0.6	---	---	---
Mn (ug/g)	39	---	---	---
Fe (ug/g)	32	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 3: Soil Chemistry Results for Representative Site 104

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	6.5	7.7	9.6	9.5
Soil EC (dS/m)	70	80	440	1110
Soil Cl (mg/kg)	32	40	277	903
SO4 (n/a)	6	5	14	98
ESP (%)	4	9	22	32
Ca/Mg (ratio)	1.7	0.9	0.5	0.2
Disp Ratio (%)	0.49	0.66	0.88	0.84
PSA – Coarse Sand (%)	29	28	31	25
PSA – Fine Sand (%)	37	35	39	36
PSA – Silt (%)	11	10	11	11

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
PSA – Clay (%)	24	29	23	31
CEC (n/a)	16	18	15	18
CEC/clay (n/a)	0.67	0.62	0.65	0.58
Organic Content (%)	1.65	---[1]	---	---
Ext P (ug/g)	8	---	---	---
Total P (%)	0.026	---	---	---
NO3 (ug/g)	11	4	7	5
Total N (%)	0.11	---	---	---
K (meq)	0.31	0.16	0.19	0.1
Ca (meq)	9.1	5.2	2.9	2.7
Mg (meq)	5.4	6.6	7.4	11
Cu (ug/g)	0.9	---	---	---
Zn (ug/g)	0.5	---	---	---
Mn (ug/g)	50	---	---	---
Fe (ug/g)	26	---	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU 3

Table 4: Soil Chemistry Results for Representative Site S12

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	7.4	6.1	7.9	8.7	9.4
Soil EC (dS/m)	20	10	190	320	680
Soil Cl (mg/kg)	30	21	183	362	669
SO4 (n/a)	2	3	10	16	48
ESP (%)	4	5	21	29	35
Ca/Mg (ratio)	3.3	2	0.4	0.7	0.8
Disp Ratio (%)	0.81	0.8	0.95	0.95	0.9
PSA – Coarse Sand (%)	24	24	15	17	17
PSA – Fine Sand (%)	61	61	37	47	46
PSA – Silt (%)	8	8	5	8	8
PSA – Clay (%)	9	9	43	30	29
CEC (n/a)	3	3	13	11	11
CEC/clay (n/a)	0.33	0.33	0.3	0.37	0.38
Organic Content (%)	0.6	---	---	---	---
Ext P (ug/g)	4	---	---	---	---
Total P (%)	0.012	---	---	---	---
NO3 (ug/g)	<1	<1	<1	<1	<1
Total N (%)	0.02	---	---	---	---
K (meq)	0.33	0.3	0.34	0.3	0.3
Ca (meq)	2	1	3.4	5	6
Mg (meq)	0.6	0.5	8	7	8
Cu (ug/g)	0.34	---	---	---	---
Zn (ug/g)	0.23	---	---	---	---
Mn (ug/g)	20	---	---	---	---
Fe (ug/g)	10	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 5: Soil Chemistry Results for Representative Site J31

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	6.4	5.6	7.8
Soil EC (dS/m)	20	10	137
Soil Cl (mg/kg)	10	8	117
SO4 (n/a)	<1	<1	5
ESP (%)	<3	<3	20

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Ca/Mg (ratio)	3	1.2	0.3
Disp Ratio (%)	0.77	0.74	0.94
PSA – Coarse Sand (%)	35	32	28
PSA – Fine Sand (%)	53	56	41
PSA – Silt (%)	5	5	5
PSA – Clay (%)	7	6	25
CEC (n/a)	4	3	12
CEC/clay (n/a)	0.57	0.5	0.48
Organic Content (%)	0.67	---	---
Ext P (ug/g)	2	---	---
Total P (%)	0.008	---	---
NO3 (ug/g)	4	1	<1
Total N (%)	0.04	---	---
K (meq)	0.22	0.13	0.11
Ca (meq)	1.8	0.7	2.5
Mg (meq)	0.6	0.6	7.5
Cu (ug/g)	0.2	---	---
Zn (ug/g)	0.14	---	---
Mn (ug/g)	12	---	---
Fe (ug/g)	21	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU 4

Table 6: Soil Chemistry Results for Representative Site S41

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	6.9	8.7	8.8	8.7	8.9
Soil EC (dS/m)	70	210	920	1480	1320
Soil Cl (mg/kg)	34	35	678	1622	1465
SO4 (n/a)	19	158	263	206	37
ESP (%)	3	8	18	24	25
Ca/Mg (ratio)	1.8	0.9	0.6	0.5	0.4
Disp Ratio (%)	0.45	0.59	0.65	0.58	0.59
PSA – Coarse Sand (%)	20	18	19	14	14
PSA – Fine Sand (%)	36	29	26	27	26
PSA – Silt (%)	8	9	10	10	12
PSA – Clay (%)	36	45	45	48	50
CEC (n/a)	29	37	34	35	35
CEC/clay (n/a)	0.81	0.82	0.76	0.73	0.7
Organic Content (%)	1.95	---[1]	---	---	---
Ext P (ug/g)	15	---	---	---	---
Total P (%)	0.035	---	---	---	---
NO3 (ug/g)	1	1	2	1	2
Total N (%)	0.14	---	---	---	---
K (meq)	0.41	0.15	0.1	0.1	0.15
Ca (meq)	18	19	14	13	11
Mg (meq)	10	21	24	25	25
Cu (ug/g)	1.2	---	---	---	---
Zn (ug/g)	0.7	---	---	---	---
Mn (ug/g)	35	---	---	---	---
Fe (ug/g)	43	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 7: Soil Chemistry Results for Representative Site J27

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	7	7.6	8.5
Soil EC (dS/m)	100	308	942
Soil Cl (mg/kg)	17	305	733
SO4 (n/a)	8	34	150
ESP (%)	1	12	20

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Ca/Mg (ratio)	2.8	0.8	0.5
Disp Ratio (%)	0.51	0.87	0.93
PSA – Coarse Sand (%)	28	23	26
PSA – Fine Sand (%)	32	26	24
PSA – Silt (%)	10	6	9
PSA – Clay (%)	31	44	41
CEC (n/a)	20	25	24
CEC/clay (n/a)	0.65	0.57	0.59
Organic Content (%)	1.75	---[1]	---
Ext P (ug/g)	10	---	---
Total P (%)	0.028	---	---
NO3 (ug/g)	4	2	1
Total N (%)	0.14	---	---
K (meq)	0.38	0.09	0.08
Ca (meq)	13	11	7.4
Mg (meq)	4.6	13	15
Cu (ug/g)	1.1	---	---
Zn (ug/g)	0.75	---	---
Mn (ug/g)	35	---	---
Fe (ug/g)	36	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 8: Soil Chemistry Results for Representative Site J32

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	6.2	7	8.6
Soil EC (dS/m)	50	163	896
Soil Cl (mg/kg)	12	87	774
SO4 (n/a)	6	6	160
ESP (%)	1	9	22
Ca/Mg (ratio)	3.1	0.8	0.4
Disp Ratio (%)	0.57	0.78	0.84
PSA – Coarse Sand (%)	30	28	21
PSA – Fine Sand (%)	41	34	30
PSA – Silt (%)	9	9	10
PSA – Clay (%)	21	30	38
CEC (n/a)	19	24	26

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
CEC/clay (n/a)	0.9	0.8	0.68
Organic Content (%)	1.65	---[1]	---
Ext P (ug/g)	8	---	---
Total P (%)	0.029	---	---
NO3 (ug/g)	9	2	1
Total N (%)	0.16	---	---
K (meq)	0.36	0.12	0.08
Ca (meq)	11	10	8.1
Mg (meq)	3.5	12	19
Cu (ug/g)	0.8	---	---
Zn (ug/g)	0.61	---	---
Mn (ug/g)	26	---	---
Fe (ug/g)	43	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 9: Soil Chemistry Results for Representative Site 119

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	7.2	9	9.4
Soil EC (dS/m)	120	290	840
Soil Cl (mg/kg)	15	59	665
SO4 (n/a)	9	7	95
ESP (%)	5	13	31
Ca/Mg (ratio)	1.6	0.9	0.4
Disp Ratio (%)	0.34	0.53	0.89
PSA – Coarse Sand (%)	24	21	22
PSA – Fine Sand (%)	27	27	30
PSA – Silt (%)	11	12	12
PSA – Clay (%)	34	41	40
CEC (n/a)	26	29	22
CEC/clay (n/a)	0.76	0.71	0.55
Organic Content (%)	2.86	---[1]	---
Ext P (ug/g)	12	---	---
Total P (%)	0.041	---	---
NO3 (ug/g)	1	2	<1
Total N (%)	0.21	---	---
K (meq)	0.21	0.13	0.1

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Ca (meq)	13.8	11.8	5.5
Mg (meq)	8.6	12.9	12.4
Cu (ug/g)	0.6	---	---
Zn (ug/g)	0.6	---	---
Mn (ug/g)	33	---	---
Fe (ug/g)	53	---	---

'---'indicates laboratory analysis was not conducted for this sample.

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Table 10: Soil Chemistry Results for Representative Site S12

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	6.7	6.8	7.1	5.2	4.8
Soil EC (dS/m)	80	370	790	820	850
Soil Cl (mg/kg)	56	440	895	819	865
SO4 (n/a)	49	59	102	114	12
ESP (%)	7	20	33	38	41
Ca/Mg (ratio)	0.6	0.4	0.3	0.3	0.2
Disp Ratio (%)	0.55	0.8	0.91	0.91	0.89
PSA – Coarse Sand (%)	14	4	3	4	4
PSA – Fine Sand (%)	34	24	27	31	33
PSA – Silt (%)	12	15	17	15	15
PSA – Clay (%)	42	60	56	52	49
CEC (n/a)	7	20	33	38	41
CEC/clay (n/a)	0.17	0.37	0.39	0.35	0.39
Organic Content (%)	1.15	---[1]	---	---	---
Ext P (ug/g)	12	---	---	---	---
Total P (%)	0.035	---	---	---	---
NO3 (ug/g)	<1	<1	<1	<1	<1
Total N (%)	0.05	---	---	---	---
K (meq)	0.26	0.24	0.19	0.19	0.2
Ca (meq)	5.4	5.1	3.6	2.1	1.7
Mg (meq)	9.1	12	11	8.4	7.7
Cu (ug/g)	1.1	---	---	---	---
Zn (ug/g)	0.5	---	---	---	---
Mn (ug/g)	18	---	---	---	---
Fe (ug/g)	44	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 11: Soil Chemistry Results for Representative Site 104

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	6.4	6.2	7.1	5
Soil EC (dS/m)	10	120	470	820
Soil Cl (mg/kg)	60	117	654	1090
SO4 (n/a)	8	8	18	79

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
ESP (%)	9	15	29	38
Ca/Mg (ratio)	0.4	0.3	0.2	0.1
Disp Ratio (%)	0.67	0.73	0.84	0.9
PSA – Coarse Sand (%)	26	28	25	22
PSA – Fine Sand (%)	31	31	33	27
PSA – Silt (%)	14	14	16	14
PSA – Clay (%)	30	30	31	42
CEC (n/a)	14	12	17	19
CEC/clay (n/a)	0.47	0.4	0.55	0.45
Organic Content (%)	1.75	---[1]	---	---
Ext P (ug/g)	23	---	---	---
Total P (%)	0.041	---	---	---
NO3 (ug/g)	10	5	2	1
Total N (%)	0.11	---	---	---
K (meq)	0.27	0.1	0.07	0.94?
Ca (meq)	3.4	2.2	1.9	1
Mg (meq)	8.7	7.8	9.8	9.8
Cu (ug/g)	1.2	---	---	---
Zn (ug/g)	1.1	---	---	---
Mn (ug/g)	31	---	---	---
Fe (ug/g)	70	---	---	---

'---'indicates laboratory analysis was not conducted for this sample.

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Table 12: Soil Chemistry Results for Representative Site S7

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	6.9	8.5	9.2
Soil EC (dS/m)	180	340	1240
Soil Cl (mg/kg)	254	302	1730
SO4 (n/a)	17	18	50
ESP (%)	12	19	34
Ca/Mg (ratio)	0.8	0.6	0.6
Disp Ratio (%)	0.74	0.91	0.8
PSA – Coarse Sand (%)	16	15	8
PSA – Fine Sand (%)	43	34	37
PSA – Silt (%)	13	13	28
PSA – Clay (%)	30	40	30
CEC (n/a)	17	20	18
CEC/clay (n/a)	0.57	0.5	0.6
Organic Content (%)	1	---[1]	---
Ext P (ug/g)	15	---	---
Total P (%)	0.034	---	---
NO3 (ug/g)	<1	<1	<1
Total N (%)	0.07	---	---
K (meq)	0.37	0.3	0.25
Ca (meq)	6.4	7.4	7.8
Mg (meq)	8	12	14
Cu (ug/g)	1.3	---	---
Zn (ug/g)	0.3	---	---
Mn (ug/g)	26	---	---
Fe (ug/g)	32	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 13: Soil Chemistry Results for Representative Site 22

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	6.9	6.5	8.7
Soil EC (dS/m)	120	130	140
Soil Cl (mg/kg)	24	28	20
SO4 (n/a)	11	13	3
ESP (%)	3	2	1

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Ca/Mg (ratio)	3.1	3.8	3.8
Disp Ratio (%)	0.47	0.47	0.73
PSA – Coarse Sand (%)	3	6	8
PSA – Fine Sand (%)	63	50	57
PSA – Silt (%)	8	10	14
PSA – Clay (%)	25	32	23
CEC (n/a)	9	14	11
CEC/clay (n/a)	0.36	0.44	0.48
Organic Content (%)	1.06	---[1]	---
Ext P (ug/g)	14	---	---
Total P (%)	0.039	---	---
NO3 (ug/g)	37	36	10
Total N (%)	0.11	---	---
K (meq)	0.41	0.37	0.17
Ca (meq)	11.6	16.1	13.4
Mg (meq)	3.8	4.2	3.5
Cu (ug/g)	0.6	---	---
Zn (ug/g)	0.4	---	---
Mn (ug/g)	37	---	---
Fe (ug/g)	18	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU 12

Table 14: Soil Chemistry Results for Representative Site J22

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	6.8	6.6	7.9
Soil EC (dS/m)	30	20	195
Soil Cl (mg/kg)	19	14	188
SO4 (n/a)	<1	<1	18
ESP (%)	<2	<3	14
Ca/Mg (ratio)	3	2.5	0.7
Disp Ratio (%)	0.75	0.84	0.93
PSA – Coarse Sand (%)	14	15	12
PSA – Fine Sand (%)	60	61	43
PSA – Silt (%)	17	17	11
PSA – Clay (%)	10	8	37
CEC (n/a)	6	4	13
CEC/clay (n/a)	0.6	0.5	0.35
Organic Content (%)	0.9	---[1]	---
Ext P (ug/g)	2	---	---
Total P (%)	0.013	---	---
NO3 (ug/g)	1	1	<1
Total N (%)	0.06	---	---
K (meq)	0.44	0.31	0.58
Ca (meq)	3.3	2	5.4
Mg (meq)	1.1	0.8	8
Cu (ug/g)	0.3	---	---
Zn (ug/g)	0.25	---	---
Mn (ug/g)	34	---	---
Fe (ug/g)	16	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 15: Soil Chemistry Results for Representative Site 145

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	6	6.3	6.6	6.1
Soil EC (dS/m)	10	10	10	10
Soil Cl (mg/kg)	1	1	1	1
SO4 (n/a)	1	1	1	4
ESP (%)	<1	<1	<1	2

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Ca/Mg (ratio)	3.6	3.2	1.9	1
Disp Ratio (%)	0.74	0.81	0.99	0.84
PSA – Coarse Sand (%)	33	38	32	29
PSA – Fine Sand (%)	55	52	55	49
PSA – Silt (%)	6	6	5	6
PSA – Clay (%)	6	6	7	16
CEC (n/a)	3	2	2	5
CEC/clay (n/a)	0.5	0.33	0.29	0.31
Organic Content (%)	0.55	---[1]	---	---
Ext P (ug/g)	4	---	---	---
Total P (%)	0.01	---	---	---
NO3 (ug/g)	4	2	1	1
Total N (%)	0.02	---	---	---
K (meq)	0.21	0.11	0.09	0.12
Ca (meq)	1.9	1.6	1.4	2.5
Mg (meq)	0.5	0.5	0.7	2.6
Cu (ug/g)	0.2	---	---	---
Zn (ug/g)	<0.1	---	---	---
Mn (ug/g)	26	---	---	---
Fe (ug/g)	10	---	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU 13

Table 16: Soil Chemistry Results for Representative Site J23

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	7.1	6.9	7.7	8.7
Soil EC (dS/m)	60	50	329	467
Soil Cl (mg/kg)	26	40	373	498
SO4 (n/a)	3	1	40	48
ESP (%)	1	4	19	19
Ca/Mg (ratio)	1.9	1.1	0.8	0.7
Disp Ratio (%)	0.67	0.77	0.91	0.92
PSA – Coarse Sand (%)	5	5	9	12
PSA – Fine Sand (%)	64	68	49	45
PSA – Silt (%)	17	11	10	8
PSA – Clay (%)	17	17	32	34
CEC (n/a)	12	10	16	20
CEC/clay (n/a)	0.71	0.59	0.5	0.59
Organic Content (%)	0.85	---[1]	---	---
Ext P (ug/g)	11	---	---	---
Total P (%)	0.02	---	---	---
NO3 (ug/g)	3	<1	<1	<1
Total N (%)	0.06	---	---	---
K (meq)	0.35	0.16	0.15	0.12
Ca (meq)	8	4.7	7.2	7.5
Mg (meq)	4.2	4.1	9.3	11
Cu (ug/g)	0.4	---	---	---
Zn (ug/g)	0.2	---	---	---
Mn (ug/g)	21	---	---	---
Fe (ug/g)	9	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 17: Soil Chemistry Results for Representative Site 48

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	7.3	7.9	6.3
Soil EC (dS/m)	20	90	260
Soil Cl (mg/kg)	145	56	255
SO4 (n/a)	16	8	61
ESP (%)	6	11	21
Ca/Mg (ratio)	1.2	1.6	1.3
Disp Ratio (%)	0.7	0.78	0.83
PSA – Coarse Sand (%)	2	4	5
PSA – Fine Sand (%)	40	58	60
PSA – Silt (%)	27	21	9
PSA – Clay (%)	32	19	29
CEC (n/a)	14	10	10
CEC/clay (n/a)	0.44	0.53	0.34
Organic Content (%)	1.28	---[1]	---
Ext P (ug/g)	6	---	---
Total P (%)	0.034	---	---
NO3 (ug/g)	23	3	<1
Total N (%)	0.1	---	---
K (meq)	0.71	0.38	0.42
Ca (meq)	6	4.5	4.3
Mg (meq)	5	2.8	3.2
Cu (ug/g)	0.9	---	---
Zn (ug/g)	0.6	---	---
Mn (ug/g)	34	---	---
Fe (ug/g)	15	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 18: Soil Chemistry Results for Representative Site 134

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	6	6.5	8.5	9.3
Soil EC (dS/m)	60	50	290	670
Soil Cl (mg/kg)	5	36	297	641
SO4 (n/a)	9	7	20	59
ESP (%)	1	8	16	25
Ca/Mg (ratio)	3.2	1.2	0.5	0.3

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Disp Ratio (%)	0.67	0.65	0.86	0.97
PSA – Coarse Sand (%)	20	18	19	16
PSA – Fine Sand (%)	52	46	46	43
PSA – Silt (%)	16	14	12	12
PSA – Clay (%)	15	23	25	29
CEC (n/a)	7	10	13	15
CEC/clay (n/a)	0.47	0.44	0.52	0.52
Organic Content (%)	1.28	---[1]	---	---
Ext P (ug/g)	10	---	---	---
Total P (%)	0.025	---	---	---
NO3 (ug/g)	19	4	1	1
Total N (%)	0.08	---	---	---
K (meq)	0.56	0.21	0.12	0.16
Ca (meq)	4.8	4.8	3.7	3.3
Mg (meq)	1.5	4.2	7.2	10.2
Cu (ug/g)	0.8	---	---	---
Zn (ug/g)	0.4	---	---	---
Mn (ug/g)	55	---	---	---
Fe (ug/g)	38	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 19: Soil Chemistry Results for Representative Site 138

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	5.9	5.6	8.2
Soil EC (dS/m)	20	160	690
Soil Cl (mg/kg)	2	223	718
SO4 (n/a)	2	11	107
ESP (%)	4	23	24
Ca/Mg (ratio)	1.6	0.9	0.6
Disp Ratio (%)	0.84	0.81	0.92
PSA – Coarse Sand (%)	4	5	4
PSA – Fine Sand (%)	71	62	35
PSA – Silt (%)	16	25	27
PSA – Clay (%)	10	11	39
CEC (n/a)	5	5	19
CEC/clay (n/a)	0.5	0.45	0.49

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Organic Content (%)	1.11	---[1]	---
Ext P (ug/g)	24	---	---
Total P (%)	0.041	---	---
NO3 (ug/g)	4	1	1
Total N (%)	0.06	---	---
K (meq)	0.61	0.32	0.59
Ca (meq)	2.4	1.9	4.9
Mg (meq)	1.5	2	7.8
Cu (ug/g)	0.4	---	---
Zn (ug/g)	1.5	---	---
Mn (ug/g)	50	---	---
Fe (ug/g)	60	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU 16 / 23 (Overlain Variant)

Table 20: Soil Chemistry Results for Representative Site S17

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	7.1	5.7	6.3	7.7	7.6
Soil EC (dS/m)	60	30	230	320	80
Soil Cl (mg/kg)	39	34	248	429	114
SO4 (n/a)	6	5	21	4	18
ESP (%)	5	11	18	25	25
Ca/Mg (ratio)	4.1	2.4	1.3	0.6	0.6
Disp Ratio (%)	0.78	0.85	0.93	0.92	0.95
PSA – Coarse Sand (%)	8	8	5	6	7
PSA – Fine Sand (%)	62	66	49	62	87
PSA – Silt (%)	21?	21?	10	10	6
PSA – Clay (%)	10	9	39	25	2
CEC (n/a)	2	2	10	10	2
CEC/clay (n/a)	0.2	0.22	0.31	0.4	1
Organic Content (%)	0.8	---[1]	---	---	---
Ext P (ug/g)	17	---	---	---	---
Total P (%)	0.009	---	---	---	---
NO3 (ug/g)	<1	<1	<1	<1	<1
Total N (%)	0.05	---	---	---	---
K (meq)	0.59	0.2	0.29	0.23	0.04
Ca (meq)	2.9	0.7	3.5	2.5	0.4
Mg (meq)	1.2	0.5	5.9	4.5	0.6
Cu (ug/g)	0.4	---	---	---	---
Zn (ug/g)	0.5	---	---	---	---
Mn (ug/g)	28	---	---	---	---
Fe (ug/g)	15	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 21: Soil Chemistry Results for Representative Site H32

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	7.5	7.2	6.4	7.5	8.1
Soil EC (dS/m)	135	30	20	30	50
Soil Cl (mg/kg)	52	<6	<6	<6	10
SO4 (n/a)	13	4	15	5	4
ESP (%)	<2	<2	1	2	2

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Ca/Mg (ratio)	3.3	3	1.5	1.4	1.5
Disp Ratio (%)	0.73	0.74	0.64	0.73	0.76
PSA – Coarse Sand (%)	24	26	18	15	24
PSA – Fine Sand (%)	60	60	42	49	50
PSA – Silt (%)	6	6	4	8	4
PSA – Clay (%)	7	7	38	31	23
CEC (n/a)	6	5	17	19	15
CEC/clay (n/a)	0.86	0.71	0.45	0.63	0.65
Organic Content (%)	0.82	---[1]	---	---	---
Ext P (ug/g)	21	---	---	---	---
Total P (%)	0.035	---	---	---	---
NO3 (ug/g)	23	<1	<1	<1	<1
Total N (%)	0.04	---	---	---	---
K (meq)	1.6	0.65	0.37	0.38	0.32
Ca (meq)	3.6	3	8.3	10	8.8
Mg (meq)	1.1	1	5.7	7.1	5.8
Cu (ug/g)	0.5	---	---	---	---
Zn (ug/g)	0.5	---	---	---	---
Mn (ug/g)	25	---	---	---	---
Fe (ug/g)	14	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 22: Soil Chemistry Results for Representative Site 42

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	7.5	7.3	7	7.4
Soil EC (dS/m)	70	30	10	20
Soil Cl (mg/kg)	19	3	1	9
SO4 (n/a)	5	3	<1	3
ESP (%)	<1	<1	<1	1
Ca/Mg (ratio)	2	2	2.1	2.6
Disp Ratio (%)	0.7	0.56	0.74	0.86
PSA – Coarse Sand (%)	2	6	28	20
PSA – Fine Sand (%)	66	64	52	35
PSA – Silt (%)	19	16	15	8
PSA – Clay (%)	15	17	8	37
CEC (n/a)	9	8	3	12

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
CEC/clay (n/a)	0.6	0.47	0.38	0.32
Organic Content (%)	1.18	---[1]	---	---
Ext P (ug/g)	5	---	---	---
Total P (%)	0.028	---	---	---
NO3 (ug/g)	7	1	1	<1
Total N (%)	0.08	---	---	---
K (meq)	0.37	0.31	0.18	0.6
Ca (meq)	4.9	4.4	1.1	6.7
Mg (meq)	2.4	2.2	0.5	2.6
Cu (ug/g)	0.5	---	---	---
Zn (ug/g)	0.7	---	---	---
Mn (ug/g)	22	---	---	---
Fe (ug/g)	9	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 23: Soil Chemistry Results for Representative Site 60

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	7.3	8.4	8.5	8.6
Soil EC (dS/m)	60	130	90	140
Soil Cl (mg/kg)	5	15	13	48
SO4 (n/a)	3	10	7	9
ESP (%)	<1	<1	<1	<1
Ca/Mg (ratio)	5.4	5.1	4.8	4
Disp Ratio (%)	0.77	0.74	0.85	0.88
PSA – Coarse Sand (%)	15	19	32	36
PSA – Fine Sand (%)	58	45	36	28
PSA – Silt (%)	15	18	17	15
PSA – Clay (%)	13	16	19	24
CEC (n/a)	11	12	9	8
CEC/clay (n/a)	0.85	0.75	0.47	0.33
Organic Content (%)	1.82	---[1]	---	---
Ext P (ug/g)	8	---	---	---
Total P (%)	0.027	---	---	---
NO3 (ug/g)	4	5	6	4
Total N (%)	0.09	---	---	---
K (meq)	0.55	0.38	0.32	0.36

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Ca (meq)	7.5	8.8	6	6.4
Mg (meq)	1.4	1.8	1.2	1.6
Cu (ug/g)	0.4	---	---	---
Zn (ug/g)	1.3	---	---	---
Mn (ug/g)	48	---	---	---
Fe (ug/g)	11	---	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU 17

Table 24: Soil Chemistry Results for Representative Site S32 (pit water influenced)

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**20-30**	**50-60**
Soil pH	5.9	5.6	5.7
Soil EC (dS/m)	90	260	540
Soil Cl (mg/kg)	76	157	479
SO4 (n/a)	96	158	5
ESP (%)	11	28	38
Ca/Mg (ratio)	1.1	0.8	1
Disp Ratio (%)	0.8	0.87	0.87
PSA – Coarse Sand (%)	4	7	11
PSA – Fine Sand (%)	38	38	44
PSA – Silt (%)	31	27	25
PSA – Clay (%)	25	32	24
CEC (n/a)	7	9	9
CEC/clay (n/a)	0.28	0.28	0.38
Organic Content (%)	1.55	---[1]	---
Ext P (ug/g)	14	---	---
Total P (%)	0.032	---	---
NO3 (ug/g)	<1	<1	<1
Total N (%)	0.1	---	---
K (meq)	0.42	0.23	0.15
Ca (meq)	3.2	2.6	2.1
Mg (meq)	2.8	3.2	3.1
Cu (ug/g)	1.3	---	---
Zn (ug/g)	3.6	---	---
Mn (ug/g)	42	---	---
Fe (ug/g)	190	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 25: Soil Chemistry Results for Representative Site 57

	Sample Depth (m)	
Analysis (Unit)	**0-10**	**20-30**
Soil pH	5.5	6.3
Soil EC (dS/m)	50	30
Soil Cl (mg/kg)	25	5
SO4 (n/a)	7	3
ESP (%)	3	4

	Sample Depth (m)	
Analysis (Unit)	**0-10**	**20-30**
Ca/Mg (ratio)	1.9	2.3
Disp Ratio (%)	0.74	0.86
PSA – Coarse Sand (%)	2	2
PSA – Fine Sand (%)	31	32
PSA – Silt (%)	37	34
PSA – Clay (%)	35	37
CEC (n/a)	8	10
CEC/clay (n/a)	0.23	0.27
Organic Content (%)	1.78	---[1]
Ext P (ug/g)	44	---
Total P (%)	0.038	---
NO3 (ug/g)	5	3
Total N (%)	0.14	---
K (meq)	1.14	1.11
Ca (meq)	3.9	5.8
Mg (meq)	2.1	2.5
Cu (ug/g)	2.7	---
Zn (ug/g)	2.8	---
Mn (ug/g)	75	---
Fe (ug/g)	236	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU 18

Table 26: Soil Chemistry Results for Representative Site S51

	Sample Depth (m)					
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**	**140-150**
Soil pH	6.4	6.4	6.9	7.2	7.3	7.8
Soil EC (dS/m)	30	20	20	20	20	20
Soil Cl (mg/kg)	11	15	11	10	9	12
SO4 (n/a)	2	1	1	1	2	7
ESP (%)	<1	<1	1	1	1	1
Ca/Mg (ratio)	4	3.5	4.6	3.7	3.2	2.7
Disp Ratio (%)	0.73	0.7	0.77	0.81	0.82	0.92
PSA – Coarse Sand (%)	7	5	13	16	18	21
PSA – Fine Sand (%)	75	78	66	68	66	55
PSA – Silt (%)	12	9	12	8	5	8
PSA – Clay (%)	9	9	12	9	12	16
CEC (n/a)	7	6	5	4	4	7
CEC/clay (n/a)	0.78	0.67	0.42	0.44	0.33	0.44
Organic Content (%)	1.45	---[1]	---	---	---	---
Ext P (ug/g)	17	---	---	---	---	---
Total P (%)	0.029	---	---	---	---	---
NO3 (ug/g)	3	3	3	3	3	3
Total N (%)	0.06	---	---	---	---	---
K (meq)	0.46	0.22	0.22	0.21	0.22	0.39
Ca (meq)	5.6	4.5	4.3	3.2	3.2	4.9
Mg (meq)	1.4	1.3	1	0.9	1	1.8
Cu (ug/g)	0.4	---	---	---	---	---
Zn (ug/g)	4	---	---	---	---	---
Mn (ug/g)	27	---	---	---	---	---
Fe (ug/g)	30	---	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 27: Soil Chemistry Results for Representative Site H31

	Sample Depth (m)	
Analysis (Unit)	**0-10**	**20-30**
Soil pH	7.6	8.6
Soil EC (dS/m)	70	90
Soil Cl (mg/kg)	17	<6
SO4 (n/a)	10	15
ESP (%)	1	1

	Sample Depth (m)	
Analysis (Unit)	**0-10**	**20-30**
Ca/Mg (ratio)	2.5	2
Disp Ratio (%)	0.68	0.65
PSA – Coarse Sand (%)	22	29
PSA – Fine Sand (%)	65	48
PSA – Silt (%)	5	8
PSA – Clay (%)	8	15
CEC (n/a)	9	12
CEC/clay (n/a)	1.13	0.8
Organic Content (%)	0.55	---[1]
Ext P (ug/g)	33	---
Total P (%)	0.036	---
NO3 (ug/g)	5	1
Total N (%)	0.03	---
K (meq)	0.59	0.34
Ca (meq)	6	9.4
Mg (meq)	2.4	4.8
Cu (ug/g)	0.4	---
Zn (ug/g)	0.5	---
Mn (ug/g)	9	---
Fe (ug/g)	13	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 28: Soil Chemistry Results for Representative Site 109

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
Soil pH	6.7	6.9	6.7	7
Soil EC (dS/m)	30	10	10	30
Soil Cl (mg/kg)	4	1	1	17
SO4 (n/a)	1	1	<1	1
ESP (%)	1	<1	<1	2
Ca/Mg (ratio)	2.8	2.9	2.6	2.2
Disp Ratio (%)	0.84	0.88	0.78	0.82
PSA – Coarse Sand (%)	37	25	18	35
PSA – Fine Sand (%)	56	60	70	47
PSA – Silt (%)	7	6	8	6
PSA – Clay (%)	5	5	6	10
CEC (n/a)	4	3	3	4

	Sample Depth (m)			
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**
CEC/clay (n/a)	0.8	0.6	0.5	0.4
Organic Content (%)	0.89	---[1]	---	---
Ext P (ug/g)	4	---	---	---
Total P (%)	0.018	---	---	---
NO3 (ug/g)	5	1	1	1
Total N (%)	0.05	---	---	---
K (meq)	0.34	0.27	0.22	0.19
Ca (meq)	2.7	1.7	1.8	2.4
Mg (meq)	1	0.6	0.7	1.1
Cu (ug/g)	0.2	---	---	---
Zn (ug/g)	1	---	---	---
Mn (ug/g)	30	---	---	---
Fe (ug/g)	11	---	---	---

'---'indicates laboratory analysis was not conducted for this sample

SMU 19

Table 29: Soil Chemistry Results for Representative Site S47

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	6.6	6.8	6.9	6.7	7
Soil EC (dS/m)	20	20	20	10	40
Soil Cl (mg/kg)	25	20	11	14	46
SO4 (n/a)	1	1	1	5	3
ESP (%)	<1	<1	<1	<1	6
Ca/Mg (ratio)	3.8	2.6	2	1.8	1.1
Disp Ratio (%)	0.81	0.8	0.81	0.82	0.86
PSA – Coarse Sand (%)	29	26	23	20	15
PSA – Fine Sand (%)	60	63	66	68	59
PSA – Silt (%)	9	9	9	8	8
PSA – Clay (%)	5	5	5	6	19
CEC (n/a)	3	2	2	2	6
CEC/clay (n/a)	0.6	0.4	0.4	0.33	0.32
Organic Content (%)	0.8	---[1]	---	---	---
Ext P (ug/g)	7	---	---	---	---
Total P (%)	0.016	---	---	---	---
NO3 (ug/g)	2	2	2	2	2
Total N (%)	0.04	---	---	---	---
K (meq)	0.3	0.28	0.21	0.18	0.34
Ca (meq)	2.4	1.5	1.1	1.1	2.8
Mg (meq)	0.6	0.6	0.6	0.6	2.5
Cu (ug/g)	0.3	---	---	---	---
Zn (ug/g)	0.5	---	---	---	---
Mn (ug/g)	38	---	---	---	---
Fe (ug/g)	12	---	---	---	---

1. '---'indicates laboratory analysis was not conducted for this sample.

Table 30: Soil Chemistry Results for Representative Site 142

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Soil pH	5.9	6.7	6.7	6.9	6.8
Soil EC (dS/m)	50	20	10	10	10
Soil Cl (mg/kg)	3	1	1	1	1
SO4 (n/a)	1	1	1	1	1
ESP (%)	6	<1	<1	<1	<1

	Sample Depth (m)				
Analysis (Unit)	**0-10**	**20-30**	**50-60**	**80-90**	**110-120**
Ca/Mg (ratio)	2.2	2.3	1.9	1.6	1.6
Disp Ratio (%)	0.96	0.65	0.69	1	0.66
PSA – Coarse Sand (%)	54	53	49	49	41
PSA – Fine Sand (%)	39	40	44	43	50
PSA – Silt (%)	3	4	3	3	5
PSA – Clay (%)	5	4	5	4	6
CEC (n/a)	3	2	1	1	1
CEC/clay (n/a)	0.6	0.5	0.2	0.25	0.17
Organic Content (%)	0.8	---[1]	---	---	---
Ext P (ug/g)	13	---	---	---	---
Total P (%)	0.012	---	---	---	---
NO3 (ug/g)	19	3	1	1	1
Total N (%)	0.06	---	---	---	---
K (meq)	0.32	0.19	0.25	0.24	0.26
Ca (meq)	1.7	1.2	0.7	0.6	0.6
Mg (meq)	0.8	0.4	0.4	0.4	0.4
Cu (ug/g)	0.2	---	---	---	---
Zn (ug/g)	1.3	---	---	---	---
Mn (ug/g)	39	---	---	---	---
Fe (ug/g)	20	---	---	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU A1

Table 31: Soil Chemistry Results for Representative Site 4

	Sample Depth (m)		
Analysis (Unit)	**0-10**	**30-40**	**50-60**
Soil pH	7.3	7.59	7.92
Soil EC (dS/m)	0.05	0.04	0.08
Nitrate Nitrogen (mg/kg)	3.0	---[1]	---
Phosphorus - Colwell extr (mg/kg)	17	---	---
Potassium (mg/kg)	310	190	240
Organic Content (%)	1.5	---	---
CEC (meq/100)	5.22	6.92	16.57
Exchangeable Potassium (meq/100g)	0.79	0.48	0.62
Exchangeable Sodium (%)	2.5	4.6	7.7

'---'indicates laboratory analysis was not conducted for this sample.

SMU A2

Table 32: Soil Chemistry Results for Representative Site 21 (GTES 2011), Burgess (2003) (italics)

	Sample Depth (cm)			
Analysis (Unit)	**0-10**	**40-50**	**80-90**	**110-120**
Soil pH	7.03 *8.3*	7.65 *8.4*	8.50 *8.9*	- *8.2*
Soil EC (dS/m)	0.06 *0.2*	0.42 *2.35*	0.95 1.47	- 1.39
Chloride (mg/mg)	26 *34*	598 *1744*	1239 1716	- 1758
Nitrate Nitrogen (mg/kg)	3.0	---	---	---
Phosphorus - Colwell extr (mg/kg)	11	---	---	---
Organic Content (%)	3.6	---	---	---
Cation Exchange (meq/100g)	22.52	44.33	57.38	---
Ca:Mg	1.5 *3.7*	0.9 1.0	1.1 0.76	--- 0.70
Exchangeable Potassium (meq/100g)	0.58	0.62	0.70	---
Exchangeable Magnesium (meq/100g)	8.48	21.07	24.23	---
Exchangeable Sodium (%)	2.8 *1.5*	9.3 *30.7*	10.6 *35.7*	---35.7

'---'indicates laboratory analysis was not conducted for this sample.

SMU A2g

Table 33: Soil Chemistry Results for Site N1-SCL (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.80-0.90**	**0.90-1.00**
Soil pH	7.96	8.23	8.29	8.25	8.22
Soil Cl (mg/kg)	23	82	384	582	669
PSA-Sand (>20µm %)	23.4	24.0	12.5	13.6	13.1
PSA-Fine Silt (2-20µm %)	18.1	11.8	24.3	19.2	24.2
PSA-Clay (<2µm%)	58.5	64.2	63.1	67.2	62.7
15 Bar (%)	31	33	34	34	34

SMU A3

No samples were taken for analysis due to the minor distribution of this soil. Burgess (2003) reported that German alluvial soil was essentially neutral with low levels of soluble salts and non-sodic.

SMU A4

Table 34: Soil Chemistry Results for Site N17 (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.10-0.20**	**0.20-0.30**	**0.50-0.60**	**0.80-0.88**
Soil pH	6.75	8.62	9.25	9.43	9.31
Soil Cl (mg/kg)	9	39	186	540	800
PSA-Sand (>20µm %)	76.4%	67.4%	69.6%	65.7%	57.3%
PSA-Fine Silt (2-20µm %)	6.0%	3.3%	1.5%	5.9%	9.4%
PSA-Clay (<2µm%)	17.6%	29.3%	28.9%	28.4%	33.4%
CEC (meq/100g)	16.28	22.08	23.15	20.55	19.97
ESP (%NaCEC)	2.5	10.4	14.2	20.5	23.2
Ca/Mg (ratio)	2.7	1.2	0.9	0.6	0.6

SMU A4c

Table 35: Soil Chemistry Results for Site N20 (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.75-0.85**	**0.90-1.00**
Soil pH	7.37	8.13	8.90	9.24	9.18
Soil Cl (mg/kg)	4	4	22	148	420
PSA-Sand (>20µm %)	60.6%	68.0%	67.3%	55.9%	48.7%
PSA-Fine Silt (2-20µm %)	12.2%	6.0%	4.3%	8.2%	5.2%
PSA-Clay (<2µm%)	27.2%	25.9%	28.4%	35.8%	46.1%
CEC (meq/100g)	21.70	21.01	22.18	31.82	37.84
ESP (%NaCEC)	0.7	1.7	7.4	13.2	17.0
Ca/Mg (ratio)	3.0	2.0	1.1	0.7	0.6

SMU A5

Table 36: Soil Chemistry Results for Site N23 (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.77-0.87**	**0.90-1.00**
Soil pH	8.33	8.71	9.31	9.46	9.50
Soil Cl (mg/kg)	20	27	42	225	440
PSA-Sand (>20µm %)	56.7	50.4	44.5	34.8	39.9
PSA-Fine Silt (2-20µm %)	11.9	9.5	15.1	16.3	8.9
PSA-Clay (<2µm%)	31.4	40.1	40.4	48.9	51.1
CEC (meq/100g)	27.67	25.03	23.49	26.84	26.59
ESP (%NaCEC)	0.2	0.7	7.9	16.0	20.3
Ca/Mg (ratio)	4.7	2.3	0.7	0.4	0.3

SMU B1

Table 37: Soil Chemistry Results for Representative Site 1 (GTES 2011), Site 17 (Burgess 2008) (italics)

	Sample Depth (cm)			
Analysis (Unit)	**0-10**	**40-50**	**80-90**	**110-120**
Soil pH	8.53 *8.5*	9.14 *8.3*	9.11 *8.3*	--- *8.3*
Soil EC (dS/m)	0.08 *0.12*	0.22 *0.10*	0.33 *0.22*	--- *0.55*
Chloride (mg/mg)	18.0 *15*	134 *10*	312 *150*	--- *550*
Nitrate Nitrogen (mg/kg)	3.0	---	---	---
Phosphorus - Colwell extr (mg/kg)	3.0	---	---	---
Potassium (mg/kg)	170	90	88	
Organic Matter (%)	4.0	---	---	---
Cation Exchange (meq/100g)	41.69 *48*	51.77 *48*	56.64 *50*	- *51*
Exchangeable Magnesium (meq/100g)	12.64	21.96	26.47	---
Exchangeable Potassium (meq/100g)	0.45	0.23	0.23	---
Exchangeable Sodium (%)	0.6 *1*	5.0 *1*	6.9 *4.0*	--- *4.0*
Ca:Mg	2.2 *2.2*	1.2 *1.5*	1.0 *1.1*	--- *0.9*

'---'indicates laboratory analysis was not conducted for this sample.

SMU B2

Table 38: Soil Chemistry Results for Representative Site 27 (GTES 2011), Site 8 (Burgess 2008) (italics)

	Sample Depth (cm)		
Analysis (Unit)	**0-10**	**30-40**	**80-100**
Soil pH	8.88 *8.5*	9.3 *8.7*	9.44 9.0
Soil EC (dS/m)	0.07 *0.12*	0.11 0.14	0.34 *0.34*
Chloride (mg/mg)	5.0 *< 10*	11 *< 10*	224 *150*
Nitrate Nitrogen (mg/kg)	2.0	---	---
Phosphorus - Colwell extr (mg/kg)	1.0	---	---
Organic Matter (%)	2.8	---	---
Cation Exchange Capacity (meq/100g)	41.21 *20*	44.15 *18*	48.4 *19*
Exchangeable Potassium (meq/100g)	0.25 *0.21*	0.25 *0.07*	0.29 *0.06*
Exchangeable Magnesium (meq/100g)	7.04 *5.3*	13.54 *10*	22.61 *14*
Exchangeable Sodium (%)	0.5 *1.0*	2.5 *3.0*	7.9 *8.0*
Ca:Mg	4.8 *3.6*	2.2 *1.1*	1.0 *0.5*

'---'indicates laboratory analysis was not conducted for this sample.

SMU B2s

Table 39: Soil Chemistry Results for Detailed Site N13 (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.80-0.90**	**0.90-1.00**
Soil pH	7.01	8.03	8.48	8.57	8.50
Soil Cl (mg/kg)	9	163	355	683	826
PSA-Sand (>20µm %)	70.7	49.2	48.1	47.0	47.9
PSA-Fine Silt (2-20µm %)	2.8	5.8	5.6	8.2	5.1
PSA-Clay (<2µm%)	26.5	44.9	46.3	44.7	47.1
CEC (meq/100g)	14.92	26.15	26.77	28.40	30.66
ESP (%NaCEC)	1.8	6.8	7.3	8.3	8.6
Ca/Mg (ratio)	1.7	1.1	1.0	0.8	0.7

SMU B2g

Table 40: Soil Chemistry Results for Detailed Site N4 (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.80-0.90**	**0.90-1.00**
Soil pH	7.57	8.06	9.23	9.24	9.18
Soil Cl (mg/kg)	28	30	140	280	514
PSA-Sand (>20µm %)	93.2	66.2	65.6	60.7	59.3
PSA-Fine Silt (2-20µm %)	1.1	7.5	12.0	16.0	17.6
PSA-Clay (<2µm%)	5.7	26.3	22.5	23.3	23.1
15 Bar (%)	11	16	14	15	14
CEC (meq/100g)	14.6	21.9	20.9	21.0	22.6
Ca/Mg (ratio)	2.0	1.6	0.9	0.7	0.6
ESP (%NaCEC)	1.2	3.0	5.5	7.8	8.5

SMU B2bl

Table 41: Soil Chemistry Results for Detailed Site 91-SCL (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.80-0.90**	**0.90-1.00**
Soil pH	6.99	8.02	9.13	9.07	8.95
Soil Cl (mg/kg)	12	12	211	701	1026
PSA-Sand (>20µm %)	82.0	74.5	59.6	58.7	47.3
PSA-Fine Silt (2-20µm %)	4.0	8.1	6.4	4.4	15.2
PSA-Clay (<2µm%)	13.9	17.4	34.0	36.9	37.5
15 Bar (%)	12	14	19	21	22

SMU B3

Table 42: Soil Chemistry Results for Representative Mound Site 222 (GTES 2011), Site 9112 Norwich Soil (Burgess 2003) (italics)

	Sample Depth (cm)			
Analysis (Unit)	**0-10**	**30-40**	**40-50**	**80-90**
Soil pH	8.14 *8.7*	8.74 *9.3*	8.81 *9.5*	--- *8.3*
Soil EC (dS/m)	0.06 *0.11*	0.22 *0.53*	0.36 *0.71*	--- *0.95*
Chloride (mg/mg)	16 *6*	114 *316*	321 *594*	--- *1104*
Nitrate Nitrogen (mg/kg)	9	---	---	---
Phosphorus - Colwell extr (mg/kg)	10	---	---	---
Organic Matter (%)	2.0	---	---	---
Exchangeable Potassium (meq/100g)	0.62 *0.4*	0.40 *0.11*	0.39 *0.15*	--- *0.13*
Exchangeable Magnesium (meq/100g)	7.38 *8.8*	11.35 *17*	12.98 *19*	--- *21*
Cation Exchange (meq/100g)	27.41 *32*	37.03 *36*	35.08 *34*	--- *33*
Ca:Mg	2.6 *3.6*	2.0 *0.8*	1.3 *0.4*	--- *0.4*
Exchangeable Sodium (%)	1.6 *3*	7.5 *9.7*	12.1 *19.4*	--- *22.7*

'---'indicates laboratory analysis was not conducted for this sample.

Table 43: Soil Chemistry Results for Representative Site Depression 223 (GTES 2011), Site 3 (Burgess 2008) (italics)

	Sample Depth (cm)			
Analysis (Unit)	**0-10**	**20-30**	**40-50**	**75-100**
Soil pH	6.79 *8.0*	8.9 *8.7*	8.12 *8.5*	--- *8.3*
Soil EC (dS/m)	0.07 *0.14*	0.22 *0.26*	0.41 *0.57*	--- 1.18
Chloride (mg/mg)	46 *20*	279 *120*	476 *560*	--- *1475*
Nitrate Nitrogen (mg/kg)	11	---	---	---
Phosphorus - Colwell extr (mg/kg)	21	---	---	---
Organic Matter (%)	1.2	---	---	---
Exchangeable Sodium (%)	5.1 *3*	9.1 *9*	12.2 *14*	--- *16*
Exchangeable Potassium (meq/100g)	0.76 *0.7*	0.50 *0.2*	0.47 *0.2*	--- *0.2*
Exchangeable Magnesium (meq/100g)	14.62 *11*	13.46 *15*	14.21 *16*	--- *17*
Cation Exchange (meq/100g)	35.01 *32*	34.39 *36*	33.91 *34*	--- *33*

	Sample Depth (cm)			
Analysis (Unit)	**0-10**	**20-30**	**40-50**	**75-100**
Ca:Mg	1.1 *1.9*	1.3 *1.2*	1.1 *0.9*	--- *0.7*

'---'indicates laboratory analysis was not conducted for this sample.

SMU B3bl

Table 44: Soil Chemistry Results for Detailed Site 5-SCL-M (Mound) (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.80-0.90**	**0.90-1.00**
Soil pH	8.19	8.38	8.40	8.53	8.55
Soil Cl (mg/kg)	15	17	16	19	39
PSA-Sand (>20µm %)	37.0	35.7	36.9	32.7	35.6
PSA-Fine Silt (2-20µm %)	10.4	9.2	9.3	8.0	7.5
PSA-Clay (<2µm%)	52.6	55.1	53.8	59.2	56.9

SMU B4

Table 45: Soil Chemistry Results for Representative Site Mound 118

	Sample Depth (cm)		
Analysis (Unit)	**0-10**	**30-40**	**80-100**
Soil pH	7.82	8.03	9.21
Soil EC (dS/m)	2.91**	0.63	0.75
Chloride (mg/mg)	5243**	2227	1209
Organic Matter (%)	1.9	---	---
Nitrate Nitrogen (mg/kg)	18	---	---
Phosphorus - Colwell extr (mg/kg)	17	---	---
Exchangeable Calcium (meq/100g)	11.58	9.91	9.84
Exchangeable Sodium (%)	18.40	7.16	9.33
Exchangeable Potassium (meq/100g)	0.50	0.41	0.41
Exchangeable Magnesium (meq/100g)	8.29	7.73	9.27
Cation Exchange Capacity (meq/100g)	38.77	25.29	28.95
Ca:Mg	1.4	1.3	1.1

'---'indicates laboratory analysis was not conducted for this sample.
** The extremely high salinity and chloride levels at the surface was considered atypical and possibly an error or associated with blade ploughing causing soil displacement and or exploration drilling which was undertaken recently in the vicinity of the sample site. However they do follow somewhat similar trends observed by other surveys in the local area. Accordingly these results have been ignored and assessments are based on trends sourced from the nearby Windeyers Hill soil survey (Burgess 2003) and Emmerton (2004).

Table 46: Soil Chemistry Results for Representative Site Depression 159 (GTES 2011)

	Sample Depth (cm)		
Analysis (Unit)	**0-10**	**20-30**	**70-80**
Soil pH	8	7.8	8.2
Soil EC (dS/m)	0.15	0.42	1.19
Chloride (mg/mg)	47	488	1585
Nitrate Nitrogen (mg/kg)	24	---	---
Phosphorus - Colwell extr (mg/kg)	16	---	---
Organic Matter (%)	2.1	---	---
Exchangeable Sodium (%)	1.5	10.2	17.7
Exchangeable Potassium (meq/100g)	0.91	0.48	0.42
Exchangeable Magnesium (meq/100g)	8.5	14.7	17.43
Cation Exchange Capacity (meq/100g)	36	40.12	47.45
Ca:Mg	3.1	1.4	1.2

'---'indicates laboratory analysis was not conducted for this sample.

SMU B5

Table 47: Soil Chemistry Results for Detailed Site N43 (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.77-0.87**	**0.90-1.00**
Soil pH	8.26	8.27	8.79	9.04	8.93
Soil Cl (mg/kg)	16	17	157	270	910
PSA-Sand (>20µm %)	67	64	52	51	51
PSA-Fine Silt (2-20µm %)	6	6	6	7	6
PSA-Clay (<2µm%)	27	30	42	42	43
15 Bar (%)	15	15	23	21	21
CEC (meq/100g)	21.19	21.84	27.10	25.56	28.30
ESP (%NaCEC)	0.3	0.9	5.5	8.3	12.7
Ca/Mg (ratio)	5.3	3.0	1.1	0.8	0.6

SMU E1

Table 48: Soil Chemistry Results for Representative Site 173 (GTES 2011), Soil Profile 9021 (Burgess 2003) (italics)

	Sample Depth (cm)		
Analysis (Unit)	**0-10**	**40-50**	**90-100**
Soil pH	8.10 *6.0*	8.15 *6.8*	6.90 *6.9*
Soil EC (dS/m)	0.01 *0.02*	0.01 *0.02*	0.01 *0.01*
Chloride (mg/mg)	2.0 *10*	1.0 *10*	1.0 *10*
Nitrate Nitrogen (mg/kg)	3.0	---	---
Phosphorus - Colwell extr (mg/kg)	<0.1	---	---
Organic Matter (%)	0.8	---	---
Exchangeable Potassium (meq/100g)	0.24	0.22	0.29
Exchangeable Magnesium (meq/100g)	0.29	0.16	0.27
Cation Exchange (meq/100g)	1.65	2.29	3.11
Ca:Mg	3.4	10.5	8.7
Exchangeable Sodium (%)	7.3 *5.5*	3.9 *0.5*	2.3 *1.0*

'---'indicates laboratory analysis was not conducted for this sample.

SMU E1r

Table 49: Soil Chemistry Results for Detailed Site 10-SCL (GTE, 2019)

	Sample Depth (m)				
Analysis (Unit)	**0.00-0.10**	**0.20-0.30**	**0.50-0.60**	**0.70-0.80**	**0.90-1.00**
Soil pH	7.22	7.28	8.21	8.40	8.56
Soil Cl (mg/kg)	13	11	14	25	73
PSA-Sand (>20µm %)	75.1	67.5	67.3	59.0	49.3
PSA-Fine Silt (2-20µm %)	8.1	11.9	9.8	16.6	21.1
PSA-Clay (<2µm%)	16.8	20.5	22.9	24.4	29.5
15 Bar (%)	16	13	14	15	17

SMU E2

Table 50: Soil Chemistry Results for Representative Site 110 (GTES 2011), Site 22 (Burgess 2008) (italics)

	Sample Depth (cm)			
Analysis (Unit)	**0-10**	**30-40**	**80-90**	**100-125**
Soil pH	9.0 *8.3*	9.0 *8.6*	8.8 *8.6*	--- *8.6*
Soil EC (dS/m)	0.04 *0.12*	0.16 *0.11*	0.42 *0.6*	--- *0.6*
Chloride (mg/mg)	6.0 *<10*	33.0 *30*	564 *600*	--- *570*
Nitrate Nitrogen (mg/kg)	3.0	---	---	---
Phosphorus - Colwell extr (mg/kg)	6.0	---	---	---
Organic Matter (%)	1.7	---	---	---
Exchangeable Potassium (meq/100g)	0.58	0.3	0.29	---
Exchangeable Magnesium (meq/100g)	9.97	21.7	25.99	---
Exchangeable Sodium (%)	1.3	6.8	9.7	---
Cation Exchange (meq/100g)	27.44 *42*	55.38 *45*	64.96 *46*	--- *60*
Ca:Mg	1.7 *1.7*	1.4 *1.2*	1.2 *0.96*	--- *0.88*

'---'indicates laboratory analysis was not conducted for this sample.

SMU E3

Table 51: Soil Chemistry Results for Representative Site 21 – SGS Lab no CTW 2504881 Burgess (2008) results (italics)

	Sample Depth (cm)		
Analysis (Unit)	**0-10**	**30-40**	**75-90**
Soil pH	6.2 *6.4*	6.4 *6.6*	7.8 *7.9*
Soil EC (dS/m)	0.02 *0.02*	0.07 *0.07*	--- *0.16*
Nitrate Nitrogen (mg/kg)	<1.0	---	---
Chloride (mg/mg)	13 *10*	15 *30*	- *165*
Organic Matter (%)	2.4	---	---
Phosphorus - Colwell extr (mg/kg)	9.0	---	---
Potassium (mg/kg)	130	---	---
Exchangeable Calcium (meq/100)	3 *1.6*	10.77 *5.2*	--- *3.8*
Exchangeable Sodium (%)	0.9 *1.0*	3.8 *6.0*	--- *10*
Exchangeable Potassium (meq/100g)	0.35 *0.34*	0.58 *0.83*	--- *0.45*
Exchangeable Magnesium (meq/100g)	1.04 *0.8*	1.52 *6.4*	--- *7.2*
Cation Exchange Capacity (meq/100g)	4.4 *3*	23 *13*	--- *14*
Ca:Mg ratio	2.9 *2.0*	1.0 *0.8*	--- *0.5*

'---'indicates laboratory analysis was not conducted for this sample.

SMU T1

Table 52: Soil Chemistry Results for Representative SITE 67 (Heyford Soil and Lands Suitability Report, 2005)

	Sample Depth (cm)		
Analysis (Unit)	**0-10**	**10-20**	**50-60**
Soil pH	5.3	5.3	5.8
Soil EC (uS/m)	142	204	402
Moisture (%)	4.9	---	---
Calcium (meq/100g)	3.9	1.9	4.3
Magnesium (meq/100g)	1.0	1.6	4.4
Potassium (meq/100g)	0.7	0.6	0.8
Sodium (meq/100g)	0.3	0.6	1.9
Cation Exchange Capacity (meq/100g)	5.9	4.8	11.4
Aluminium (meq/100g)	<0.1	<0.1	<0.1
Exchangeable Sodium Percentage (%)	5.8	13.3	16.9
Ca:Mg ratio	3.9	1.2	1.0
Total Sulphur (%)	0.01	---	---
Boron (mg/kg)	<0.2	---	---
Copper (mg/kg)	<1.0	---	---
Iron (mg/kg)	28.6	---	---
Manganese mg/kg	3.28	---	---
Zinc mg/kg	<1.0	---	---
Nitrite-N mg/kg	<0.1	---	---
Nitrate N mg/kg	1.4	---	---
Nitrite+Nitrate N mg/kg	1.4	---	---
Bicarb Extract Phosphorus (Olsen) mg/kg	3	---	---
Organic matter (%)	0.7	---	---

'---'indicates laboratory analysis was not conducted for this sample.

SMU T2

Table 53: Soil Chemistry Results for Representative SITE 2 (Heyford Soil and Lands Suitability Report, 2005)

	Sample Depth (cm)	
Analysis (Unit)	**0-10**	**10-20**
Soil pH	7.9	6.8
Soil EC (uS/m)	235	167
Moisture (%)	19.8	---
Calcium (meq/100g)	19.9	5.1
Magnesium (meq/100g)	11.9	1.8
Potassium (meq/100g)	1.0	0.6
Sodium (meq/100g)	2.0	0.3
Cation Exchange Capacity (meq/100g)	34.8	7.8
Aluminium (meq/100g)	<0.1	>0.1
Exchangeable Sodium Percentage (%)	5.8	3.8
Ca:Mg ratio	1.7	2.8
Total Sulphur (%)	0.41	---
Boron (mg/kg)	2.4	---
Copper (mg/kg)	<1	---
Iron (mg/kg)	5.64	---
Manganese mg/kg	6.42	---
Zinc mg/kg	2.94	---
Nitrite-N mg/kg	<0.1	---
Nitrate N mg/kg	1.7	---
Nitrite+Nitrate N mg/kg	1.7	---
Bicarb Extract Phosphorus (Olsen) mg/kg	<1	---
Organic matter (%)	<0.5	---

'---'indicates laboratory analysis was not conducted for this sample.

ESSA Pty Ltd /EAL NATA (ASPAC certified)

For Info Refer ESSA Pty Ltd
PO Box 442 Sunnybank Q 4109

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References: H2096 Sheet 1 of 4

Date Received: 06/07/2018
Date Completec 25/07/2018 Reissued 24/2/21

FINAL REPORT

Project:

Project -Saraji East (18SRE)

All results in this report relate only to the items tested.
Results are expressed on an "as received basis".

Client Name: GT Environmental

Contact Mr Reece Mc Cann

Sample Type: Soil

Number of samples: 75

ESSA /EAL Pty Ltd **(NATA,ASPAC Approved)**

Soil Analysis Report
Batch Numbers: H2096

Date Received: 06/07/2018
Date Completed:25/07/2018

Client: GTE sARAJI- Results Page 1 of 2

ESSA Ref	field ref	Soil pH	Soil EC	Soil Cl		Exch.Ca	Exch. Mg	Exch.K	Exch. Na	CEC	ESP	Ca/Mg
	depth (m)		dS/m	mg/kg		meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	Ratio
H2096/1	4-SCL-0.0-0.1	7.74	0.08	7								
H2096/2	4-SCL-0.2-0.3	8.82	0.19	13								
H2096/3	4-SCL-0.5-0.6	8.82	0.26	124								
H2096/4	4-SCL-0.7-0.8	8.60	0.44	419								
H2096/5	4-SCL-0.9-1.0	8.65	0.63	799								
H2096/6	10-SCL-0.0-0.1	7.22	0.08	13								
H2096/7	10-SCL-0.2-0.3	7.28	0.03	11								
H2096/8	10-SCL-0.5-0.6	8.21	0.04	14								
H2096/9	10-SCL-0.7-0.8	8.40	0.04	25								
H2096/10	10-SCL-0.9-1.0	8.56	0.06	73								
H2096/11	65-SCL-0.0-0.1	7.83	0.08	12								
H2096/12	65-SCL-0.2-0.3	8.47	0.13	10								
H2096/13	65-SCL-0.5-0.6	8.90	0.18	18								
H2096/14	65-SCL-0.8-0.9	8.93	0.32	101								
H2096/15	65-SCL-0.9-1.0	8.96	0.37	159								
H2096/16	91-SCL-0.0-0.1	6.99	0.08	12								
H2096/17	91-SCL-0.2-0.3	8.02	0.07	12								
H2096/18	91-SCL-0.5-0.6	9.13	0.33	211								
H2096/19	91-SCL-0.8-0.9	9.07	0.76	701								
H2096/20	91-SCL-0.9-1.0	8.95	0.94	1026								
H2096/21	110-SCL-0.0-0.1	7.30	0.10	27								
H2096/22	110-SCL-0.2-0.3	7.93	0.09	12								
H2096/23	110-SCL-0.5-0.6	8.83	0.26	39								
H2096/24	110-SCL-0.7-0.8	8.91	0.31	72								
H2096/25	110-SCL-0.9-1.0	9.04	0.29	47								
H2096/26	115-SCL-0.0-0.1	7.85	0.14	34								
H2096/27	150-SCL-0.2-0.3	8.19	0.16	14								
H2096/28	115-SCL-0.5-0.6	8.57	0.19	68								
H2096/29	115-SCL-0.8-0.9	8.69	0.22	16								
H2096/30	115-SCL-0.9-1.0	8.78	0.26	40								
H2096/31	N1-SCL-0.0-0.1	7.96	0.16	23								
H2096/32	N1-SCL-0.2-0.3	8.23	0.14	82								
H2096/33	N1-SCL-0.5-0.6	8.29	0.47	384								
H2096/34	N1-SCL-0.8-0.9	8.25	0.52	582								
H2096/35	N1-SCL-0.9-1.0	8.22	0.58	669								
H2096/36	N2-SCL-0.0-0.1	7.67	0.13	39								
H2096/37	N2-SCL-0.2-0.3	8.23	0.12	59								
H2096/38	N2-SCL-0.5-0.6	8.52	0.10	50								
H2096/39	N2-SCL-0.8-0.9	8.47	0.15	73								
H2096/40	N2-SCL-0.9-1.0	8.48	0.18	114								
H2096/41	N3-SCL-0.0-0.1	7.78	0.12	35								
H2096/42	N3-SCL-0.2-0.3	8.34	0.08	15								
H2096/43	N3-SCL-0.5-0.6	8.52	0.10	14								
H2096/44	N3-SCL-0.8-0.9	8.61	0.15	14								
H2096/45	N3-SCL-0.9-1.0	8.66	0.17	21		11.09	7.08	0.22	0.86	19.2	4.4	1.6
H2096/46	N4-SCL-0.0-0.1	7.57	0.25	28		9.04	4.50	0.91	0.18	14.6	1.2	2.0
H2096/47	N4-SCL-0.2-0.3	8.06	0.11	30		13.00	8.04	0.19	0.65	21.9	3.0	1.6
H2096/48	N4-SCL-0.5-0.6	9.23	0.27	140		9.34	10.33	0.06	1.14	20.9	5.5	0.9
H2096/49	N4-SCL-0.8-0.9	9.24	0.43	280		7.70	11.55	0.08	1.63	21.0	7.8	0.7
H2096/50	N4-SCL-0.9-1.0	9.18	0.54	514		7.79	12.78	0.07	1.92	22.6	8.5	0.6
H2096/51	N5-SCL-0.0-0.1	6.82	0.09	63		11.53	5.73	1.23	0.10	18.6	0.6	2.0
H2096/52	N5-SCL-0.2-0.3	8.05	0.09	15		16.60	10.13	0.24	0.87	27.8	3.1	1.6
H2096/53	N5-SCL-0.5-0.6	9.03	0.34	201		15.55	17.77	0.09	3.19	36.6	8.7	0.9
H2096/54	N5-SCL-0.8-0.9	9.04	0.71	649		12.21	17.99	0.03	3.56	33.8	10.5	0.7
H2096/55	N5-SCL-0.9-1.0	9.03	0.78	918		11.19	17.41	0.04	3.34	32.0	10.4	0.6
H2096/56	N6-SCL-0.0-0.1	7.15	0.11	9		24.76	12.10	0.74	0.37	38.0	1.0	2.0
H2096/57	N6-SCL-0.2-0.3	8.27	0.22	7		22.26	12.16	0.11	1.66	36.2	4.6	1.8
H2096/58	N6-SCL-0.5-0.6	8.94	0.46	320		20.31	16.39	0.02	5.19	41.9	12.4	1.2
H2096/59	N6-SCL-0.77-0.87	8.66	1.06	1429		18.88	18.62	0.09	6.13	43.7	14.0	1.0
H2096/60	N6-SCL-0.9-1.0	8.68	1.08	1213		17.42	17.46	0.05	5.09	40.0	12.7	1.0
H2096/61	N7-SCL-0.0-0.1	7.61	0.11	21		17.28	6.41	0.17	0.28	24.1	1.2	2.7
H2096/62	N7-SCL-0.2-0.3	8.52	0.10	50		17.58	8.15	0.08	0.57	26.4	2.2	2.2
H2096/63	N7-SCL-0.5-0.6	9.15	0.43	306		12.73	15.60	0.03	2.70	31.1	8.7	0.8
H2096/64	N7-SCL-0.8-0.9	8.90	1.02	980		12.12	19.17	0.02	4.63	35.9	12.9	0.6
H2096/65	N7-SCL-0.9-1.0	8.80	1.16	1014		13.39	21.72	0.05	5.38	40.5	13.3	0.6
H2096/66	N8-SCL-0.0-0.1	7.29	0.06	15		15.30	9.66	0.41	0.12	25.5	0.5	1.6
H2096/67	N8-SCL-0.2-0.3	8.87	0.16	82		15.69	14.97	0.07	1.33	32.1	4.1	1.0
H2096/68	N8-SCL-0.5-0.6	9.37	0.35	166		13.74	22.47	0.09	4.52	40.8	11.1	0.6
H2096/69	N8-SCL-0.8-0.9	9.16	0.81	643		11.56	23.51	0.09	5.45	40.6	13.4	0.5
H2096/70	N8-SCL-0.9-1.0	8.98	1.02	949		13.44	28.20	0.10	6.36	48.1	13.2	0.5
H2096/71	N9-SCL-0.0-0.09	7.77	0.23	12		10.73	5.32	0.66	0.26	17.0	1.5	2.0
H2096/72	N9-SCL-0.2-0.3	7.90	0.09	6		10.99	6.93	0.08	0.84	18.8	4.5	1.6
H2096/73	N9-SCL-0.55-0.65	9.20	0.40	235		12.80	16.78	0.03	3.26	32.9	9.9	0.8
H2096/74	N9-SCL-0.75-0.85	9.14	0.62	543		8.86	13.84	0.04	2.68	25.4	10.5	0.6
H2096/75	N9-SCL-0.9-1.0	9.01	0.90	929		9.62	16.95	0.02	3.25	29.8	10.9	0.6

Soil Analysis Report
Batch Numbers: H2096

Date Received: 06/07/2018
Date Completed:25/07/2018

Client: GTE Saraji Results Page 2 of2

Lab No	Sample No	ADMC	Gravel	CS>50µm	CS>20µm	2-50µm-Silt	2-20µm-Silt	Clay <2µm	15 Bar
	Depth (m)	%	%	%	%	%	%	%	%
H2096/1	**4-SCL-0.0-0.1**	11.2	0.3	36.5	36.5	16.6	16.6	46.8	28
H2096/2	**4-SCL-0.2-0.3**	14.9	0.3	28.6	28.6	23.4	23.4	48.0	32
H2096/3	**4-SCL-0.5-0.6**	15.8	0.0	27.4	30.3	23.6	20.7	49.0	32
H2096/4	**4-SCL-0.7-0.8**	17.5	1.6	29.3	32.9	23.9	20.3	46.8	33
H2096/5	**4-SCL-0.9-1.0**	16.5	1.0	24.0	36.7	37.9	25.2	38.1	30
H2096/6	**10-SCL-0.0-0.1**	13.4	0.6	68.2	75.1	15.0	8.1	16.8	16
H2096/7	**10-SCL-0.2-0.3**	6.0	0.4	70.0	67.5	9.5	11.9	20.5	13
H2096/8	**10-SCL-0.5-0.6**	7.2	3.8	65.9	67.3	11.2	9.8	22.9	14
H2096/9	**10-SCL-0.7-0.8**	8.1	6.4	52.9	59.0	22.7	16.6	24.4	15
H2096/10	**10-SCL-0.9-1.0**	9.2	3.5	45.7	49.3	24.8	21.1	29.5	17
H2096/11	**65-SCL-0.0-0.1**	22.5	0.5	22.4	28.9	34.6	28.0	43.1	27
H2096/12	**65-SCL-0.2-0.3**	13.9	0.3	30.1	41.6	25.7	14.1	44.3	28
H2096/13	**65-SCL-0.5-0.6**	15.0	0.1	16.7	26.8	35.7	25.6	47.6	30
H2096/14	**65-SCL-0.8-0.9**	16.3	3.1	22.9	25.8	26.3	23.4	50.8	31
H2096/15	**65-SCL-0.9-1.0**	16.9	6.1	24.7	28.0	23.7	20.5	51.6	31
H2096/16	**91-SCL-0.0-0.1**	11.0	1.5	70.4	82.0	15.7	4.0	13.9	12
H2096/17	**91-SCL-0.2-0.3**	9.0	1.0	67.6	74.5	15.0	8.1	17.4	14
H2096/18	**91-SCL-0.5-0.6**	8.9	1.5	54.5	59.6	11.5	6.4	34.0	19
H2096/19	**91-SCL-0.8-0.9**	11.6	2.6	53.1	58.7	10.0	4.4	36.9	21
H2096/20	**91-SCL-0.9-1.0**	12.1	1.7	45.0	47.3	17.5	15.2	37.5	22
H2096/21	**110-SCL-0.0-0.1**	9.3	0.5	44.3	56.3	18.5	6.5	37.2	22
H2096/22	**110-SCL-0.2-0.3**	15.9	0.5	31.3	43.4	21.3	9.3	47.3	28
H2096/23	**110-SCL-0.5-0.6**	17.3	7.2	20.4	36.6	21.6	5.4	58.0	30
H2096/24	**110-SCL-0.7-0.8**	19.4	24.8	20.9	28.8	33.3	25.4	45.8	33
H2096/25	**110-SCL-0.9-1.0**	17.9	22.3	41.3	55.5	37.1	23.0	21.5	33
H2096/26	**115-SCL-0.0-0.1**	18.0	0.8	40.4	46.1	22.8	17.1	36.8	24
H2096/27	**150-SCL-0.2-0.3**	17.0	0.2	36.2	38.7	22.0	19.5	41.8	29
H2096/28	**115-SCL-0.5-0.6**	22.1	0.6	32.2	44.1	18.2	6.4	49.6	31
H2096/29	**115-SCL-0.8-0.9**	22.7	5.1	27.3	36.2	28.0	19.0	44.7	32
H2096/30	**115-SCL-0.9-1.0**	22.3	1.2	35.7	38.9	10.6	7.5	53.7	32
H2096/31	**N1-SCL-0.0-0.1**	23.4	0.0	20.7	23.4	20.8	18.1	58.5	31
H2096/32	**N1-SCL-0.2-0.3**	16.1	0.0	16.5	24.0	19.3	11.8	64.2	33
H2096/33	**N1-SCL-0.5-0.6**	17.6	0.0	9.5	12.5	27.4	24.3	63.1	34
H2096/34	**N1-SCL-0.8-0.9**	17.8	0.4	14.2	13.6	18.6	19.2	67.2	34
H2096/35	**N1-SCL-0.9-1.0**	17.7	0.4	6.1	13.1	31.2	24.2	62.7	34
H2096/36	**N2-SCL-0.0-0.1**	16.1	0.0	33.1	42.2	20.8	11.6	46.1	30
H2096/37	**N2-SCL-0.2-0.3**	13.6	0.3	27.0	32.2	23.3	18.1	49.7	30
H2096/38	**N2-SCL-0.5-0.6**	13.8	0.1	21.3	27.7	25.0	18.7	53.7	31
H2096/39	**N2-SCL-0.8-0.9**	15.3	0.7	25.8	36.0	22.8	12.6	51.4	31
H2096/40	**N2-SCL-0.9-1.0**	15.5	0.3	25.0	32.1	24.0	16.9	51.0	31
H2096/41	**N3-SCL-0.0-0.1**	22.4	0.0	9.9	38.0	37.8	9.7	52.3	30
H2096/42	**N3-SCL-0.2-0.3**	14.4	0.4	25.2	32.4	24.0	16.9	50.8	29
H2096/43	**N3-SCL-0.5-0.6**	14.5	0.7	33.1	40.5	18.7	11.3	48.2	29
H2096/44	**N3-SCL-0.8-0.9**	14.8	0.3	20.7	37.8	26.8	9.7	52.6	29
H2096/45	**N3-SCL-0.9-1.0**	14.9	0.5	21.3	33.2	28.6	16.8	50.0	29
H2096/46	**N4-SCL-0.0-0.1**	12.2	0.7	76.4	93.2	17.9	1.1	5.7	11
H2096/47	**N4-SCL-0.2-0.3**	9.1	0.2	56.3	66.2	17.3	7.5	26.3	16
H2096/48	**N4-SCL-0.5-0.6**	8.1	0.4	56.0	65.6	21.5	12.0	22.5	14
H2096/49	**N4-SCL-0.8-0.9**	7.8	0.3	58.5	60.7	18.2	16.0	23.3	15
H2096/50	**N4-SCL-0.9-1.0**	8.3	0.5	50.1	59.3	26.8	17.6	23.1	14
H2096/51	**N5-SCL-0.0-0.1**	16.9	0.3	78.3	78.6	7.6	7.3	14.1	14
H2096/52	**N5-SCL-0.2-0.3**	11.0	1.2	62.8	67.0	14.6	10.3	22.6	18
H2096/53	**N5-SCL-0.5-0.6**	9.3	1.3	65.5	65.0	7.0	7.5	27.5	20
H2096/54	**N5-SCL-0.8-0.9**	10.9	2.1	63.1	62.2	4.0	5.0	32.9	20
H2096/55	**N5-SCL-0.9-1.0**	11.2	1.6	55.7	61.6	15.2	9.3	29.1	21
H2096/56	**N6-SCL-0.0-0.1**	22.8	0.1	51.2	54.4	22.5	19.3	26.2	22
H2096/57	**N6-SCL-0.2-0.3**	13.9	0.0	48.3	56.7	21.5	13.1	30.2	23
H2096/58	**N6-SCL-0.5-0.6**	16.5	0.1	21.8	29.0	27.2	20.1	51.0	31
H2096/59	**N6-SCL-0.77-0.87**	15.9	1.6	32.0	36.9	30.8	25.9	37.2	26
H2096/60	**N6-SCL-0.9-1.0**	14.7	4.3	40.5	47.5	23.2	16.3	36.3	22
H2096/61	**N7-SCL-0.0-0.1**	25.9	1.1	64.1	64.1	12.4	12.4	23.5	14
H2096/62	**N7-SCL-0.2-0.3**	9.8	1.4	52.5	66.7	24.2	9.9	23.3	17
H2096/63	**N7-SCL-0.5-0.6**	10.6	0.6	50.1	59.9	14.1	4.3	35.8	20
H2096/64	**N7-SCL-0.8-0.9**	13.8	2.4	42.0	53.7	22.9	11.3	35.1	23
H2096/65	**N7-SCL-0.9-1.0**	14.6	1.5	42.9	49.6	17.9	11.3	39.1	22
H2096/66	**N8-SCL-0.0-0.1**	15.8	1.3	74.1	77.3	9.2	6.0	16.7	13
H2096/67	**N8-SCL-0.2-0.3**	9.8	1.2	62.2	69.9	18.4	10.7	19.4	17
H2096/68	**N8-SCL-0.5-0.6**	12.1	3.4	44.6	58.5	21.3	7.4	34.1	24
H2096/69	**N8-SCL-0.8-0.9**	14.0	1.2	35.1	53.2	25.3	7.3	39.6	26
H2096/70	**N8-SCL-0.9-1.0**	15.9	2.8	34.4	47.2	22.8	9.9	42.9	26
H2096/71	**N9-SCL-0.0-0.09**	16.1	1.7	71.5	81.8	17.3	7.0	11.2	12
H2096/72	**N9-SCL-0.2-0.3**	7.0	1.2	62.2	76.4	18.3	4.1	19.5	13
H2096/73	**N9-SCL-0.55-0.65**	10.4	1.6	55.6	65.1	15.9	6.4	28.5	19
H2096/74	**N9-SCL-0.75-0.85**	9.5	2.3	60.8	59.9	15.0	15.9	24.2	17
H2096/75	**N9-SCL-0.9-1.0**	10.4	0.7	59.1	55.5	13.5	17.1	27.4	18

METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty	LOQ	Unit	Name	Method Description
pH	4A1	1.1	0.1	pH	pH	1:5 water extr, pH meter
EC	3A1	5.4	0.01	dS/m	Electrical conductivity	1:5 water extr, EC meter
Cl	5A2	10.0	10.0	mg/kg	Chloride	1:5 water extr, (AA) colorimetric
NO3-N	7C2	6.7	1.0	mg/kg	Nitrate-nitrogen	1:5 water extr, (AA) colorimetric
NH4-N	7C2	7.8	0.6	mg/kg	Ammonium-nitrogen	1M KCl extr, (AA) colorimetric
Bicarb.P	9B2	16.8	1.0	mg/kg	Bicarb.ext.phosphorus	0.5M NaHCO3 @ pH 8.5, (AA) colorimetric
Exch.Ca	15B/C1	7.2	0.18	meq/100(	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Mg	15B/C1	4.7	0.31	meq/100(	Exchangeable magnesiu	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Na	15B/C1	9.6	0.09	meq/100(	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.K	15B/C1	4.8	0.02	meq/100(	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100(	Cation Exchange Capac	KNO3 + Ca(NO3)2 extr, (AA) colorimetric
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Conte	Gravimetric oven dry @ 105C
R1	NA	20.2	NA		Dispersion Ratio	Ratio [Aqueous dispersible (Silt + Clay):Total (Silt + Clay)]
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur	Ca(H2PO4)2 @ pH 4.0 extractable sulfate-sulfur, ICPOES
Sand	no ref	22.1	1.0	%	Particle size, sand	Hydrometer, gravimetric & Sieve
Silt	no ref	16.6	1.0	%	Particle size, silt	Hydrometer, gravimetric
Clay	no ref	12.7	1.0	%	Particle size, clay	Hydrometer, gravimetric

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

For Manager **D E Baker BSc MASSSI**
Analytical Services:

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
Soluble Salts included in Exchangeable Cations - Except PRE-WASHED (if EC>0.3dS/m).

QUALITY CONTROL DATA

Soil

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	B		5.0 - 5.3
EC	dS/m	B		0.27 - 0.32
Cl	mg/kg	B		10 - 35
NO3-N	mg/kg	B		10 - 16
NH4-N	mg/kg	NA		NA
Bicarb.P	mg/kg	B		51 -75
Total Kjeldahl N	%	ASPAC 34	0.110	.100 - .120
Total P	%	ASPAC 34	0.02	.019 - .021
Organic Carbon	%	B		1.82 - 2.3
Ca (Exch. cations)pH	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH	meq/100g	B		.057 - .182
K (Exch. cations)pH	meq/100g	B		1.209 - 1.411
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	B	17.0	17.3 - 22.4
Fine Sand	%	B	22.0	20.0 - 25.7
Silt	%	B	16.0	10.5 - 19.8
Clay	%	B	44.0	37.9 - 48.9
R1		B		0.23 - 0.38

Test Method	Units	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	mg/kg	SB		2.37 - 3.25
DTPA-Zn	mg/kg	SB		3.15 - 3.81
DTPA-Mn	mg/kg	SB		97.7 - 149.0
DTPA-Fe	mg/kg	SB		24.3 - 32.6
0.33 Bar	%	G		32 - 51
15 Bar	%	G		23 - 30
Ca (Exch. cations)pH8.5	meq/100g	S12		27.7 - 35.4
Mg (Exch. cations)pH8.5	meq/100g	S12		22.88 - 24.5
Na (Exch. cations)pH8.5	meq/100g	S12		2.0 - 2.28
K (Exch. cations)pH8.5	meq/100g	S12		1.64 - 2.09

ESSA Pty Ltd /EAL NATA (ASPAC certified)

For Info Refer ESSA Pty Ltd
PO Box 442 Sunnybank Q 4109

Phone: 0403245560

email: e.s.s.a@bigpond.net.au

References: I2733

Date Received: 13/06/2019
Date Completed: 14/07/2019 Reissue 24.2/21

FINAL REPORT

Project:

Project -Saraji East (18SRE) No 1

All results in this report relate only to the items tested. Results are expressed on an "as received basis".

Client Name: GT Environmental

Contact: Mr Reece Mc Cann

Sample Type: Soil

Number of samples: 145

ESSA /EAL Pty Ltd **(NATA,ASPAC Approved)**

Soil Analysis Report
Batch Numbers: I2733

Date Received: 13/06/2019
Date Completed:14/07/2019

Client: GTE SARAJI- Results Page 1 of 2

ESSA Ref	field ref	Soil pH	Soil EC	Soil Cl	Exch.Ca	Exch. Mg	Exch.K	Exch. Na	CEC	ESP	Ca/Mg
	depth (m)		dS/m	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	Ratio
i2733/1	6-SCL-0.0-0.1	7.88	0.191	22	24.22	10.38	1.85	0.21	36.65	0.6	2.3
i2733/2	6-SCL-0.2-0.3	8.43	0.264	117	19.94	11.38	1.30	1.47	34.09	4.3	1.8
i2733/3	6-SCL-0.5-0.6	8.61	0.694	626	15.46	14.40	0.75	4.09	34.70	11.8	1.1
i2733/4	6-SCL-0.8-0.9	8.55	1.005	1042	15.16	15.83	0.53	5.76	37.27	15.5	1.0
i2733/5	6-SCL-0.9-1.0	8.72	0.904	917	11.77	12.31	0.43	4.40	28.91	15.2	1.0
i2733/6	7-SCL-0.0-0.1	7.47	0.182	10	19.92	6.20	1.29	0.13	27.53	0.5	3.2
i2733/7	7-SCL-0.2-0.3	9.05	0.173	29	18.59	5.80	1.25	0.12	25.76	0.5	3.2
i2733/8	7-SCL-0.5-0.6	9.18	0.361	232	16.24	12.83	0.53	2.85	32.45	8.8	1.3
i2733/9	7-SCL-0.8-0.9	9.16	0.454	354	14.01	14.53	0.40	5.36	34.30	15.6	1.0
i2733/10	7-SCL-0.9-1.0	9.16	0.494	417	11.29	11.48	0.35	4.39	27.51	16.0	1.0
i2733/11	100-SCL-0.0-0.1	7.92	0.088	8	19.29	9.13	0.55	0.22	29.18	0.8	2.1
i2733/12	100-SCL-0.2-0.3	8.44	0.105	57	22.50	8.89	0.34	1.59	33.32	4.8	2.5
i2733/13	100-SCL-0.5-0.6	8.60	0.258	244	21.83	12.10	0.28	3.81	38.02	10.0	1.8
i2733/14	100-SCL-0.8-0.9	8.53	0.456	467	19.82	12.99	0.27	4.34	37.41	11.6	1.5
i2733/15	100-SCL-0.9-1.0	8.63	0.467	449	19.89	12.62	0.25	3.86	36.61	10.5	1.6
i2733/16	102-SCL-D-0.0-0.1	7.56	0.050	24	..	..	..	..	..	..	..
i2733/17	102-SCL-D-0.2-0.3	8.19	0.086	32	..	..	..	..	..	..	..
i2733/18	102-SCL-D-0.5-0.6	8.80	0.212	95	..	..	..	..	..	..	..
i2733/19	102-SCL-D-0.8-0.9	8.74	0.309	230	..	..	..	..	..	..	..
i2733/20	102-SCL-D-0.9-1.0	8.54	0.447	426	..	..	..	..	..	..	..
i2733/21	102-SCL-M-0.0-0.1	7.33	0.042	10	..	..	..	..	..	..	..
i2733/22	102-SCL-M-0.2-0.3	8.23	0.058	16	..	..	..	..	..	..	..
i2733/23	102-SCL-M-0.5-0.6	8.81	0.149	23	..	..	..	..	..	..	..
i2733/24	102-SCL-M-0.83-0.9	8.98	0.215	74	..	..	..	..	..	..	..
i2733/25	102-SCL-M-0.9-1.0	8.92	0.266	151	..	..	..	..	..	..	..
i2733/26	103-SCL-D-0.0-0.1	7.11	0.074	11	..	..	..	..	..	..	..
i2733/27	103-SCL-D-0.2-0.3	7.90	0.086	53	..	..	..	..	..	..	..
i2733/28	103-SCL-D-0.5-0.6	7.80	0.359	463	..	..	..	..	..	..	..
i2733/29	103-SCL-D-0.8-0.9	6.99	0.634	818	..	..	..	..	..	..	..
i2733/30	103-SCL-D-0.9-1.0	6.28	0.621	821	..	..	..	..	..	..	..
i2733/31	103-SCL-M-0.0-0.1	8.65	0.107	11	..	..	..	..	..	..	..
i2733/32	103-SCL-M-0.2-0.3	8.36	0.131	78	..	..	..	..	..	..	..
i2733/33	103-SCL-M-0.5-0.6	9.20	0.296	174	..	..	..	..	..	..	..
i2733/34	103-SCL-M-0.8-0.9	9.15	0.540	485	..	..	..	..	..	..	..
i2733/35	103-SCL-M-0.9-1.0	9.09	0.656	665	..	..	..	..	..	..	..
i2733/36	5-SCL-M-0.0-0.1	8.19	0.117	15	..	..	..	..	..	..	..
i2733/37	5-SCL-M-0.2-0.3	8.38	0.120	17	..	..	..	..	..	..	..
i2733/38	5-SCL-M-0.5-0.6	8.40	0.124	16	..	..	..	..	..	..	..
i2733/39	5-SCL-M-0.8-0.9	8.53	0.146	19	..	..	..	..	..	..	..
i2733/40	5-SCL-M-0.9-1.0	8.55	0.165	39	..	..	..	..	..	..	..
i2733/41	5-SCL-D-0.0-0.1	7.33	0.077	11	..	..	..	..	..	..	..
i2733/42	5-SCL-D-0.2-0.3	7.58	0.058	15	..	..	..	..	..	..	..
i2733/43	5-SCL-D-0.5-0.6	7.89	0.061	45	..	..	..	..	..	..	..
i2733/44	5-SCL-D-0.8-0.9	8.20	0.183	143	..	..	..	..	..	..	..
i2733/45	5-SCL-D-0.9-1.0	8.30	0.244	215	..	..	..	..	..	..	..
i2733/46	N23-0.0-0.1	8.33	0.135	20	22.33	4.79	0.49	0.06	27.67	0.2	4.7
i2733/47	N23-0.2-0.3	8.71	0.111	27	17.17	7.49	0.21	0.16	25.03	0.7	2.3
i2733/48	N23-0.5-0.6	9.31	0.220	42	8.48	13.01	0.14	1.87	23.49	7.9	0.7
i2733/49	N23-0.8-0.9	9.46	0.415	225	6.60	15.76	0.17	4.31	26.84	16.0	0.4
i2733/50	N23-0.9-1.0	9.50	0.615	440	5.24	15.84	0.11	5.40	26.59	20.3	0.3
i2733/51	N24-0.0-0.1	8.59	0.099	18	21.39	5.64	0.32	0.12	27.47	0.4	3.8
i2733/52	N24-0.2-0.3	8.98	0.143	21	14.26	10.19	0.18	0.85	25.47	3.3	1.4
i2733/53	N24-0.5-0.6	9.45	0.280	122	7.95	13.82	0.15	3.18	25.09	12.7	0.6
i2733/54	N24-0.8-0.9	9.49	0.476	284	6.56	16.21	0.20	4.91	27.88	17.6	0.4
i2733/55	N24-0.9-1.0	9.48	0.594	445	6.24	16.83	0.13	5.59	28.79	19.4	0.4
i2733/56	N25-0.0-0.1	8.36	0.123	22	26.83	7.20	0.51	0.19	34.74	0.6	3.7
i2733/57	N25-0.2-0.3	9.11	0.240	108	19.44	19.10	0.17	3.36	42.08	8.0	1.0
i2733/58	N25-0.5-0.6	9.33	0.438	317	12.65	20.50	0.20	5.82	39.17	14.9	0.6
i2733/59	N25-0.8-0.9	9.30	0.614	563	8.57	16.90	0.17	5.41	31.05	17.4	0.5
i2733/60	N25-0.9-1.0	9.23	0.798	792	8.51	18.25	0.26	6.09	33.12	18.4	0.5
i2733/61	N27-0.0-0.1	8.27	0.106	15	17.10	3.65	0.47	0.06	21.28	0.3	4.7
i2733/62	N27-0.2-0.3	8.54	0.109	28	12.18	6.85	0.36	0.80	20.20	4.0	1.8
i2733/63	N27-0.5-0.6	9.10	0.324	230	13.68	13.63	0.23	4.34	31.88	13.6	1.0
i2733/64	N27-0.8-0.9	9.02	0.483	393	13.00	13.54	0.23	4.90	31.67	15.5	1.0
i2733/65	N27-0.9-1.0	8.85	0.440	447	12.43	10.32	0.32	3.26	26.34	12.4	1.2

ESSA Ref	field ref	Soil pH	Soil EC	Soil Cl	Exch.Ca	Exch. Mg	Exch.K	Exch. Na	CEC	ESP	Ca/Mg
	depth (m)		dS/m	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	Ratio
i2733/66	**32-SCL-0.0-0.1**	7.73	0.108	14	10.27	3.39	0.50	0.14	14.30	1.0	3.0
i2733/67	**32-SCL-0.2-0.3**	8.69	0.128	15	12.56	7.60	0.26	0.62	21.03	2.9	1.7
i2733/68	**32-SCL-0.5-0.6**	9.25	0.205	64	6.72	7.47	0.20	1.26	15.64	8.0	0.9
i2733/69	**32-SCL-0.8-0.9**	9.31	0.332	225	5.78	8.44	0.18	2.09	16.48	12.7	0.7
i2733/70	**32-SCL-0.9-1.0**	9.27	0.470	321	5.86	9.28	0.17	2.67	17.98	14.9	0.6
i2733/71	**80-SCL-0.0-0.1**	7.09	0.059	17	9.33	3.81	0.34	0.08	13.57	0.6	2.4
i2733/72	**80-SCL-0.22-0.3**	7.82	0.040	16	9.65	4.44	0.05	0.43	14.57	2.9	2.2
i2733/73	**80-SCL-0.5-0.6**	9.24	0.203	62	8.05	9.79	0.02	1.97	19.82	10.0	0.8
i2733/74	**80-SCL-0.8-0.9**	9.40	0.395	257	6.07	10.90	0.01	4.31	21.29	20.2	0.6
i2733/75	**80-SCL-0.9-1.0**	9.29	0.530	358	5.74	11.02	0.02	4.37	21.16	20.7	0.5
i2733/76	**N12-0.0-0.1**	7.23	0.042	22	9.06	5.72	0.40	0.34	15.52	2.2	1.6
i2733/77	**N12-0.2-0.3**	7.93	0.015	155	12.07	9.08	0.35	1.59	23.08	6.9	1.3
i2733/78	**N12-0.5-0.6**	8.63	0.484	481	13.10	14.49	0.33	2.53	30.45	8.3	0.9
i2733/79	**N12-0.8-0.9**	8.59	0.671	793	12.32	15.25	0.38	2.85	30.79	9.2	0.8
i2733/80	**N12-0.9-1.0**	8.53	0.739	747	12.46	16.26	0.52	3.17	32.41	9.8	0.8
i2733/81	**N13-0.0-0.1**	7.01	0.045	9	9.06	5.19	0.41	0.27	14.92	1.8	1.7
i2733/82	**N13-0.2-0.3**	8.03	0.204	163	12.80	11.28	0.31	1.77	26.15	6.8	1.1
i2733/83	**N13-0.5-0.6**	8.48	0.351	355	12.02	12.55	0.25	1.95	26.77	7.3	1.0
i2733/84	**N13-0.8-0.9**	8.57	0.668	683	11.16	14.61	0.27	2.35	28.40	8.3	0.8
i2733/85	**N13-0.9-1.0**	8.50	0.787	826	11.66	16.02	0.33	2.65	30.66	8.6	0.7
i2733/86	**N14-0.0-0.1**	6.85	0.031	9	6.19	3.56	0.36	0.16	10.26	1.6	1.7
i2733/87	**N14-0.2-0.3**	8.29	0.097	86	12.11	9.83	0.36	1.68	23.98	7.0	1.2
i2733/88	**N14-0.5-0.6**	8.78	0.382	368	12.90	14.21	0.40	2.46	29.98	8.2	0.9
i2733/89	**N14-0.8-0.9**	8.62	0.656	671	11.10	13.95	0.38	2.52	27.95	9.0	0.8
i2733/90	**N14-0.9-1.0**	8.57	0.731	768	10.69	13.85	0.37	2.50	27.41	9.1	0.8
i2733/91	**77-SCL-0.0-0.1**	7.71	0.115	8	20.50	6.31	0.31	0.13	27.26	0.5	3.2
i2733/92	**77-SCL-0.2-0.3**	8.47	0.014	6	22.54	10.15	0.10	0.88	33.68	2.6	2.2
i2733/93	**77-SCL-0.5-0.6**	8.71	0.022	75	16.79	13.18	0.06	2.50	32.53	7.7	1.3
i2733/94	**77-SCL-0.8-0.9**	8.71	0.439	404	17.23	17.45	0.05	4.68	39.41	11.9	1.0
i2733/95	**77-SCL-0.9-1.0**	8.48	0.703	759	16.96	19.65	0.08	6.09	42.78	14.2	0.9
i2733/96	**N26-0.0-0.1**	8.47	0.119	5	21.58	4.64	0.30	0.21	26.74	0.8	4.6
i2733/97	**N26-0.2-0.3**	8.58	0.186	19	17.76	10.92	0.06	1.79	30.53	5.9	1.6
i2733/98	**N26-0.5-0.6**	8.93	0.331	125	13.97	17.50	0.01	5.86	37.34	15.7	0.8
i2733/99	**N26-0.80-0.9**	9.21	0.526	252	13.56	20.51	0.00	8.03	42.10	19.1	0.7
i2733/100	**N26-0.9-1.0**	8.98	0.592	307	11.36	16.97	0.01	6.39	34.73	18.4	0.7
i2733/101	**N20-0.0-0.1**	7.37	0.053	4	15.93	5.34	0.28	0.14	21.70	0.7	3.0
i2733/102	**N20-0.2-0.3**	8.13	0.054	4	13.69	6.95	0.01	0.36	21.01	1.7	2.0
i2733/103	**N20-0.5-0.6**	8.90	0.154	22	10.56	9.98	0.00	1.63	22.18	7.4	1.1
i2733/104	**N20-0.75-0.85**	9.24	0.316	148	11.33	16.25	0.02	4.21	31.82	13.2	0.7
i2733/105	**N20-0.9-1.0**	9.18	0.533	420	11.57	19.78	0.08	6.42	37.84	17.0	0.6
i2733/106	**N21-0.0-0.1**	7.19	0.053	3	16.29	7.27	0.49	0.15	24.20	0.6	2.2
i2733/107	**N21-0.2-0.3**	8.10	0.071	27	13.56	8.45	0.21	0.70	22.93	3.1	1.6
i2733/108	**N21-0.5-0.58**	9.08	0.221	87	11.77	13.64	0.03	2.98	28.42	10.5	0.9
i2733/109	**N21-0.8-0.9**	9.23	0.375	304	10.73	12.67	0.06	2.81	26.27	10.7	0.8
i2733/110	**N21-0.9-1.0**	9.04	0.628	591	13.42	22.55	0.16	6.78	42.90	15.8	0.6
i2733/111	**N22-0.0-0.1**	7.41	0.069	11	15.58	5.70	1.61	0.23	23.12	1.0	2.7
i2733/112	**N22-0.2-0.3**	8.35	0.078	22	17.20	9.61	0.13	1.22	28.16	4.3	1.8
i2733/113	**N22-0.5-0.6**	8.96	0.205	83	13.62	12.30	0.02	2.54	28.48	8.9	1.1
i2733/114	**N22-0.8-0.9**	9.04	0.329	182	10.88	12.92	0.04	3.38	27.22	12.4	0.8
i2733/115	**N22-0.9-1.0**	8.98	0.499	359	12.68	17.13	0.09	4.89	34.80	14.1	0.7
i2733/116	**N15-0.0-0.1**	8.13	0.141	24	..	..	..	..	..	..	..
i2733/117	**N15-0.2-0.3**	8.64	0.134	27	..	..	..	..	..	..	..
i2733/118	**N15-0.55-0.6**	8.97	0.307	196	..	..	..	..	..	..	..
i2733/119	**N15-0.8-0.9**	8.55	0.480	409	..	..	..	..	..	..	..
i2733/120	**N15-0.9-1.0**	8.76	0.577	634	..	..	..	..	..	..	..
i2733/121	**N16-0.0-0.1**	7.92	0.089	9	..	..	..	..	..	..	..
i2733/122	**N16-0.2-0.3**	8.67	0.150	38	..	..	..	..	..	..	..
i2733/123	**N16-0.5-0.6**	8.74	0.215	120	..	..	..	..	..	..	..
i2733/124	**N16-0.8-0.9**	8.72	0.325	255	..	..	..	..	..	..	..
i2733/125	**N16-0.9-1.0**	8.78	0.392	354	..	..	..	..	..	..	..
i2733/126	**60-SCL-0.0-0.1**	7.72	0.056	9	..	..	..	..	..	..	..
i2733/127	**60-SCL-0.2-0.3**	8.90	0.145	17	..	..	..	..	..	..	..
i2733/128	**60-SCL-0.5-0.6**	8.38	0.298	163	..	..	..	..	..	..	..
i2733/129	**60-SCL-0.8-0.9**	8.72	0.454	458	..	..	..	..	..	..	..
i2733/130	**60-SCL-0.9-1.0**	8.73	0.542	633	..	..	..	..	..	..	..
i2733/131	**N17-0.0-0.1**	6.75	0.062	9	11.47	4.26	0.15	0.40	16.28	2.5	2.7
i2733/132	**N17-0.1-0.2**	8.62	0.251	39	10.86	8.81	0.12	2.29	22.08	10.4	1.2
i2733/133	**N17-0.2-0.3**	9.25	0.340	186	9.14	10.62	0.09	3.29	23.15	14.2	0.9
i2733/134	**N17-0.5-0.6**	9.43	0.608	540	6.39	9.85	0.10	4.21	20.55	20.5	0.6
i2733/135	**N17-0.8-0.88**	9.31	0.815	800	5.77	9.47	0.09	4.64	19.97	23.2	0.6
i2733/136	**N18-0.0-0.1**	7.26	0.066	9	10.64	3.58	0.12	0.20	14.54	1.4	3.0
i2733/137	**N18-0.2-0.3**	8.94	0.281	112	8.51	8.98	0.07	2.71	20.26	13.4	0.9
i2733/138	**N18-0.5-0.6**	9.34	0.634	508	6.10	11.02	0.12	4.50	21.74	20.7	0.6
i2733/139	**N18-0.8-0.9**	9.51	0.500	916	6.19	12.75	0.17	5.87	24.98	23.5	0.5
i2733/140	**N18-0.9-1.0**	8.94	1.137	1194	6.82	15.18	0.19	7.26	29.45	24.7	0.4
i2733/141	**N19-0.0-0.1**	8.28	0.142	22	11.36	2.99	0.49	0.25	15.09	1.6	3.8
i2733/142	**N19-0.2-0.3**	8.78	0.167	20	10.80	6.88	0.25	1.06	18.99	5.6	1.6
i2733/143	**N19-0.5-0.6**	9.25	0.291	147	6.98	8.26	0.07	2.21	17.52	12.6	0.8
i2733/144	**N19-0.8-0.9**	9.39	0.427	258	5.53	8.20	0.08	2.75	16.55	16.6	0.7
i2733/145	**N19-0.9-0.95**	9.42	0.611	461	5.13	8.99	0.15	3.43	17.69	19.4	0.6

Soil Analysis Report
Batch Numbers: I2733

Date Received: 13/06/2019
Date Completed:14/07/2019

Client: GTE Saraji Results Page 2 of2

Lab No	Sample No	ADMC	Gravel	CS>50µm	CS>20µm	2-50µm-Silt	2-20µm-Silt	Clay <2µm	15 Bar
	Depth (m)	%	%	%	%	%	%	%	%
i2733/1	6-SCL-0.0-0.1	23.1%	1.7%	38.5%	38.2%	13.4%	13.6%	48.2%	
i2733/2	6-SCL-0.2-0.3	16.8%	2.2%	47.5%	52.4%	10.9%	5.9%	41.6%	
i2733/3	6-SCL-0.5-0.6	14.6%	2.1%	39.6%	43.2%	11.0%	7.3%	49.5%	
i2733/4	6-SCL-0.8-0.9	15.6%	2.0%	39.5%	41.5%	11.0%	9.0%	49.5%	
i2733/5	6-SCL-0.9-1.0	14.3%	1.2%	52.4%	54.3%	10.8%	8.9%	36.8%	
i2733/6	7-SCL-0.0-0.1	19.9%	0.6%	49.3%	54.8%	15.3%	9.8%	35.5%	19
i2733/7	7-SCL-0.2-0.3	14.6%	0.5%	47.7%	51.9%	12.6%	8.4%	39.6%	24
i2733/8	7-SCL-0.5-0.6	15.0%	2.8%	32.6%	40.2%	21.4%	13.8%	46.0%	26
i2733/9	7-SCL-0.8-0.9	12.8%	8.5%	53.2%	59.9%	13.3%	6.6%	33.5%	20
i2733/10	7-SCL-0.9-1.0	13.8%	2.0%	40.8%	46.8%	18.1%	12.0%	41.1%	21
i2733/11	100-SCL-0.0-0.1	18.9%	0.1%	40.1%	48.3%	17.4%	9.2%	42.5%	
i2733/12	100-SCL-0.2-0.3	14.4%	0.6%	38.0%	45.9%	20.6%	12.7%	41.4%	
i2733/13	100-SCL-0.5-0.6	16.0%	0.2%	37.5%	42.6%	16.8%	11.6%	45.8%	
i2733/14	100-SCL-0.8-0.9	17.8%	0.1%	31.1%	34.9%	13.5%	9.8%	55.3%	
i2733/15	100-SCL-0.9-1.0	16.8%	0.5%	32.7%	34.9%	16.3%	14.2%	50.9%	
i2733/16	102-SCL-D-0.0-0.1	18.1%	0.4%	39.3%	43.2%	15.1%	11.2%	45.6%	
i2733/17	102-SCL-D-0.2-0.3	17.0%	0.7%	27.7%	31.5%	15.0%	11.2%	57.3%	
i2733/18	102-SCL-D-0.5-0.6	15.3%	1.0%	28.7%	32.5%	11.8%	8.0%	59.4%	
i2733/19	102-SCL-D-0.8-0.9	16.6%	2.8%	28.6%	30.5%	12.2%	10.2%	59.2%	
i2733/20	102-SCL-D-0.9-1.0	18.3%	2.9%	28.1%	32.4%	12.7%	8.5%	59.1%	
i2733/21	102-SCL-M-0.0-0.1	15.1%	4.8%	61.6%	64.6%	9.5%	6.4%	29.0%	
i2733/22	102-SCL-M-0.2-0.3	11.8%	0.3%	51.1%	54.3%	10.8%	7.6%	38.1%	
i2733/23	102-SCL-M-0.5-0.6	11.8%	0.9%	47.4%	50.4%	11.2%	8.3%	41.4%	
i2733/24	102-SCL-M-0.83-0.9	11.6%	8.8%	46.0%	47.7%	8.9%	7.2%	45.1%	
i2733/25	102-SCL-M-0.9-1.0	12.7%	5.3%	32.7%	36.6%	19.6%	15.7%	47.7%	
i2733/26	103-SCL-D-0.0-0.1	19.2%	0.2%	30.1%	33.7%	20.0%	16.4%	49.8%	
i2733/27	103-SCL-D-0.2-0.3	15.0%	0.2%	16.8%	29.8%	26.1%	13.1%	57.1%	
i2733/28	103-SCL-D-0.5-0.6	13.4%	0.0%	24.9%	28.4%	16.4%	13.0%	58.6%	
i2733/29	103-SCL-D-0.8-0.9	14.6%	0.1%	28.6%	32.2%	16.0%	12.3%	55.5%	
i2733/30	103-SCL-D-0.9-1.0	14.7%	0.3%	33.3%	36.9%	15.6%	12.0%	51.1%	
i2733/31	103-SCL-M-0.0-0.1	15.0%	2.0%	52.0%	57.3%	12.6%	7.3%	35.4%	
i2733/32	103-SCL-M-0.2-0.3	11.0%	0.3%	52.6%	55.7%	8.7%	5.6%	38.8%	
i2733/33	103-SCL-M-0.5-0.6	10.8%	3.1%	49.0%	57.7%	12.8%	4.1%	38.2%	
i2733/34	103-SCL-M-0.8-0.9	10.6%	5.7%	55.7%	59.2%	10.9%	7.4%	33.4%	
i2733/35	103-SCL-M-0.9-1.0	11.7%	3.1%	52.3%	55.6%	9.6%	6.2%	38.2%	
i2733/36	5-SCL-M-0.0-0.1	24.6%	4.7%	30.5%	37.0%	16.9%	10.4%	52.6%	
i2733/37	5-SCL-M-0.2-0.3	18.5%	2.4%	30.4%	35.7%	14.5%	9.2%	55.1%	
i2733/38	5-SCL-M-0.5-0.6	18.8%	3.9%	32.6%	36.9%	13.6%	9.3%	53.8%	
i2733/39	5-SCL-M-0.8-0.9	18.2%	5.9%	27.3%	32.7%	13.4%	8.0%	59.2%	
i2733/40	5-SCL-M-0.9-1.0	17.3%	13.2%	30.9%	35.6%	12.3%	7.5%	56.9%	
i2733/41	5-SCL-D-0.0-0.1	24.6%	0.4%	31.5%	35.4%	13.8%	9.9%	54.7%	
i2733/42	5-SCL-D-0.2-0.3	19.8%	0.3%	24.9%	29.0%	14.8%	10.7%	60.4%	
i2733/43	5-SCL-D-0.5-0.6	19.5%	0.3%	22.6%	26.2%	13.2%	9.5%	64.3%	
i2733/44	5-SCL-D-0.8-0.9	19.7%	0.2%	17.6%	21.7%	11.3%	7.2%	71.1%	
i2733/45	5-SCL-D-0.9-1.0	21.3%	3.9%	16.8%	21.1%	11.7%	7.4%	71.5%	
i2733/46	N23-0.0-0.1	11.2%	0.6%	57.1%	56.7%	11.5%	11.9%	31.4%	
i2733/47	N23-0.2-0.3	11.4%	2.9%	46.6%	50.4%	13.3%	9.5%	40.1%	
i2733/48	N23-0.5-0.6	11.0%	3.9%	38.5%	44.5%	21.1%	15.1%	40.4%	
i2733/49	N23-0.8-0.9	11.6%	1.8%	33.1%	34.8%	18.0%	16.3%	48.9%	
i2733/50	N23-0.9-1.0	12.6%	1.8%	35.1%	39.9%	13.8%	8.9%	51.1%	
i2733/51	N24-0.0-0.1	12.7%	2.5%	60.1%	59.9%	5.5%	5.7%	34.4%	
i2733/52	N24-0.2-0.3	12.0%	2.1%	51.9%	54.8%	11.0%	8.0%	37.1%	
i2733/53	N24-0.5-0.6	11.4%	2.4%	43.5%	47.0%	17.1%	13.6%	39.4%	
i2733/54	N24-0.8-0.9	11.8%	1.2%	33.2%	37.7%	20.0%	15.4%	46.8%	
i2733/55	N24-0.9-1.0	12.6%	0.7%	39.3%	43.9%	15.5%	10.8%	45.2%	
i2733/56	N25-0.0-0.1	15.3%	1.2%	59.0%	60.6%	9.6%	8.0%	31.4%	
i2733/57	N25-0.2-0.3	18.0%	0.4%	41.0%	46.3%	9.7%	4.3%	49.3%	
i2733/58	N25-0.5-0.6	17.4%	2.0%	48.5%	53.0%	9.2%	4.6%	42.4%	
i2733/59	N25-0.8-0.9	15.8%	0.7%	42.3%	42.1%	8.6%	8.7%	49.2%	
i2733/60	N25-0.9-1.0	15.8%	1.7%	34.5%	36.6%	10.9%	8.8%	54.6%	
i2733/61	N27-0.0-0.1	9.6%	1.0%	72.0%	71.2%	1.4%	2.2%	26.6%	
i2733/62	N27-0.2-0.3	8.9%	0.4%	67.6%	71.0%	6.1%	2.7%	26.3%	
i2733/63	N27-0.5-0.6	11.0%	1.2%	52.1%	54.0%	6.8%	5.0%	41.0%	
i2733/64	N27-0.8-0.9	12.7%	3.9%	48.3%	50.0%	11.4%	9.6%	40.4%	
i2733/65	N27-0.9-1.0	11.9%	3.4%	38.6%	44.4%	17.2%	11.3%	44.3%	

Lab No	Sample No	ADMC	Gravel	CS>50µm	CS>20µm	2-50µm-Silt	2-20µm-Silt	Clay <2µm	15 Bar
	Depth (m)	%	%	%	%	%	%	%	%
i2733/66	32-SCL-0.0-0.1	9.9%	1.3%	64.4%	68.0%	11.9%	8.4%	23.7%	
i2733/67	32-SCL-0.2-0.3	9.6%	0.7%	53.2%	55.9%	8.6%	5.9%	38.2%	
i2733/68	32-SCL-0.5-0.6	7.9%	2.4%	57.6%	60.6%	11.1%	8.2%	31.3%	
i2733/69	32-SCL-0.8-0.9	7.5%	4.2%	61.7%	57.5%	9.4%	13.6%	29.0%	
i2733/70	32-SCL-0.9-1.0	8.7%	1.0%	55.7%	60.2%	11.7%	7.2%	32.6%	
i2733/71	80-SCL-0.0-0.1	9.6%	0.2%	77.8%	79.7%	3.9%	1.9%	18.4%	
i2733/72	80-SCL-0.22-0.3	7.1%	0.9%	65.2%	68.1%	12.1%	9.2%	22.7%	
i2733/73	80-SCL-0.5-0.6	8.5%	0.5%	59.4%	63.3%	9.7%	5.8%	30.9%	
i2733/74	80-SCL-0.8-0.9	8.1%	1.1%	55.1%	60.8%	11.4%	5.7%	33.5%	
i2733/75	80-SCL-0.9-1.0	9.3%	1.3%	58.2%	63.3%	11.2%	6.2%	30.5%	
i2733/76	N12-0.0-0.1	12.1%	0.2%	54.2%	66.3%	22.8%	10.6%	23.1%	
i2733/77	N12-0.2-0.3	12.6%	0.2%	48.1%	57.5%	15.4%	6.0%	36.5%	
i2733/78	N12-0.5-0.6	12.5%	1.3%	30.6%	44.2%	23.1%	9.4%	46.3%	
i2733/79	N12-0.8-0.9	12.2%	0.8%	38.6%	45.2%	16.6%	10.0%	44.8%	
i2733/80	N12-0.9-1.0	11.7%	1.8%	39.6%	50.6%	20.3%	9.3%	40.0%	
i2733/81	N13-0.0-0.1	11.3%	0.2%	55.8%	70.7%	17.7%	2.8%	26.5%	
i2733/82	N13-0.2-0.3	11.8%	0.0%	38.0%	49.2%	17.0%	5.8%	44.9%	
i2733/83	N13-0.5-0.6	11.1%	0.5%	37.4%	48.1%	16.3%	5.6%	46.3%	
i2733/84	N13-0.8-0.9	11.5%	0.8%	35.8%	47.0%	19.4%	8.2%	44.7%	
i2733/85	N13-0.9-1.0	11.6%	0.4%	40.8%	47.9%	12.1%	5.1%	47.1%	
i2733/86	N14-0.0-0.1	9.6%	0.2%	60.3%	72.3%	22.6%	10.6%	17.1%	
i2733/87	N14-0.2-0.3	12.7%	0.0%	36.4%	47.1%	16.8%	6.1%	46.8%	
i2733/88	N14-0.5-0.6	12.4%	0.7%	30.8%	47.4%	25.2%	8.6%	44.0%	
i2733/89	N14-0.8-0.9	11.7%	0.8%	40.6%	49.1%	16.7%	8.1%	42.7%	
i2733/90	N14-0.9-1.0	11.9%	1.0%	38.2%	44.7%	15.7%	9.2%	46.1%	
i2733/91	77-SCL-0.0-0.1	15.2%	0.8%	58.6%	61.8%	10.8%	7.6%	30.6%	
i2733/92	77-SCL-0.2-0.3	12.6%	1.1%	45.7%	52.3%	13.9%	7.3%	40.4%	
i2733/93	77-SCL-0.5-0.6	12.9%	0.6%	51.3%	58.2%	11.1%	4.3%	37.6%	
i2733/94	77-SCL-0.8-0.9	15.9%	0.3%	43.1%	46.7%	12.5%	8.8%	44.5%	
i2733/95	77-SCL-0.9-1.0	16.4%	0.0%	35.5%	44.2%	16.8%	8.0%	47.7%	
i2733/96	N26-0.0-0.1	13.6%	5.0%	59.7%	67.4%	10.7%	3.0%	29.6%	
i2733/97	N26-0.2-0.3	13.9%	5.1%	56.1%	59.8%	9.0%	5.2%	35.0%	
i2733/98	N26-0.5-0.6	17.0%	4.1%	45.3%	50.3%	10.4%	5.4%	44.3%	
i2733/99	N26-0.80-0.9	17.5%	7.0%	42.0%	46.3%	14.2%	10.0%	43.8%	
i2733/100	N26-0.9-1.0	13.9%	10.0%	50.0%	54.1%	10.9%	6.7%	39.1%	
i2733/101	N20-0.0-0.1	9.4%	2.4%	60.2%	60.6%	12.6%	12.2%	27.2%	
i2733/102	N20-0.2-0.3	8.9%	2.2%	65.0%	68.0%	9.1%	6.0%	25.9%	
i2733/103	N20-0.5-0.6	9.0%	4.5%	63.5%	67.3%	8.1%	4.3%	28.4%	
i2733/104	N20-0.75-0.85	11.0%	6.4%	57.2%	55.9%	6.9%	8.2%	35.8%	
i2733/105	N20-0.9-1.0	13.5%	3.1%	44.8%	48.7%	9.1%	5.2%	46.1%	
i2733/106	N21-0.0-0.1	10.7%	3.2%	66.0%	66.6%	4.5%	4.0%	29.4%	
i2733/107	N21-0.2-0.3	10.6%	2.9%	60.3%	61.9%	8.3%	6.7%	31.4%	
i2733/108	N21-0.5-0.58	11.4%	4.8%	56.4%	58.1%	6.8%	5.1%	36.8%	
i2733/109	N21-0.8-0.9	12.6%	4.5%	46.0%	51.8%	11.7%	5.9%	42.3%	
i2733/110	N21-0.9-1.0	14.8%	2.9%	37.3%	41.2%	11.1%	7.2%	51.6%	
i2733/111	N22-0.0-0.1	11.5%	0.7%	62.9%	64.9%	10.3%	8.3%	26.8%	
i2733/112	N22-0.2-0.3	11.5%	2.2%	60.5%	62.1%	9.1%	7.4%	30.4%	
i2733/113	N22-0.5-0.6	11.4%	2.8%	61.9%	61.9%	8.7%	8.7%	29.4%	
i2733/114	N22-0.8-0.9	12.4%	4.2%	56.8%	60.7%	6.0%	2.1%	37.3%	
i2733/115	N22-0.9-1.0	13.9%	7.3%	51.5%	55.5%	7.7%	3.7%	40.8%	
i2733/116	N15-0.0-0.1	17.6%	1.5%	51.4%	59.9%	11.3%	2.8%	37.2%	
i2733/117	N15-0.2-0.3	15.7%	2.2%	41.4%	47.5%	12.6%	6.4%	46.0%	
i2733/118	N15-0.55-0.6	15.9%	4.8%	41.9%	46.2%	11.8%	7.5%	46.3%	
i2733/119	N15-0.8-0.9	16.2%	6.8%	41.5%	48.1%	15.1%	8.5%	43.4%	
i2733/120	N15-0.9-1.0	16.7%	7.9%	35.6%	39.9%	12.3%	8.0%	52.1%	
i2733/121	N16-0.0-0.1	16.1%	0.4%	53.7%	59.5%	13.7%	7.9%	32.6%	
i2733/122	N16-0.2-0.3	14.8%	0.2%	52.0%	58.1%	10.9%	4.8%	37.1%	
i2733/123	N16-0.5-0.6	16.1%	0.2%	40.3%	53.3%	20.5%	7.5%	39.2%	
i2733/124	N16-0.8-0.9	18.8%	0.2%	40.1%	44.6%	16.7%	12.2%	43.2%	
i2733/125	N16-0.9-1.0	18.9%	2.0%	39.8%	46.7%	12.1%	5.2%	48.1%	
i2733/126	60-SCL-0.0-0.1	17.6%	0.2%	53.1%	56.8%	10.3%	6.6%	36.6%	
i2733/127	60-SCL-0.2-0.3	15.9%	1.0%	44.3%	48.3%	14.3%	10.4%	41.4%	
i2733/128	60-SCL-0.5-0.6	17.0%	0.4%	38.9%	42.8%	14.1%	10.2%	47.0%	
i2733/129	60-SCL-0.8-0.9	18.1%	0.9%	36.3%	40.9%	13.5%	9.0%	50.2%	
i2733/130	60-SCL-0.9-1.0	17.5%	4.1%	36.0%	40.4%	10.3%	5.9%	53.7%	
i2733/131	N17-0.0-0.1	7.8%	2.2%	76.9%	76.4%	5.5%	6.0%	17.6%	
i2733/132	N17-0.1-0.2	10.3%	1.0%	63.6%	67.4%	7.1%	3.3%	29.3%	
i2733/133	N17-0.2-0.3	9.9%	5.1%	66.1%	69.6%	5.0%	1.5%	28.9%	
i2733/134	N12-0.5-0.6	9.4%	5.9%	60.3%	65.7%	11.3%	5.9%	28.4%	
i2733/135	N12-0.8-0.88	9.1%	23.7%	52.9%	57.3%	13.7%	9.4%	33.4%	
i2733/136	N18-0.0-0.1	7.7%	4.3%	74.2%	73.6%	4.2%	4.9%	21.5%	
i2733/137	N18-0.2-0.3	10.5%	2.6%	60.7%	62.3%	4.8%	3.2%	34.6%	
i2733/138	N18-0.5-0.6	10.7%	2.4%	51.5%	55.0%	8.0%	4.5%	40.6%	
i2733/139	N18-0.8-0.9	11.7%	15.2%	43.0%	49.8%	19.6%	12.9%	37.4%	
i2733/140	N18-0.9-1.0	12.5%	17.8%	41.6%	51.4%	20.9%	11.2%	37.5%	
i2733/141	N19-0.0-0.1	7.6%	3.6%	82.4%	87.8%	11.3%	5.9%	6.3%	
i2733/142	N19-0.2-0.3	10.8%	4.6%	56.8%	65.5%	12.4%	3.7%	30.8%	
i2733/143	N19-0.5-0.6	9.8%	2.5%	58.6%	73.2%	13.2%	-1.5%	28.2%	
i2733/144	N19-0.8-0.9	8.3%	3.1%	67.1%	70.7%	9.4%	5.8%	23.5%	
i2733/145	N19-0.9-0.95	9.5%	6.5%	60.2%	65.6%	12.4%	7.0%	27.4%	

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METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name	Method Description
pH	4A1	1.1	0.1	pH	pH	1:5 water extr, pH meter
EC	3A1	5.4	0.01	dS/m	Electrical conductivity	1:5 water extr, EC meter
Cl	5A2	10.0	10.0	mg/kg	Chloride	1:5 water extr, (AA) colorimetric
NO3-N	7C2	6.7	1.0	mg/kg	Nitrate-nitrogen	1:5 water extr, (AA) colorimetric
NH4-N	7C2	7.8	0.6	mg/kg	Ammonium-nitrogen	1M KCl extr, (AA) colorimetric
Bicarb.P	9B2	16.8	1.0	mg/kg	Bicarb.ext.phosphorus	0.5M NaHCO3 @ pH 8.5, (AA) colorimetric
Exch.Ca	15B/C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Mg	15B/C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Na	15B/C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.K	15B/C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO3 + Ca(NO3)2 extr, (AA) colorimetric
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Content	Gravimetric oven dry @ 105C
R1	NA	20.2	NA		Dispersion Ratio	Ratio [Aqueous dispersible (Silt + Clay):Total (Silt + Clay)]
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur	Ca(H2PO4)2 @ pH 4.0 extractable sulfate-sulfur, ICPOES
Sand	no ref	22.1	1.0	%	Particle size, sand	Hydrometer, gravimetric & Sieve
Silt	no ref	16.6	1.0	%	Particle size, silt	Hydrometer, gravimetric
Clay	no ref	12.7	1.0	%	Particle size, clay	Hydrometer, gravimetric

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

For Manager Analytical Services: **D E Baker BSc MASSSI**

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.

Soluble Salts included in Exchangeable Cations - Except PRE-WASHED (if EC>0.3dS/m).

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QUALITY CONTROL DATA

Soil

Reference: I2733

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia*. CSIRO Publishing: Collingwood.

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	B		5.0 - 5.3
EC	dS/m	B		0.27 - 0.32
Cl	mg/kg	B		10 - 35
NO3-N	mg/kg	B		10 - 16
NH4-N	mg/kg	NA		NA
Bicarb.P	mg/kg	B		51 -75
Total Kjeldahl N	%	ASPAC 34	0.110	.100 - .120
Total P	%	ASPAC 34	0.02	.019 - .021
Organic Carbon	%	B		1.82 - 2.3
Ca (Exch. cations)pH7	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH7	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH7	meq/100g	B		.057 - .182
K (Exch. cations)pH7	meq/100g	B		1.209 - 1.411
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	B	17.0	17.3 - 22.4
Fine Sand	%	B	22.0	20.0 - 25.7
Silt	%	B	16.0	10.5 - 19.8
Clay	%	B	44.0	37.9 - 48.9
R1		B		0.23 - 0.38

Test Method	Units	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	mg/kg	SB		2.37 - 3.25
DTPA-Zn	mg/kg	SB		3.15 - 3.81
DTPA-Mn	mg/kg	SB		97.7 - 149.0
DTPA-Fe	mg/kg	SB		24.3 - 32.6
0.33 Bar	%	G		32 - 51
15 Bar	%	G		23 - 30
Ca (Exch. cations)pH8.5	meq/100g	S12		27.7 - 35.4
Mg (Exch. cations)pH8.5	meq/100g	S12		22.88 - 24.5
Na (Exch. cations)pH8.5	meq/100g	S12		2.0 - 2.28
K (Exch. cations)pH8.5	meq/100g	S12		1.64 - 2.09

ESSA Pty Ltd /EAL NATA (ASPAC certified)

For Info Refer ESSA Pty Ltd
PO Box 442 Sunnybank Q 4109

Phone: 0403245560

email: e.s.s.a@bigpond.net.au

References: I3569

Date Received: 09/07/2019
Date Completed: 31/07/2019 Reissue 24/2/21

FINAL REPORT

Project:

Project -Saraji East (18SRE) No 2

All results in this report relate only to the items tested. Results are expressed on an "as received basis".

Client Name: GT Environmental

Contact: Mr Reece Mc Cann

Sample Type: Soil

Number of samples: 85

ESSA /EAL Pty Ltd **(NATA,ASPAC Approved)**

Soil Analysis Report
Batch Number: I3569

Date Received: 09/07/2019
Date Completed:31/07/2019

Client: GTE SARAJI Part 2- Results Page 1 of 2

ESSA Ref	field ref	Soil pH	Soil EC	Soil Cl	Exch.Ca	Exch. Mg	Exch.K	Exch. Na	CEC	ESP	Ca/Mg
	depth (m)		dS/m	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	Ratio
I3569/1	N45-SCL-0.0-0.05	8.36	0.115	14	22.54	3.74	0.27	0.08	26.63	0.3	6.0
I3569/2	N45-SCL-0.25-0.3	8.80	0.164	40	15.73	10.28	0.13	1.41	27.55	5.1	1.5
I3569/3	N45-SCL-0.5-0.6	8.92	0.445	333	12.80	15.36	0.24	3.47	31.88	10.9	0.8
I3569/4	N45-SCL-0.8-0.9	8.93	0.824	803	10.26	14.78	0.27	3.83	29.14	13.1	0.7
I3569/5	N45-SCL-0.9-1.0	8.94	0.827	840	10.67	15.68	0.28	3.96	30.59	12.9	0.7
I3569/6	N28-SCL-0.0-0.05	8.10	0.107	13	18.46	2.54	0.41	0.06	21.46	0.3	7.3
I3569/7	N28-SCL-0.2-0.3	8.46	0.089	23	15.14	5.85	0.23	0.42	21.65	2.0	2.6
I3569/8	N28-SCL-0.5-0.6	8.99	0.346	227	12.50	15.12	0.33	2.88	30.84	9.4	0.8
I3569/9	N28-SCL-0.8-0.9	9.09	0.588	522	8.67	13.10	0.28	2.79	24.84	11.2	0.7
I3569/10	N28-SCL-0.9-1.0	9.04	0.701	686	9.03	14.19	0.32	3.24	26.78	12.1	0.6
I3569/11	N43-SCL-0.0-0.1	8.26	0.122	16	17.36	3.28	0.49	0.06	21.19	0.3	5.3
I3569/12	N43-SCL-0.2-0.3	8.27	0.090	17	15.98	5.30	0.37	0.19	21.84	0.9	3.0
I3569/13	N43-SCL-0.5-0.6	8.79	0.258	157	13.55	11.83	0.24	1.48	27.10	5.5	1.1
I3569/14	N43-SCL-0.8-0.9	9.04	0.376	270	10.08	12.97	0.39	2.12	25.56	8.3	0.8
I3569/15	N43-SCL-0.9-1.0	8.93	0.827	910	9.14	15.09	0.49	3.59	28.30	12.7	0.6
I3569/16	N29-SCL-0.0-0.10	8.69	0.097	8	..	..	..	..	..	..	..
I3569/17	N29-SCL-0.2-0.3	8.87	0.123	13	..	..	..	..	..	..	..
I3569/18	N29-SCL-0.5-0.6	9.18	0.178	30	..	..	..	..	..	..	..
I3569/19	N29-SCL-0.8-0.9	9.39	0.256	18	..	..	..	..	..	..	..
I3569/20	N29-SCL-0.9-1.0	9.42	0.344	14	..	..	..	..	..	..	..
I3569/21	N30-SCL-0.0-0.1	8.35	0.113	24	..	..	..	..	..	..	..
I3569/22	N30-SCL-0.2-0.3	8.80	0.117	11	..	..	..	..	..	..	..
I3569/23	N30-SCL-0.5-0.6	9.21	0.183	14	..	..	..	..	..	..	..
I3569/24	N30-SCL-0.8-0.9	9.41	0.223	17	..	..	..	..	..	..	..
I3569/25	N30-SCL-0.9-1.0	9.07	0.172	11	..	..	..	..	..	..	..
I3569/26	N34-SCL-0.0-0.1	9.06	0.170	24	..	..	..	..	..	..	..
I3569/27	N34-SCL-0.2-0.3	8.88	0.099	14	..	..	..	..	..	..	..
I3569/28	N34-SCL-0.5-0.6	9.19	0.182	11	..	..	..	..	..	..	..
I3569/29	N34-SCL-0.8-0.9	9.41	0.233	22	..	..	..	..	..	..	..
I3569/30	N34-SCL-0.9-1.0	9.48	0.285	25	..	..	..	..	..	..	..
I3569/31	N31-SCL-0.0-0.1	8.54	0.084	12	..	..	..	..	..	..	..
I3569/32	N31-SCL-0.2-0.3	8.34	0.082	21	..	..	..	..	..	..	..
I3569/33	N31-SCL-0.5-0.6	8.44	0.167	18	..	..	..	..	..	..	..
I3569/34	N31-SCL-0.8-0.9	8.88	0.112	21	..	..	..	..	..	..	..
I3569/35	N31-SCL-0.9-1.0	9.02	0.178	12	..	..	..	..	..	..	..
I3569/36	N32-SCL-0.0-0.1	8.32	0.138	16	..	..	..	..	..	..	..
I3569/37	N32-SCL-0.2-0.3	8.51	0.146	15	..	..	..	..	..	..	..
I3569/38	N32-SCL-0.5-0.6	8.90	0.190	16	..	..	..	..	..	..	..
I3569/39	N32-SCL-0.8-0.9	9.12	0.226	14	..	..	..	..	..	..	..
I3569/40	N32-SCL-0.9-1.0	9.11	0.246	14	..	..	..	..	..	..	..
I3569/41	N33-SCL-0.0-0.1	8.22	0.079	24	..	..	..	..	..	..	..
I3569/42	N33-SCL-0.2-0.3	8.92	0.196	15	..	..	..	..	..	..	..
I3569/43	N33-SCL-0.5-0.6	9.23	0.248	11	..	..	..	..	..	..	..
I3569/44	N33-SCL-0.8-0.9	8.71	0.091	14	..	..	..	..	..	..	..
I3569/45	N33-SCL-0.9-1.0	9.27	0.300	12	..	..	..	..	..	..	..
I3569/46	N35-SCL-0.0-0.04	8.70	0.091	7	..	..	..	..	..	..	..
I3569/47	N35-SCL-0.2-0.3	8.68	0.140	24	..	..	..	..	..	..	..
I3569/48	N35-SCL-0.5-0.6	8.99	0.214	33	..	..	..	..	..	..	..
I3569/49	N35-SCL-0.8-0.9	9.10	0.261	75	..	..	..	..	..	..	..
I3569/50	N35-SCL-0.9-1.0	9.12	0.353	149	..	..	..	..	..	..	..
I3569/51	N36-SCL-0.0-0.05	8.69	0.090	11	..	..	..	..	..	..	..
I3569/52	N36-SCL-0.2-0.3	8.46	0.133	32	..	..	..	..	..	..	..
I3569/53	N36-SCL-0.5-0.6	8.50	0.117	25	..	..	..	..	..	..	..
I3569/54	N36-SCL-0.8-0.9	8.80	0.190	39	..	..	..	..	..	..	..
I3569/55	N36-SCL-0.9-1.0	8.90	0.248	66	..	..	..	..	..	..	..
I3569/56	N37-SCL-0.0-0.05	8.70	0.089	8	..	..	..	..	..	..	..
I3569/57	N37-SCL-0.2-0.3	8.67	0.120	17	..	..	..	..	..	..	..
I3569/58	N37-SCL-0.5-0.6	8.86	0.118	24	..	..	..	..	..	..	..
I3569/59	N37-SCL-0.8-0.9	8.99	0.233	49	..	..	..	..	..	..	..
I3569/60	N37-SCL-0.9-1.0	9.04	0.288	99	..	..	..	..	..	..	..
I3569/61	N38-SCL-0.0-0.1	8.03	0.091	37	..	..	..	..	..	..	..
I3569/62	N38-SCL-0.2-0.3	7.72	0.068	68	..	..	..	..	..	..	..
I3569/63	N38-SCL-0.5-0.6	8.04	0.168	221	..	..	..	..	..	..	..
I3569/64	N38-SCL-0.8-0.9	8.59	0.543	640	..	..	..	..	..	..	..
I3569/65	N38-SCL-0.9-1.0	8.59	0.615	802	..	..	..	..	..	..	..
I3569/66	N39-SCL-0.0-0.1	7.69	0.058	18	..	..	..	..	..	..	..
I3569/67	N39-SCL-0.2-0.3	7.90	0.051	33	..	..	..	..	..	..	..
I3569/68	N39-SCL-0.5-0.6	8.49	0.173	220	..	..	..	..	..	..	..
I3569/69	N39-SCL-0.8-0.9	8.75	0.443	534	..	..	..	..	..	..	..
I3569/70	N39-SCL-0.9-1.0	8.74	0.561	562	..	..	..	..	..	..	..
I3569/71	N40-SCL-0.0-0.1	7.92	0.056	8	..	..	..	..	..	..	..
I3569/72	N40-SCL-0.2-0.3	8.76	0.133	11	..	..	..	..	..	..	..
I3569/73	N40-SCL-0.5-0.6	9.04	0.235	107	..	..	..	..	..	..	..
I3569/74	N40-SCL-0.8-0.9	8.98	0.426	384	..	..	..	..	..	..	..
I3569/75	N40-SCL-0.9-1.0	8.80	0.628	669	..	..	..	..	..	..	..
I3569/76	N41-SCL-0.0-0.1	7.27	0.036	9	9.77	4.81	0.16	0.16	14.90	1.1	2.0
I3569/77	N41-SCL-0.2-0.3	7.70	0.049	9	6.73	4.20	0.41	0.09	11.44	0.8	1.6
I3569/78	N41-SCL-0.5-0.6	7.95	0.036	9	5.86	5.00	0.55	0.22	11.63	1.9	1.2
I3569/79	N41-SCL-0.8-0.9	8.28	0.060	12	6.10	6.29	0.50	0.41	13.31	3.1	1.0
I3569/80	N41-SCL-0.9-1.0	8.51	0.170	17	8.21	7.32	0.45	0.37	16.35	2.3	1.1
I3569/81	N42-SCL.0-0.1	7.02	0.035	8	9.03	3.99	0.16	<0.065	13.23	0.4	2.3
I3569/82	N42-SCL-0.2-0.3	7.79	0.025	9	8.00	4.51	0.37	0.05	12.92	0.4	1.8
I3569/83	N42-SCL-0.5-0.6	7.97	0.027	7	5.84	4.45	0.37	0.15	10.81	1.4	1.3
I3569/84	N42-SCL-0.8-0.9	8.32	0.066	12	6.26	5.93	0.40	0.36	12.95	2.7	1.1
I3569/85	N42-SCL-0.9-1.0	8.80	0.162	21	8.55	8.99	0.37	0.55	18.45	3.0	1.0

Soil Analysis Report
Batch Numbers: I3569

Date Received: 09/07/2019
Date Completed:31/07/2019

Client: GTE SarajiPart 2 Results Page 2 of2

Lab No	Sample No	ADMC	Gravel	CS>50µm	CS>20µm	2-50µm-Silt	2-20µm-Silt	Clay <2µm	15 Bar
	Depth (m)	%	%	%	%	%	%	%	%
I3569/1	N45-SCL-0.0-0.05	10	0	56	61	19	13	25	
I3569/2	N45-SCL-0.25-0.3	14	0	51	57	12	6	37	
I3569/3	N45-SCL-0.5-0.6	17	1	42	44	7	5	51	
I3569/4	N45-SCL-0.8-0.9	16	3	48	52	9	5	42	
I3569/5	N45-SCL-0.9-1.0	17	1	40	44	8	5	51	
I3569/6	N28-SCL-0.0-0.05	9	0	67	72	14	9	20	17
I3569/7	N28-SCL-0.2-0.3	11	1	60	66	11	6	29	17
I3569/8	N28-SCL-0.5-0.6	16	2	38	48	16	6	46	25
I3569/9	N28-SCL-0.8-0.9	14	3	51	55	11	7	38	22
I3569/10	N28-SCL-0.9-1.0	14	4	42	49	14	7	44	22
I3569/11	N43-SCL-0.0-0.1	8	0	62	67	11	6	27	15
I3569/12	N43-SCL-0.2-0.3	10	1	61	64	9	6	30	15
I3569/13	N43-SCL-0.5-0.6	14	1	48	52	10	6	42	23
I3569/14	N43-SCL-0.8-0.9	13	3	49	51	9	7	42	21
I3569/15	N43-SCL-0.9-1.0	13	2	47	51	10	6	43	21
I3569/16	N29-SCL-0.0-0.10	15	1	45	50	14	8	41	
I3569/17	N29-SCL-0.2-0.3	16	2	51	57	12	6	37	
I3569/18	N29-SCL-0.5-0.6	15	5	50	53	11	7	40	
I3569/19	N29-SCL-0.8-0.9	18	2	40	44	14	10	46	
I3569/20	N29-SCL-0.9-1.0	19	2	41	45	15	11	44	
I3569/21	N30-SCL-0.0-0.1	19	1	42	47	12	6	46	
I3569/22	N30-SCL-0.2-0.3	17	1	50	61	18	7	32	
I3569/23	N30-SCL-0.5-0.6	16	6	48	57	13	4	40	
I3569/24	N30-SCL-0.8-0.9	16	6	41	54	18	5	41	
I3569/25	N30-SCL-0.9-1.0	18	4	47	58	13	3	39	
I3569/26	N34-SCL-0.0-0.1	11	1	51	55	11	7	38	
I3569/27	N34-SCL-0.2-0.3	14	1	48	59	16	5	36	
I3569/28	N34-SCL-0.5-0.6	15	2	52	64	14	1	35	
I3569/29	N34-SCL-0.8-0.9	17	4	39	52	19	6	42	
I3569/30	N34-SCL-0.9-1.0	17	3	41	49	19	10	41	
I3569/31	N31-SCL-0.0-0.1	15	0	38	57	20	0	43	
I3569/32	N31-SCL-0.2-0.3	22	0	35	49	22	8	43	
I3569/33	N31-SCL-0.5-0.6	21	0	29	39	21	11	50	
I3569/34	N31-SCL-0.8-0.9	21	0	34	40	12	6	53	
I3569/35	N31-SCL-0.9-1.0	21	0	35	41	12	6	53	
I3569/36	N32-SCL-0.0-0.1	19	0	51	54	11	8	38	
I3569/37	N32-SCL-0.2-0.3	21	1	35	50	21	6	44	
I3569/38	N32-SCL-0.5-0.6	21	1	44	51	13	7	42	
I3569/39	N32-SCL-0.8-0.9	21	2	33	41	18	10	49	
I3569/40	N32-SCL-0.9-1.0	22	2	33	40	16	10	51	
I3569/41	N33-SCL-0.0-0.1	17	0	47	51	11	8	42	
I3569/42	N33-SCL-0.2-0.3	21	1	46	52	14	8	40	
I3569/43	N33-SCL-0.5-0.6	20	4	29	45	16	0	55	
I3569/44	N33-SCL-0.8-0.9	18	5	29	39	20	11	51	
I3569/45	N33-SCL-0.9-1.0	19	3	27	38	19	8	54	
I3569/46	N35-SCL-0.0-0.04	17	1	40	47	13	5	47	
I3569/47	N35-SCL-0.2-0.3	20	0	42	45	11	7	47	
I3569/48	N35-SCL-0.5-0.6	24	0	39	39	6	5	55	
I3569/49	N35-SCL-0.8-0.9	25	6	37	41	11	7	52	
I3569/50	N35-SCL-0.9-1.0	24	9	33	36	14	11	53	
I3569/51	N36-SCL-0.0-0.05	17	1	44	49	12	8	44	
I3569/52	N36-SCL-0.2-0.3	20	0	42	41	12	12	47	
I3569/53	N36-SCL-0.5-0.6	26	0	40	42	11	9	49	
I3569/54	N36-SCL-0.8-0.9	26	0	25	24	14	15	61	
I3569/55	N36-SCL-0.9-1.0	25	1	31	35	16	12	54	
I3569/56	N37-SCL-0.0-0.05	13	1	50	49	5	6	45	23
I3569/57	N37-SCL-0.2-0.3	20	0	46	50	11	7	44	28
I3569/58	N37-SCL-0.5-0.6	23	0	40	53	16	2	44	31
I3569/59	N37-SCL-0.8-0.9	24	0	51	56	7	2	42	35
I3569/60	N37-SCL-0.9-1.0	26	4	31	36	6	1	63	35
I3569/61	N38-SCL-0.0-0.1	16	2	59	60	4	4	36	
I3569/62	N38-SCL-0.2-0.3	15	1	55	57	4	2	41	
I3569/63	N38-SCL-0.5-0.6	14	2	58	58	5	5	37	
I3569/64	N38-SCL-0.8-0.9	14	2	49	53	11	8	40	
I3569/65	N38-SCL-0.9-1.0	14	1	50	54	8	4	43	
I3569/66	N39-SCL-0.0-0.1	15	1	47	52	12	7	41	
I3569/67	N39-SCL-0.2-0.3	15	1	43	45	11	9	46	
I3569/68	N39-SCL-0.5-0.6	12	5	55	60	12	8	32	
I3569/69	N39-SCL-0.8-0.9	13	2	49	51	5	3	46	
I3569/70	N39-SCL-0.9-1.0	13	1	56	57	7	6	37	
I3569/71	N40-SCL-0.0-0.1	15	2	46	49	12	8	43	
I3569/72	N40-SCL-0.2-0.3	15	2	45	50	15	9	40	
I3569/73	N40-SCL-0.5-0.6	15	3	38	46	17	9	45	
I3569/74	N40-SCL-0.8-0.9	15	3	42	46	11	7	47	
I3569/75	N40-SCL-0.9-1.0	15	3	33	41	19	11	48	
I3569/76	N41-SCL-0.0-0.1	9	1	71	71	7	6	23	
I3569/77	N41-SCL-0.2-0.3	11	3	57	63	10	4	33	
I3569/78	N41-SCL-0.5-0.6	10	5	53	53	12	13	34	
I3569/79	N41-SCL-0.8-0.9	12	1	76	81	8	3	15	
I3569/80	N41-SCL-0.9-1.0	10	2	51	55	14	10	35	
I3569/81	N42-SCL.0-0.1	9	1	73	77	8	5	19	12
I3569/82	N42-SCL-0.2-0.3	11	3	55	59	9	6	35	15
I3569/83	N42-SCL-0.5-0.6	11	4	55	61	8	2	37	16
I3569/84	N42-SCL-0.8-0.9	11	2	52	57	11	6	37	18
I3569/85	N42-SCL-0.9-1.0	12	2	53	56	10	6	38	18

ESSA / EAL Pty Ltd (Nata ASPAC Approved)

METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name	Method Description
pH	4A1	1.1	0.1	pH	pH	1:5 water extr, pH meter
EC	3A1	5.4	0.01	dS/m	Electrical conductivity	1:5 water extr, EC meter
Cl	5A2	10.0	10.0	mg/kg	Chloride	1:5 water extr, (AA) colorimetric
NO3-N	7C2	6.7	1.0	mg/kg	Nitrate-nitrogen	1:5 water extr, (AA) colorimetric
NH4-N	7C2	7.8	0.6	mg/kg	Ammonium-nitrogen	1M KCl extr, (AA) colorimetric
Bicarb.P	9B2	16.8	1.0	mg/kg	Bicarb.ext.phosphorus	0.5M NaHCO3 @ pH 8.5, (AA) colorimetric
Exch.Ca	15B/C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Mg	15B/C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.Na	15B/C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
Exch.K	15B/C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH4OAc @ pH 7.0/8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO3 + Ca(NO3)2 extr, (AA) colorimetric
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Content	Gravimetric oven dry @ 105C
R1	NA	20.2	NA		Dispersion Ratio	Ratio [Aqueous dispersible (Silt + Clay):Total (Silt + Clay)]
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur	Ca(H2PO4)2 @ pH 4.0 extractable sulfate-sulfur, ICPOES
Sand	no ref	22.1	1.0	%	Particle size, sand	Hydrometer, gravimetric & Sieve
Silt	no ref	16.6	1.0	%	Particle size, silt	Hydrometer, gravimetric
Clay	no ref	12.7	1.0	%	Particle size, clay	Hydrometer, gravimetric

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

For Manager Analytical Services: **D E Baker BSc MASSSI**

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.

Soluble Salts included in Exchangeable Cations - Except PRE-WASHED (if EC>0.3dS/m).

ESSA / EAL Pty Ltd(NATA ASPAC Approved)

QUALITY CONTROL DATA

Soil

Reference: I3569

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia*. CSIRO Publishing: Collingwood.

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	B		5.0 - 5.3
EC	dS/m	B		0.27 - 0.32
Cl	mg/kg	B		10 - 35
NO3-N	mg/kg	B		10 - 16
NH4-N	mg/kg	NA		NA
Bicarb.P	mg/kg	B		51 -75
Total Kjeldahl N	%	ASPAC 34	0.110	.100 - .120
Total P	%	ASPAC 34	0.02	.019 - .021
Organic Carbon	%	B		1.82 - 2.3
Ca (Exch. cations)pH7	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH7	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH7	meq/100g	B		.057 - .182
K (Exch. cations)pH7	meq/100g	B		1.209 - 1.411
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	B	17.0	17.3 - 22.4
Fine Sand	%	B	22.0	20.0 - 25.7
Silt	%	B	16.0	10.5 - 19.8
Clay	%	B	44.0	37.9 - 48.9
R1		B		0.23 - 0.38

Test Method	Units	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	mg/kg	SB		2.37 - 3.25
DTPA-Zn	mg/kg	SB		3.15 - 3.81
DTPA-Mn	mg/kg	SB		97.7 - 149.0
DTPA-Fe	mg/kg	SB		24.3 - 32.6
0.33 Bar	%	G		32 - 51
15 Bar	%	G		23 - 30
Ca (Exch. cations)pH8.5	meq/100g	S12		27.7 - 35.4
Mg (Exch. cations)pH8.5	meq/100g	S12		22.88 - 24.5
Na (Exch. cations)pH8.5	meq/100g	S12		2.0 - 2.28
K (Exch. cations)pH8.5	meq/100g	S12		1.64 - 2.09

ESSA Pty Ltd / by EAL NATA (ASPAC certified)

For Info Refer ESSA Pty Ltd
PO Box 442 Sunnybank Q 4109

Phone: 0403245560

email: e.s.s.a@bigpond.net.au

ReferencesK6315,6319,6329,6331 to 6333, 6344 to 6351 Sheet 1 of 4:

Date Received: 15/05/2021
Date Completed: 30/05/2021

Final REPORT

Project:ESSA 21 6793
Project - 20SRE May 27 2021

All results in this report relate only to the items tested. Results are expressed on an "as received basis".

Client Name: GT Environmental
Contact: Mr Reece Mc Cann
Sample Type: Soil

Number of samples: 40Tested

ESSA /EAL Pty Ltd **(NATA, ASPAC Approved)**
Soil Analysis Report
References: K7115
Client: GTE 20SRE- Results Page 1 of 2

ESSA Ref	field ref	Soil pH	Soil EC	Soil Cl	Exch.Ca	Exch. Mg	Exch.K	CEC	ESP	Ca/Mg	
	depth (m)	H20	dS/m	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	Ratio	
K7115/1	**N47-0.00-0.08**	8.05	0.079	11	**27.0**	**11.1**	**0.26**	**38.7**	**1.0**	**2.4**	
K7115/2	**N47-0.20-0.30**	8.73	0.143	13	**18.4**	**12.3**	**0.41**	**31.8**	**2.4**	**1.5**	
K7115/3	**N47-0.50-0.60**	9.28	0.352	149	**9.9**	**17.0**	**<0.12**	**30.0**	**10.1**	**0.6**	
K7115/4	**N47-0.70-0.80**	9.22	0.537	326	**8.8**	**17.1**	**<0.12**	**29.2**	**11.2**	**0.5**	
K7115/5	**N47-0.90-1.00**	9.11	0.668	630	**8.7**	**18.2**	**<0.12**	**30.7**	**11.9**	**0.5**	
K7115/6	**N49-0.00-0.10**	7.78	0.049	60	**24.4**	**10.4**	**0.28**	**35.4**	**0.8**	**2.3**	
K7115/7	**N49-0.20-0.30**	9.08	0.218	41	**13.1**	**22.9**	**<0.12**	**37.5**	**3.8**	**0.6**	
K7115/8	**N49-0.50-0.60**	9.18	0.484	299	**9.2**	**25.4**	**<0.12**	**37.4**	**7.1**	**0.4**	
K7115/9	**N49-0.70-0.80**	9.13	0.658	414	**9.0**	**27.7**	**0.15**	**40.2**	**8.3**	**0.3**	
K7115/10	**N49-0.90-1.00**	9.07	0.753	704	**8.3**	**27.2**	**<0.12**	**39.0**	**8.5**	**0.3**	
K7115/11	**N57-0.00-0.10**	7.79	0.088	75	**21.1**	**10.9**	**0.23**	**32.4**	**0.8**	**1.9**	
K7115/12	**N57-0.20-0.30**	9.02	0.166	41	**21.1**	**17.1**	**<0.12**	**40.0**	**4.5**	**1.2**	
K7115/13	**N57-0.50-0.60**	8.93	0.457	246	**13.5**	**16.6**	**<0.12**	**33.3**	**9.3**	**0.8**	
K7115/14	**N57-0.70-0.80**	8.43	0.731	753	**12.7**	**17.2**	**<0.12**	**34.0**	**12.0**	**0.7**	
K7115/15	**N57-0.90-1.00**	6.28	0.813	1003	**11.4**	**16.6**	**<0.12**	**31.6**	**11.4**	**0.7**	
K7115/16	**N54-0.00-0.10**	7.20	0.051	11	**22.5**	**13.9**	**0.39**	**37.2**	**1.0**	**1.6**	
K7115/17	**N54-0.20-0.30**	8.92	0.159	34	**21.3**	**16.9**	**<0.12**	**40.0**	**4.5**	**1.3**	
K7115/18	**N54-0.50-0.60**	8.98	0.435	258	**16.1**	**22.1**	**<0.12**	**42.7**	**10.4**	**0.7**	
K7115/19	**N54-0.70-0.80**	8.71	0.663	831	**10.5**	**15.7**	**<0.12**	**29.9**	**11.9**	**0.7**	
K7115/20	**N54-0.90-1.00**	8.40	0.784	1002	**11.0**	**16.7**	**<0.12**	**31.8**	**12.6**	**0.7**	
K7115/21	**N56-0.00-0.10**	7.59	0.068	97	**21.3**	**10.3**	**0.77**	**32.7**	**0.9**	**2.1**	
K7115/22	**N56-0.20-0.30**	9.11	0.195	40	**16.6**	**18.5**	**0.14**	**37.5**	**6.0**	**0.9**	
K7115/23	**N56-0.50-0.60**	9.03	0.470	302	**14.4**	**20.5**	**<0.12**	**39.5**	**11.5**	**0.7**	
K7115/24	**N56-0.70-0.80**	8.94	0.714	696	**13.4**	**20.4**	**<0.12**	**38.6**	**12.2**	**0.7**	
K7115/25	**N56-0.90-1.00**	8.81	0.875	919	**13.5**	**22.2**	**<0.12**	**41.1**	**13.1**	**0.6**	
K7115/26	**N58-0.00-0.10**	7.82	0.074	6	**18.6**	**10.6**	**0.31**	**29.7**	**0.5**	**1.7**	
K7115/27	**N58-0.20-0.30**	8.79	0.117	22	**21.2**	**14.7**	**<0.12**	**36.6**	**1.8**	**1.4**	
K7115/28	**N58-0.50-0.60**	9.12	0.230	72	**14.6**	**18.6**	**0.14**	**35.4**	**6.0**	**0.8**	
K7115/29	**N58-0.66-0.76**	9.00	0.349	153	**14.1**	**20.6**	**<0.12**	**37.7**	**7.8**	**0.7**	
K7115/30	**N58-0.90-1.00**	8.97	0.493	175	**14.9**	**24.0**	**0.27**	**43.4**	**9.6**	**0.6**	
K7115/31	**N46-0.00-0.10**	7.26	0.062	72	**15.2**	**8.0**	**0.54**	**23.9**	**0.7**	**1.9**	
K7115/32	**N46-0.20-030**	8.96	0.122	29	**16.9**	**14.2**	**<0.12**	**32.0**	**2.5**	**1.2**	
K7115/33	**N46-0.50-0.60**	9.13	0.220	99	**13.9**	**18.8**	**<0.12**	**35.3**	**7.1**	**0.7**	
K7115/34	**N46-0.70-0.80**	9.08	0.380	156	**13.4**	**20.6**	**<0.12**	**37.4**	**8.9**	**0.7**	
K7115/35	**N46-0.90-1.00**	8.96	0.552	407	**13.2**	**20.7**	**<0.12**	**37.6**	**9.5**	**0.6**	
K7115/36	**N52-0.00-0.10**	7.20	0.054	5	**14.7**	**7.9**	**0.35**	**23.1**	**0.7**	**1.9**	
K7115/37	**N52-0.20-0.30**	9.31	0.205	41	**11.8**	**13.8**	**<0.12**	**27.3**	**6.1**	**0.9**	
K7115/38	**N52-0.50-0.60**	9.10	0.982	879	**8.1**	**18.5**	**<0.12**	**31.4**	**15.3**	**0.4**	
K7115/39	**N52-0.70-0.80**	8.99	1.165	807	**6.3**	**15.5**	**<0.12**	**26.3**	**17.4**	**0.4**	
K7115/40	**N52-0.90-1.00**	8.81	1.287	879	**5.9**	**15.2**	**<0.12**	**25.6**	**17.5**	**0.4**	

Ex Cations Bold = Method 15C1 Other =15A1 All done by 15C1

ESSA Ref	field ref	Soil pH	Soil EC	Soil Cl	Exch.Ca	Exch. Mg	Exch.K	CEC	ESP	Ca/Mg	
	depth (m)	H20	dS/m	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	Ratio	

Client: GTE 20SRE- Results Page 2 of 2

ESSA Ref	Sample No	Moisture	Gravel	Sand	Sand	Silt	Silt	Clay
	Depth (m)	Content	> 2 mm	> 50 µm	> 20 µm	2−50 µm	2−20 µm	< 2 µm
				<2mm	<2mm	<2mm	<2mm	<2mm
K7115/1	N47-0.00-0.08	11	0	27	29	20	17	54
K7115/2	N47-0.20-0.30	14	1	42	45	7	4	51
K7115/3	N47-0.50-0.60	12	4	42	48	13	7	45
K7115/4	N47-0.70-0.80	12	3	46	50	9	5	45
K7115/5	N47-0.90-1.00	12	1	43	47	10	7	47
K7115/6	N49-0.00-0.10	11	0	36	39	17	14	47
K7115/7	N49-0.20-0.30	13	2	39	43	13	9	48
K7115/8	N49-0.50-0.60	12	10	33	39	16	9	52
K7115/9	N49-0.70-0.80	13	8	33	38	13	8	53
K7115/10	N49-0.90-1.00	13	6	31	35	13	9	56
K7115/11	N57-0.00-0.10	15	1	41	45	18	14	41
K7115/12	N57-0.20-0.30	15	1	16	20	16	12	68
K7115/13	N57-0.50-0.60	16	1	29	33	13	9	58
K7115/14	N57-0.70-0.80	19	1	21	24	16	12	63
K7115/15	N57-0.90-1.00	19	0	23	27	16	12	61
K7115/16	N54-0.00-0.10	19	0	38	42	15	11	47
K7115/17	N54-0.20-0.30	14	0	37	41	10	6	53
K7115/18	N54-0.50-0.60	18	0	11	17	18	12	71
K7115/19	N54-0.70-0.80	18	1	21	25	17	13	61
K7115/20	N54-0.90-1.00	18	0	23	27	16	12	61
K7115/21	N56-0.00-0.10	9	0	44	47	14	11	42
K7115/22	N56-0.20-0.30	14	1	34	37	13	10	53
K7115/23	N56-0.50-0.60	14	2	33	37	14	10	53
K7115/24	N56-0.70-0.80	14	2	33	35	11	9	56
K7115/25	N56-0.90-1.00	15	0	33	36	14	10	54
K7115/26	N58-0.00-0.10	15	1	27	35	21	13	51
K7115/27	N58-0.20-0.30	13	0	42	47	16	10	43
K7115/28	N58-0.50-0.60	14	4	39	43	13	9	48
K7115/29	N58-0.66-0.76	15	5	34	40	18	12	48
K7115/30	N58-0.90-1.00	17	3	24	30	21	15	55
K7115/31	N46-0.00-0.10	13	1	62	67	13	7	26
K7115/32	N46-0.20-030	12	1	46	49	12	8	42
K7115/33	N46-0.50-0.60	12	3	41	45	13	9	46
K7115/34	N46-0.70-0.80	13	2	32	36	14	10	53
K7115/35	N46-0.90-1.00	14	2	32	36	16	12	52
K7115/36	N52-0.00-0.10	13	1	66	70	11	7	23
K7115/37	N52-0.20-0.30	11	2	48	51	10	7	42
K7115/38	N52-0.50-0.60	12	1	37	41	14	10	49
K7115/39	N52-0.70-0.80	13	1	43	47	14	10	43
K7115/40	N52-0.90-1.00	15	0	39	45	14	8	47

ESSA / EAL Pty Ltd (Nata ASPAC Approved)

METHOD DESCRIPTIONS

Soil

Reference:K7115

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name
pH	4A1	1.1	0.1	pH	pH
EC	3A1	5.4	0.01	dS/m	Electrical conductivity
Cl	5A2	10.0	10.0	mg/kg	Chloride
NO3-N	7C2	6.7	1.0	mg/kg	Nitrate-nitrogen
NH4-N	7C2	7.8	0.6	mg/kg	Ammonium-nitrogen
Bicarb.P	9B2	16.8	1.0	mg/kg	Bicarb.ext.phosphorus
Exch.Ca	15D/C1	7.2	0.18	meq/100g	Exchangeable calcium
Exch.Mg	15D/C1	4.7	0.31	meq/100g	Exchangeable magnesium
Exch.Na	15D/C1	9.6	0.09	meq/100g	Exchangeable calcium
Exch.K	15D/C1	4.8	0.02	meq/100g	Exchangeable calcium
EX Sodium %	15N1				Exch Na/CEC x100
Ca/Mg	NA				Ca/Mg Ratio
Exch Cations	15D/C1				If EC >0.3dS/m then Prewashed with ethanol /glycer
Org Matter	NA				Leco Furnace
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Content
R1	NA	20.2	NA		Dispersion Ratio
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur
Sand	no ref	22.1	1.0	%	Particle size, sand
Silt	no ref	16.6	1.0	%	Particle size, silt
Clay	no ref	12.7	1.0	%	Particle size, clay
Emerson No	Emerson	CSIRO		Index	Emerson Number

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Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.*
Published : CSIRO Collingwood
Soluble Salts included in Exch. Cations - Except PRE-WASHED (if EC>0.3dS/m).

D E Baker BSc CPSS

Director and Principal Soil Scientist – ESSA Pty Ltd



Adjunct Professional Fellow Southern Cross University
Chief Soil Chemistry Trainer Soil Science Australia (National & Qld)
Hon. Life Member Soil Science Australia (National & Qld)
Certified Professional Practicing Soil Scientist CPSS



ESSA / EAL Pty Ltd(NATA ASPAC Approved)

QUALITY CONTROL DATA

Reference: J7115

Soil

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	B		5.0 - 5.3
EC	dS/m	B		0.27 - 0.32
Cl	mg/kg	B		10 - 35
NO3-N	mg/kg	B		10 - 16
NH4-N	mg/kg	NA		NA
Bicarb.P	mg/kg	B		51 -75
Total Kjeldahl N	%	ASPAC 34	0.110	.100 - .120
Total P	%	ASPAC 34	0.02	.019 - .021
Organic Carbon	%	B		1.82 - 2.3
Ca (Exch. cations)pH7	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH7	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH7	meq/100g	B		.057 - .182
K (Exch. cations)pH7	meq/100g	B		1.209 - 1.411
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	B	17.0	17.3 - 22.4
Fine Sand	%	B	22.0	20.0 - 25.7
Silt	%	B	16.0	10.5 - 19.8
Clay	%	B	44.0	37.9 - 48.9
R1		B		0.23 - 0.38

Test Method	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	SB		2.37 - 3.25
DTPA-Zn	SB		3.15 - 3.81
DTPA-Mn	SB		97.7 - 149.0
DTPA-Fe	SB		24.3 - 32.6
0.33 Bar	G		32 - 51
15 Bar	G		23 - 30
Ca (Exch. cations)p	S12		27.7 - 35.4
Mg (Exch. cations)p	S12		22.88 - 24.5
Na (Exch. cations)p	S12		2.0 - 2.28
K (Exch. cations)p	S12		1.64 - 2.09

ESSA / ACL (ASPAC)

5 Dunphy St Sunnybank Hills
Qld 4109

Phone: 0403245560

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Reference: **21/21**

Date Received: 7/6/2021
Date Completed: 18/6/2021

FINAL REPORT

Project: -15 Bar K7115
20SRE

All results in this report relate only to the items tested. Results are expressed on an "as received basis".

Client Name: GTE

Contact: Mr R Mc Cann

Sample Type: Soil

Number of samples: 20

ESSA (ACL)Pty Ltd

Soil Analysis Report
Batch Number: (K7115) 21/21

Date Received: 7/6/2021
Date Completed: 18/6/2021

Client: GTE

Lab No	Site		Sample ID	15 bar
				%
195	K 7115/31	**N46-0.00-0.10**	11	19
196	K7115/32	**N46-0.20-030**	12	24
197	K7115/33	**N46-0.50-0.60**	13	26
198	K 7115/34	**N46-0.70-0.80**	14	27
199	K7115/35	**N46-0.90-1.00**	15	28
200	K7115/36	**N52-0.00-0.10**	16	20
201	K 7115/37	**N52-0.20-0.30**	17	23
202	K7115/38	**N52-0.50-0.60**	18	29
203	K7115/39	**N52-0.70-0.80**	19	29
204	K 7115/40	**N52-0.90-1.00**	20	27
205	K7115/11	**N57-0.00-0.10**	31	13
206	K7115/12	**N57-0.20-0.30**	32	20
207	K 7115/13	**N57-0.50-0.60**	33	22
208	K7115/14	**N57-0.70-0.80**	34	24
209	K7115/15	**N57-0.90-1.00**	35	24
210	K 7115/16	**N54-0.00-0.10**	36	13
211	K7115/17	**N54-0.20-0.30**	37	17
212	K 7115/18	**N54-0.50-0.60**	38	21
213	K7115/19	**N54-0.70-0.80**	39	21
214	K7115/20	**N54-0.90-1.00**	40	22

ESSA (ACL) Pty Ltd

METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name	Method Description
pH	4A1	1.1	0.1	pH	pH	1:5 water extr, pH meter
EC	3A1	5.4	0.01	dS/m	Electrical conductivity	1:5 water extr, EC meter
Cl	5A2	10.0	10.0	mg/kg	Chloride	1:5 water extr, (AA) colorimetric
NO3-N	7C2	6.7	1.0	mg/kg	Nitrate-nitrogen	1:5 water extr, (AA) colorimetric
NH4-N	7C2	7.8	0.6	mg/kg	Ammonium-nitrogen	1M KCl extr, (AA) colorimetric
Bicarb.P	9B2	16.8	1.0	mg/kg	Bicarb.ext.phosphorus	0.5M NaHCO3 @ pH 8.5, (AA) colorimetric
TN	7A2	12.9	0.01	%	Total Kjeldahl Nitrogen	Sulphuric acid digest, (AA) colorimetric
OC	8B1	9.7	0.02	%	Organic Carbon	Walkley & Black, ($H_2SO_4/K_2Cr_2O_7$), titr.
Ca (Neut)	15A1	10.3	0.10	meq/100g	Exchangeable calcium	1M NH_4Cl @ pH 7.0 shake, AAS
Mg (Neut)	15A1	6.6	0.10	meq/100g	Exchangeable magnesium	1M NH_4Cl @ pH 7.0 shake, AAS
Na (Neut)	15A1	7.3	0.03	meq/100g	Exchangeable sodium	1M NH_4Cl @ pH 7.0 shake, AAS
K (Neut)	15A1	3.9	0.02	meq/100g	Exchangeable potassium	1M NH_4Cl @ pH 7.0 shake, AAS
ECEC	15J1	5.0	1	meq/100g	Effective cation ex.capacity	Sum of exchangeable cations
ESP	15N1	5.0	3	%	Exchangeable Na%	(Exchangeable Na/sum of exch.cations)%
Sand	no ref	22.1	1.0	%	Particle size, sand	Hydrometer, gravimetric
Silt	no ref	16.6	1.0	%	Particle size, silt	Hydrometer, gravimetric
Clay	no ref	12.7	1.0	%	Particle size, clay	Hydrometer, gravimetric
(-) 15 Bar	no Ref				Pressure Plate	15 Bar Ceramic Pressure Plate

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992 /2011)**

For Manager
Analytical Services: D Baker

Dennis Baker Soil Scientist (ESSA)



Soil Science Leader and Soil Chemistry Specialist
Adjunct Professional Fellow Southern Cross University
Chief Soil Chemistry Trainer Soil Science Australia (National & Qld)
Trainer in Soil Science Soil Science Australia (National & Qld)
Hon. Life Member Soil Science Australia (National & Qld)
Certified Professional Practicing Soil Scientist CPSS



ESSA /ACL Pty Ltd

METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name	Method Description
Ca (Alc)	15C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
Mg (Alc)	15C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
Na (Alc)	15C1	9.6	0.09	meq/100g	Exchangeable sodium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
K (Alc)	15C1	4.8	0.02	meq/100g	Exchangeable potassium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO3 + Ca(NO3)2 extr, (AA) colorimetric
DTPA-Cu	12A1	17.1	0.26	mg/kg	DTPA ext. copper	DTPA extraction, AAS
DTPA-Zn	12A1	16.4	0.10	mg/kg	DTPA ext. zinc	DTPA extraction, AAS
DTPA-Mn	12A1	9.0	0.32	mg/kg	DTPA ext. manganese	DTPA extraction, AAS
DTPA-Fe	12A1	13.0	0.23	mg/kg	DTPA ext. iron	DTPA extraction, AAS
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Content	Gravimetric oven dry @ 105C
R1	NA	20.2	NA		Dispersion Ratio	Ratio [Aqueous dispersible (Silt + Clay):Total (Silt + Clay)]
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur	Ca(H2PO4)2 @ pH 4.0 extractable sulfate-sulfur, ICPOES
Al	15G1	NA	NA	meq/100g	Exchangeable Aluminium	Exch. Hydrogen and Aluminium by 1M KCl
H+	15G1	NA	NA	meq/100g	Exchangeable Acidity	Exch. Hydrogen and Aluminium by 1M KCl
15 Bar		NA	NA		15 Bar Analysis	Pressure Plate/Gravimetric oven dry @ 105C
1/3 Bar		NA	NA		15 Bar Analysis	Pressure Plate/Gravimetric oven dry @ 105C

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

For Manager
Analytical Services: _____

ESSA / ACL Pty Ltd

QUALITY CONTROL DATA

Soil

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	r118		9.7 - 10.1
EC	dS/m	r118		.301 - .334
Cl	mg/kg	r118		28 -40
NO3-N	mg/kg	rv		3 - 8
NH4-N	mg/kg	B		80-96
Olsen P	mg/kg	rv		15 - 20
Total Kjeldahl N	%	32-13		.329 - .485
Total P	%	aspac 111		.040 - .052
Organic Carbon	%	rv		1.82 - 2.3
Ca (Exch. cations)pH7	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH7	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH7	meq/100g	B		.057 - .182
K (Exch. cations)pH7	meq/100g	B		1.21 - 1.41
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	RD		29 -33
Fine Sand	%	RD		27 - 32
Silt	%	RD		10 - 16
Clay	%	RD		21 - 29
R1		RD		.38 - .57

Test Method	Units	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	mg/kg	112-09		1.52 - 1.82
DTPA-Zn	mg/kg	112-09		1.25 - 1.45
DTPA-Mn	mg/kg	112-09		148 - 178
DTPA-Fe	mg/kg	112-09		7.9 - 13.2
Suflate-sulfur	mg/kg	B		5 - 12
ADMC	%			NA
15 Bar	%	G	29, 29, 30, 30	23 - 32
0.33 Bar	%	G		36 - 52
Ca (Exch. cations)pH8.5	meq/100g	S12		27.7 - 37.4
Mg (Exch. cations)pH8.5	meq/100g	S12		22.6 - 26.5
Na (Exch. cations)pH8.5	meq/100g	S12		2.0 - 2.28
K (Exch. cations)pH8.5	meq/100g	S12		1.64 - 2.09



Environmental Soil Solutions
Australia Pty Ltd

ACN: 090 697 331 ABN 51 090 697 331

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24/02/2021 – GTE Query Soil Chemical Reports

RE: Method Codes

- **Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.**
- **Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

The methods references reported in recent GTE Saraji reports By ESSA

- H2096
- I2733
- I3569.

Have been updated

In addition the Ca/ Mg and ESP have been checked and any errors updated

COMMENT
In relation to the 1992 and 2001 versions of George Rayment's Methods

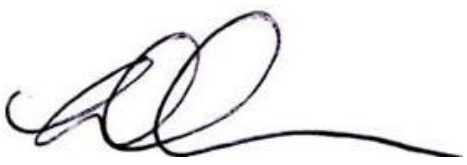
1) no numbering has been changed in the updates
2) any new methods added have been allocated subsequent codes

So,
4A1 in 1992 = 4A1 in 2011
3A1 in 1992 = 3A1 in 2011 And so on

If you have any further queries, please do not hesitate giving me a call on the number below.

Regards

Dennis Baker Soil Scientist



D E Baker BSc
Soil Science Leader and Soil Chemistry Specialist
Adjunct Professional Fellow Southern Cross University
Chief Soil Chemistry Trainer Soil Science Australia (Qld & National)
Hon Life Member Soil Science Australia (Qld & National)
ESSA Pty Ltd
M0403245560

Table D-1: Summary of Land Suitability classes for SMU A2g

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm)	5	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	5	3	3	3	3	3	3	3	3	3	3	3	3	3
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4M	1	1	2	1	1	1	1	1	1	1	1	1	1
Overall Suitability Class		4	4	3	3	4	3	4	3	3	3	3	4	4

1. Based on erosion potential assessment of SMU A2 as low in topsoil

Table D-2: Summary of Land Suitability classes for SMU A4

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Erosion Hazard (Es)	31	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	6	5	5	5	5	5	5	5	5	5	5	5	5	5
Narrow Moisture Range (Pm)	6	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4M	1	1	2	1	1	1	1	1	1	1	1	1	1
Overall Suitability Class		5	5	5	5	5	5	5	5	5	5	5	5	5

Table D-3: Summary of Land Suitability classes for SMU A4c

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)	22	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	21	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	5	5	5	4	5	5	5	5	5	5	5	5	5	5
Narrow Moisture Range (Pm)	6	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4M	1	1	2	1	1	1	1	1	1	1	1	1	1
Overall Suitability Class		5	5	4	5	5	5	5	5	5	5	5	5	5

Table D-4: Summary of Land Suitability classes for SMU A5

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	22	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	21	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	4	5	5	3	4	5	4	5	4	4	4	4	5	5
Narrow Moisture Range (Pm)	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		5	5	3	4	5	4	5	4	4	4	4	5	5

Table D-11 Summary of Land Suitability classes for SMU B1

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm)	6	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	4	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		4	4	3	3	4	3	4	3	3	3	3	4	4

Table D-5: Summary of Land Suitability classes for SMU B2s

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[2]	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Erosion Hazard (Es)	31	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		4	4	3	3	4	3	4	3	3	3	3	4	4

Table D-6: Summary of Land Suitability classes for SMU B2g

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[2]	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Erosion Hazard (Es)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil Water Availability (M)	4	4	4	3	4	4	4	4	4	4	4	4	4	4
Narrow Moisture Range (Pm)	4	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		4	4	3	4	4	4	4	4	4	4	4	4	4

Table D-7: Summary of Land Suitability classes for SMU B2bl

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil Water Availability (M)	4	5	5	3	4	5	4	5	4	4	4	4	5	5
Narrow Moisture Range (Pm)	5	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		5	5	3	4	5	4	5	4	4	4	4	5	5

1. Water erosion assessed on SMU B2 erosion potential

Table D-8: Summary of Land Suitability classes for SMU B3bl

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es) [1]	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm) [1]	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Surface Condition (Ps)	5	3	3	3	3	3	3	3	3	3	3	3	3	3
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	4	2	2	2	2	2	2	2	2	2	2	2	2	2
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		4	4	3	3	4	3	4	3	3	3	3	4	4

1. Erosion hazard based on SMU B3, assessed as low to moderate dispersive subsoil

Table D-9: Summary of Land Suitability classes for SMU B5

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Erosion Hazard (Es)	31	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	4	4	4	3	4	4	4	4	4	4	4	4	4	4
Narrow Moisture Range (Pm)	6	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4M	1	1	2	1	1	1	1	1	1	1	1	1	1
Overall Suitability Class		4	4	3	4	4	4	4	4	4	4	4	4	4

Table D-10: Summary of Land Suitability classes for SMU E1r

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	31	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	4	5	5	3	4	5	4	5	4	4	4	4	5	5
Narrow Moisture Range (Pm)	5	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	4	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		5	5	3	4	5	4	5	4	4	4	4	5	5

Table D-12: Summary of Land Suitability classes for SMU E2

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	21	1	1	1	1	1	1	1	1	1	1	1	1	1
Erosion Hazard (Es)	21	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm)	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Surface Condition (Ps)	4	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4M	1	1	2	1	1	1	1	1	1	1	1	1	1
Overall Suitability Class		4	4	3	3	4	3	4	3	3	3	3	4	4

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