

# Restoration Plan to Support RIDA Application Saraji East Project

Final V4  
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# TABLE OF CONTENTS

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<b>1</b>	<b>INTRODUCTION.....</b>	<b>1</b>
1.1	SCOPE OF WORKS	1
1.2	PROJECT DESCRIPTION	1
1.3	PROJECT LOCATION	2
<b>2</b>	<b>LEGISLATIVE CONTEXT .....</b>	<b>3</b>
2.1	OVERVIEW	3
2.2	STRATEGIC CROPPING LAND REQUIREMENTS	3
2.2.1	Strategic cropping areas	4
<b>3</b>	<b>SITE ENVIRONMENT .....</b>	<b>5</b>
3.1	CLIMATE	5
3.2	HYDROLOGY AND TOPOGRAPHY	5
3.3	GEOLOGY AND GEOMORPHOLOGY	6
3.4	SOIL MAPPING UNITS AND MAP UNIT POLYGONS	6
3.4.1	Pre-Clear Reference Sites for Pre-Activity Condition	7
3.5	STRATEGIC CROPPING LAND	8
<b>4</b>	<b>RESTORATION PLAN.....</b>	<b>9</b>
4.1	OVERVIEW	9
4.2	PROPOSED DISTURBANCE	9
4.2.1	Proposed Disturbance Activity	10
4.2.2	Risks Associated with the Proposed Disturbance Activity	14
4.3	ACTIVITIES TO RESTORE SCL TO PRE-DISTURBANCE CONDITION	14
4.3.1	Land Suitability and SCL Assessment	14
4.3.2	Land Suitability and SCL Assessment Differences	18
4.3.3	Defining Restoration Criteria	18
4.4	RESTORATION METHODS	19
4.4.1	Previous Studies	19
4.4.2	Restoration Plan Procedures, Schedule and Costs	19
4.4.3	General Recommendations during Project Site Activities	21
4.4.4	Soil Surface Preparation	21
4.4.5	Revegetation	22
4.4.6	Recommended Soil Management, Treatments and Amelioration	25
4.4.7	Erosion and Sediment Control Plan	25
4.4.8	Monitoring Program	25
4.4.9	Restoration Criteria Success	27
<b>5</b>	<b>REFERENCES.....</b>	<b>28</b>

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<b>6</b>	<b>FIGURES.....</b>	<b>29</b>
	<b>FIGURE 1 PROJECT DISTURBANCE, SCL MAP UNIT POLYGONS AND SOIL MAPPING UNITS</b>	
<b>7</b>	<b>APPENDICES .....</b>	<b>30</b>
	<b>APPENDIX A GT ENVIRONMENTAL (2021), SARAJI EAST COAL MINE PROJECT, STRATEGIC CROPPING LAND ASSESSMENT</b>	
	<b>APPENDIX B GT ENVIRONMENTAL (2020), SARAJI EAST COAL MINE PROJECT, BASELINE LAND RESOURCES AND SOIL SUITABILITY</b>	
	<b>APPENDIX C LAND SUITABILITY ASSESSMENT, LSAT, 1995 AND DRNM, 2013</b>	

# 1 INTRODUCTION

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GT Environmental Pty Ltd (GTE) was commissioned to assist AECOM Australia Pty Ltd (AECOM) in compiling a Restoration Plan (RP) to support a regional interests development approval (RIDA) application for the Saraji East Project (the Project).

*The Regional Planning Interests Act 2014* (RPI Act) identifies and protects areas of regional interest from inappropriate resource or regulated activities. A Strategic Cropping Area (SCA) is an area of regional interest under the RPI Act and consists of the areas shown in the Strategic Cropping Land (SCL) trigger map as SCL (Department of Infrastructure, Local Government and Planning (DILGP), 2014).

A resource activity or regulated activity located within an SCA will be required to obtain a regional interests development approval (RIDA) under the RPI Act, unless exempt under sections 22, 23, 24 or 25 of the Act (DILGP, 2014).

A RIDA is being sought to undertake resource activities (the Project) that have potential to disturb Strategic Cropping Land (SCL). This RP is provided in support of a SCA RIDA to demonstrate how permanent impacts to SCL shall be avoided.

## 1.1 Scope of Works

This RP is to demonstrate that an electrical transmission line (ETL) infrastructure easement will be returned to pre-activity condition. The RP focuses on areas of the proposed disturbance which includes the ETL disturbance footprint (herein known as the Project site) falling within mapped SCL, as outlined within *Saraji East Strategic Cropping Land Assessment* (GT Environmental, 2021 [Appendix A]).

This RP will present:

- The land is able (without constraints) to be restored to its pre-activity condition following the undertaking of the proposed activity, and,
- The impacted SCL has been restored to its pre-activity condition, capacity and/or productivity following the cessation of that activity.

## 1.2 Project Description

BM Alliance Coal Operations Pty Ltd (BMA) proposes to develop the Project, a greenfield single-seam underground mine development on Mining Lease Area (MLA) 70383 commencing from within Mining Lease (ML) 1775. A new infrastructure transport and infrastructure corridor will be constructed on MLA 70383.

The Project proposal also comprises a Coal Handling Preparation Plant (CHPP), associated Mine Infrastructure Area (MIA) and a new rail spur and balloon loop; which are proposed to be located on the site of the existing adjacent Saraji Mine. The Project is expected to produce up to seven million tonnes per annum (Mtpa) of metallurgical product coal for the export market over a life of 25 to 30 years.

### **1.3 Project Location**

The Project is located approximately 30 kilometres (km) north of Dysart and approximately 170 km southwest of Mackay in Queensland.

## 2 LEGISLATIVE CONTEXT

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### 2.1 Overview

The RPI Act identifies and protects areas of Queensland that are of regional interest. The intent of the RPI Act is to manage the impact and support coexistence of resource activities and other regulated activities in areas of regional interest. The RPI Act is supported by the Regional Planning Interests Regulation 2014 (RPI Regulation).

The RPI Act and RPI Regulation seek to establish an appropriate balance between protecting priority land uses and delivering economic projects for Queensland regions.

The RPI Act protects:

- living areas in regional communities,
- high-quality agricultural areas from dislocation,
- Strategic Cropping Land, and,
- regionally important environmental areas.

Areas of Regional Interest are defined under the RPI Act as follows:

- a Priority Agricultural Area,
- a Priority Living Area,
- the Strategic Cropping Area, and,
- a Strategic Environmental Area.

The RPI Act restricts the carrying out of resource or regulated activities where the activity is not exempt from the provisions of the RPI Act, or a regional interests development approval (RIDA) has not been granted.

A resource activity (as applicable to the Project) is defined under the section 12 (2) of the RPI Act as follows:

- An activity for which a resource authority is required to lawfully carry out, and,
- For a provision of a resource authority or proposed resource authority – an authorised activity for the authority or proposed authority (if granted) under the relevant resource act.

### 2.2 Strategic Cropping Land Requirements

A resource activity or regulated activity located within an SCA will be required to obtain a RIDA under the RPI Act, unless exempt under sections 22, 23, 24 or 25 of the Act (DILGP, 2014). It is considered on this basis that the Project is not exempt from the requirement for a RIDA for SCL.

### 2.2.1 Strategic cropping areas

SCA covers the area mapped as SCL on the Department Resources (DoR) SCL trigger map. The SCL trigger map is updated by DoR periodically to indicate 'potential Strategic Cropping Land.' There are three required outcomes for the SCA when applying for a RIDA:

- No impact on SCL in the SCA,
- No material impact on SCL on the property, and,
- No material impact on SCL in an area in the SCA.

Several prescribed solutions are encouraged when assessing outcomes of RIDA applications in relation to SCL which include:

- Voluntary agreement with landowners,
- Locating the resource activity on land not used for SCL,
- Minimising the construction and operation footprint of a resource activity, and,
- No permanent impact on more than two (2) percent (%) of the SCL on the 'property'.

As defined under the RPI Regulation, a property in the SCL area is:

- A single lot, or,
- Otherwise – all the lots that are owned by the same entity or have one (1) or more common owners and:
  - are managed as a single agricultural enterprise, or,
  - form a single discrete area because 1 lot is adjacent, in whole or part, to another lot in that single discrete area (other than for any road or watercourse between any of the lots).

As defined under the RPI Regulation, a resource activity or regulated activity has a permanent impact on SCL if because of carrying out the activity, the land cannot be restored to its pre-activity condition.

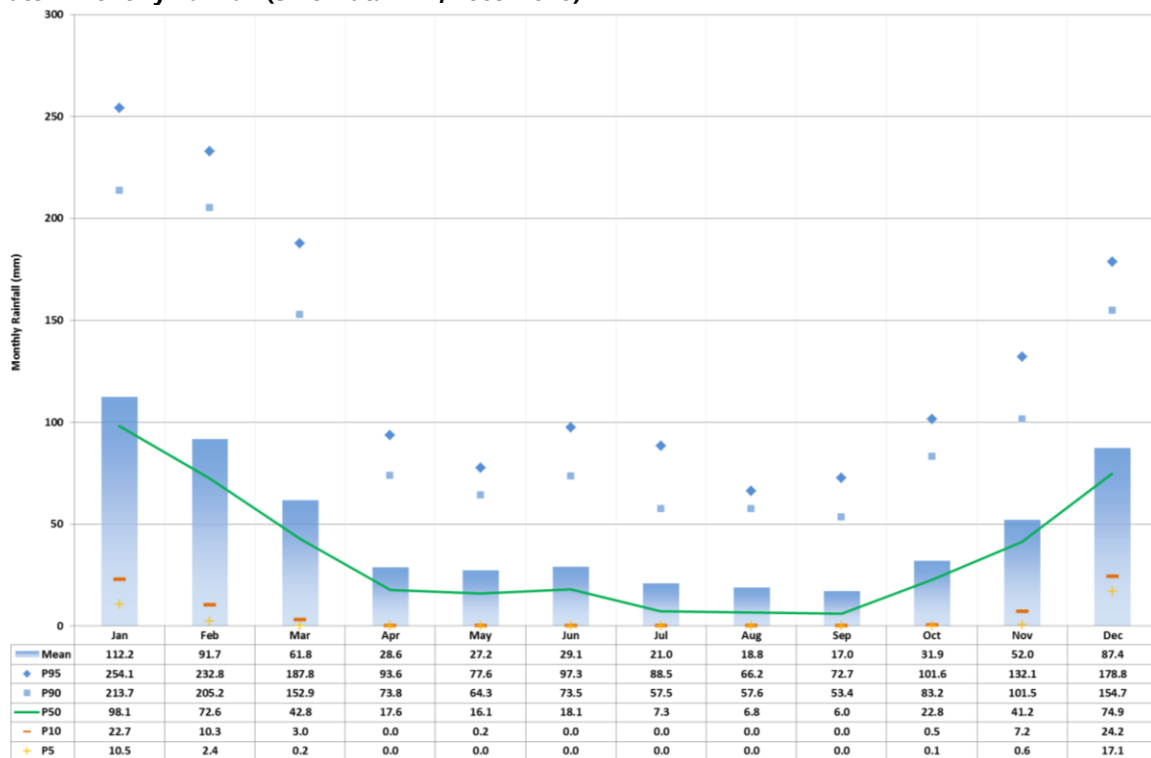
## 3 SITE ENVIRONMENT

### 3.1 Climate

Climate at the Project Site is classified as subtropical with a moderately dry winter (as per the Köppen Climate Classification). Historic climate data was sourced from the Bureau of Meteorology SILO Data Drill using 128 years of records (1889 to 2017). The data is produced by accessing grids of data derived from interpolating the bureau's records from individual weather recording stations.

Plate 1 shows mean monthly rainfall for the Project. Annual rainfall at the Project site is highly variable and subject to prolonged periods of above and below average rainfall. The mean monthly rainfall shows a distinct seasonal distribution with monthly rainfall totals greatest in the wet season extending from December through March. The average monthly evaporation exceeds the average monthly rainfall throughout the year with a maximum of around 238 millimetres (mm) average monthly evaporation in December.

**Plate 1 Monthly Rainfall (SILO Data Drill, 1889-2018)**



### 3.2 Hydrology and Topography

Typical of the watercourses in the region, the watercourses in the Project site flow intermittently through the year in response to rainfall and runoff, with extended periods of no flow. Watercourses located nearby the project site include Philip Creek to the north and Downs creek to the south.

The topography is gently undulating with a surface height variance of approximately 15 metres (m) and two tributary channels transecting the Project site. The ecological values of the Project site are considered typical for the northern Bowen Basin with large areas of land historically cleared for grazing. Prior to land clearing for agricultural land uses, much of the area supported Brigalow and Belah vegetation on clay soils with tracts of Eucalypt woodlands on the alluvial and sand plains.

### 3.3 Geology and Geomorphology

The Project site is located on the western limb of the northern Bowen Basin with geology from the late Tertiary, Quaternary age in the north west to the Eocene, Oligocene age in the south east.

The shallower Tertiary sediments consist of clay, sandy clay, clayey sand and gravel, but have been noted as consisting predominantly of clay. The clay-bound nature of the Tertiary sediments ensures that permeable lenses of sands and gravels are complex in distribution and irregular. In-filled Quaternary alluvial channels associated with the present-day creek courses are locally incised into the Tertiary Formation.

The south eastern portion of the Project site includes sedimentary rocks of the Duaringa formation consisting of mudstone, sandstone, conglomerate, siltstone, oil shale, lignite and basalt.

Two single tributaries transect through the Project site. A tributary the northern area of the Project site flowing north east to a confluence prior to Philip creek. A first order tributary flows to the east through the southern portion of the Project site towards the Isaac River.

### 3.4 Soil Mapping Units and Map Unit Polygons

Soil Mapping Units (SMUs) were initially identified for the Project site in Baseline Land Resources and Soil Suitability Assessment (GTE, 2020 [Appendix B]). SCL assessments conducted during and after the Baseline Land Resources and Soil Suitability Assessment have identified SCL Map Unit Polygons (MUP).

The SCL MUPs outlined below were applied to isolated areas of each SMU within SCL Assessment (GTE, 2021 [Appendix A]). The following SMUs, MUPs, their Australian Soil Classification (ASC) and soil concepts for each specific MUP and analysed sites for SCL and the Baseline Land Resources and Soil Suitability Assessment have been identified to include trigger mapped SCL and are detailed below in Table 1.

**Table 1 SMU, MUP, Australian Soil Classification and Concept**

SMU	MUP	Australian Soil Classification and Concept
A2g	7	Crusting Grey Vertosol, Crusting grey clay with subdominant black soils on gently undulating plains with mixed shrubbery.
B1	13	Black Vertosol, Black, well-structured clays on gently undulating plains.
B2bl	6	Black Dermosol, Dark sandy clay loams with coarser structured clay subsoils on gently undulating plains.



SMU	MUP	Australian Soil Classification and Concept
B2s	8	Black Dermosol, Dark greyish brown weak to moderately structured clay soils on cleared gently undulating plains.
B3bl	16	Black Vertosol, Dark brown clay soils with gilgai microrelief on gently undulating plains of mixed regrowth
E1r	14	Red Chromosol, Sandy loams over red clay subsoils on cleared gently undulating plains.
E2	17	Black Vertosol, Dark cracking clays with cropping on undulating plains.

### 3.4.1 Pre-Clear Reference Sites for Pre-Activity Condition

Pre-clear reference (PCR) sites have been selected based on existing SCL sites which have been assessed within the disturbed MUPs, however not located within the disturbance area. The PCR sites selected with the basic components for pre-activity condition include the following in Table 2.

**Table 2 Pre-clear Reference Sites for Pre-activity Condition**

MUP / Pre-Clear Reference Site	Terrain, Landform, and slope	Site lithology	Current land use	Previous site disturbance and modification	Site and soil hydrology	Soil surface condition	Vegetation and groundcover, including crops	Microrelief	Soil depth (including depths >1 metre)	Soil profile descriptions, incl. for each horizon or layer.
7 / N2	Very gently undulating plain	Late Tertiary, Quaternary, Alluvium	Grazing	Semi disturbed	No surface water, water courses	Cracking with crust	Various shrubs and grasses. No crops.	None	= > 1.00 m	Refer Appendix (GTE, 2021)
13 / 7-SCL	Very gently undulating plain	Late Tertiary, Quaternary, Alluvium	Forage Crops	Extensive disturbance	No surface water, water courses	Self-mulching	Forage Crops	None	= > 1.00 m	Refer Appendix (GTE, 2021)
6 / 80-SCL	Gently undulating plain	Late Tertiary, Quaternary, Alluvium	Grazing	Extensive disturbance	No surface water, water courses	Firm	Grasses, Brigalow nearby	None	= > 1.00 m	Refer Appendix (GTE, 2021)
8 / N12	Gently undulating plain	Late Tertiary, Quaternary, Alluvium	Grazing	Semi-disturbed	No surface water, water courses	Firm	Grasses	None	= > 1.00 m	Refer Appendix (GTE, 2021)
16 / 5-SCL	Gently undulating plain	Late Tertiary,	Grazing	Extensive disturbance	No surface water,	Self-mulching	Grasses, shrubs	<0.2m deep,	= > 1.00 m	Refer Appendix

MUP / Pre-Clear Reference Site	Terrain, Landform, and slope	Site lithology	Current land use	Previous site disturbance and modification	Site and soil hydrology	Soil surface condition	Vegetation and groundcover, including crops	Microrelief	Soil depth (including depths >1 metre)	Soil profile descriptions, incl. for each horizon or layer.
		Quaternary, Alluvium  Eocene-Oligocene, Sedimentary rock			water courses	with cracking		40% cover		(GTE, 2021)
14 / N41	Gently undulating plain	Late Tertiary, Quaternary, Alluvium	Grazing	Extensive disturbance	No surface water, water courses	Firm	Grasses, shrubs	None	= > 1.00 m	Refer Appendix (GTE, 2021)
17 / 110-SCL	Flat plain	Late Tertiary, Quaternary, Alluvium  Eocene-Oligocene, Sedimentary rock	Crops	Extensive disturbance	No surface water, water courses	Cracking	Crops (Forage)	None	= > 1.00 m	Refer Appendix (GTE, 2021)

These PCR sites are presented in Figure 1 and additional field observations, laboratory data in GTE, 2021 and GTE, 2020, Appendix A and B. Survey location GPS data for the PCR sites are summarised in Table 3.

**Table 3 Survey Data for Pre-clear Reference Sites**

PCR Site	Survey Location (GDA94 ZONE 55)
N2	641096mE 7512914mN
7-SCL	641298mE 7510328mN
80-SCL	642045mE 7511689mN
N12	640984mE 7512975mN
5-SCL	642166mE 7508999mN
N41	642742mE 7510104mN
110-SCL	644310mE 7508052mN

### 3.5 Strategic Cropping Land

SCL is identified to occur within the Project Site and immediate surrounds, with areas where intersect with mapped SCL limited to Lot 101 on SP310393 as detailed in Figure 1.

## 4 RESTORATION PLAN

### 4.1 Overview

A RP is required to demonstrate how permanent impacts to SCL as a result of a resource activity will be avoided. The RP is required to demonstrate the capacity for SCL disturbed by the resource activity to be returned to pre-activity status.

The following RP information requirements for demonstrating land will be restored to pre-mine condition is presented in RPI Act Statutory Guideline 09/14, (2019). These have been used to guide the contents of this RP and presented in relevant sections below, as summarised in Table 4.

**Table 4 Restoration Plan Information Requirements and Report Section**

<b>RPI 09/14 (2019) Information Requirements</b>	<b>Section</b>
Information on the nature of impact on the land and methods used to determine impact	4.2, 4.3.1
Characterisation of the pre-activity (current) condition of the land and soils	4.3.1, 4.3.2, 4.4
Evaluation of the nature and risk of any predicted impacts on the land	4.3.1, 4.3.2, 4.4
Evidence that scientifically proven and practical methods do exist for restoring the land	4.3.3, 4.4
Detail on the application of the restoration methods including timeframes	4.3.3, 4.4, Table 14
A monitoring program including benchmarking and progress milestones	4.4.8, Table 17
A fully costed estimate of identified restoration works	4.4.2, Table 14
Restoration criteria against which successful restoration can be demonstrated	4.4.8, 4.4.9

This RP should be considered a live and adaptive document. It will require adjustment based on circumstances changing based on the current design and plan in site construction activities, technology, knowledge, and best practice.

### 4.2 Proposed Disturbance

No more than two 2% of SCL may be permanently impacted, as required under the RPI Act. The total area of the mapped SCL is calculated as the area of a SCL map unit that covers one or more lot and plans under the ownership of a single landholder. Permanent disturbance to that mapped SCL under the ownership of that single landholder cannot exceed 2% of that mapped area.

The area of impact is considered to be the area of that mapped SCL which will potentially be impacted by the activity, whether or not the land can be restored to its pre-activity condition after the activity ceases.

The proposed disturbance to SCL as a result of the Project is presented in Figure 1. Table 5 details areas of impacted SCL and associated Lot and Plans. The total proposed disturbance to the mapped SCL within Lot 101 on SP310393 is 21 hectares (ha).

**Table 5 Areas of Impacted SCL**

Lot and Plan	SCL Mapped (ha)	Impacted SCL (ha)	Impacted SCL (%)	Owner
Lot 101 on SP310393	3,306	<p>The Proposed Activity Footprint covers approximately 20.4 ha (35 m wide corridor for approximately 6.02 km) (0.62% of the SCL on the property), comprising:</p> <ul style="list-style-type: none"> <li>• 13.45 ha verified SCL (0.41% of the SCL on the property)</li> <li>• 6.96 ha non-SCL area (0.21% of the SCL on the property).</li> </ul>	0.62%	<p>BHP Coal Pty Ltd  Umal Consolidated Pty Ltd  BHP Queensland Coal Investments Pty Ltd  Mitsubishi Development Pty Ltd  QCT Investment Pty Ltd  QCT Mining Pty Ltd  QCT Resources Pty Ltd</p>

As the proposed percentage of impacted SCL is below 2%, it is considered that the prescribed outcome that no permanent impact on more than 2% of the SCL on the property can be met. This is supported by the RP which demonstrates that the SCL can be returned to its pre-activity and pre-disturbance condition.

#### **4.2.1 Proposed Disturbance Activity**

Bulk electricity demand for the Project will be supplied by the existing Ergon Supply (Dysart 66 kV supply to Saraji Mine), located south of the Project Site. The provision of power of the Project will be supported through the construction of two new powerlines:

- A 66 kV northern extension connecting the Project to the infrastructure and transport corridor, and,
- A co-aligned 66 kV powerline and connection extending off lease and connecting to the Dysart Substation.

The proposed activity associated with this Restoration Plan relates to the latter of the above powerlines as it traverses SCL. Works associated with the proposed activity are further detailed in the following sections.

#### **Access to Site**

Access to the Proposed Activity site will be available with the following three options that would be utilised based on convenience and efficiency at the time:

- Via Dysart-Moranbah Road or Saraji Road, which is the main access route to the Saraji mine located to the north of the Project Site, and through to the existing infrastructure easement, or
- Via the existing infrastructure easement from the south of the Project Site where the easement intersects Golden Mile Road, or,

- Via the easement crossing Lake Vermont Road to the east of the Project Site.

### **Permanent Works**

No permanent works are associated with the proposed activity. The proposed activity will ultimately be removed and the land subject to the expected area of impact of the Proposed Activity Footprint will be restored to its pre-activity condition, as outlined in this Restoration Plan.

### **Temporary Works**

The proposed activity is temporary in nature and involves the creation of a 35 m wide corridor through SCL for the construction and operation of the 66 kV powerline. Construction works for the proposed activity are anticipated to take approximately 3 months.

The proposed activity is expected to have an operational life of approximately 50 years. On completion, the powerline will be completely removed and the Proposed Activity Footprint will be returned to its pre-activity condition in accordance with this Restoration Plan.

### **Design Considerations and Line Route Selection**

The primary parameters, such as voltage, capacity, potential connection points, physical and regulatory constraints, have been considered in the design of the proposed powerline.

The line route selection process for the proposed activity comprised four stages that include understanding the purpose of the line, desktop study, site visit, and final route selection. The final route for the powerline has been selected based on the impact consideration of different physical, environmental and regulatory constraints for design and construction.

These constraints include cultural heritage, native title, vegetation clearing, waterway crossing, route length, flood zones, geology and terrain, infrastructure crossings (e.g. road, rail, powerlines), land tenure and landowners, mine plan and safety

Additionally, the alignment for the proposed activity is located adjacent to existing infrastructure and associated easements, representing a logical and practical alignment.

### **Corridor Width**

The corridor width for the proposed activity is 35 m which has been determined by the position of the conductors under high wind conditions (blow-out) for the longest spans and regulatory electrical clearances, including a safety margin.

The 35 m corridor width safely accommodates the powerline, including structures, conductors and ground stays. It also provides sufficient space for construction and maintenance activities as well as providing electrical clearance to objects located on the corridor boundary.

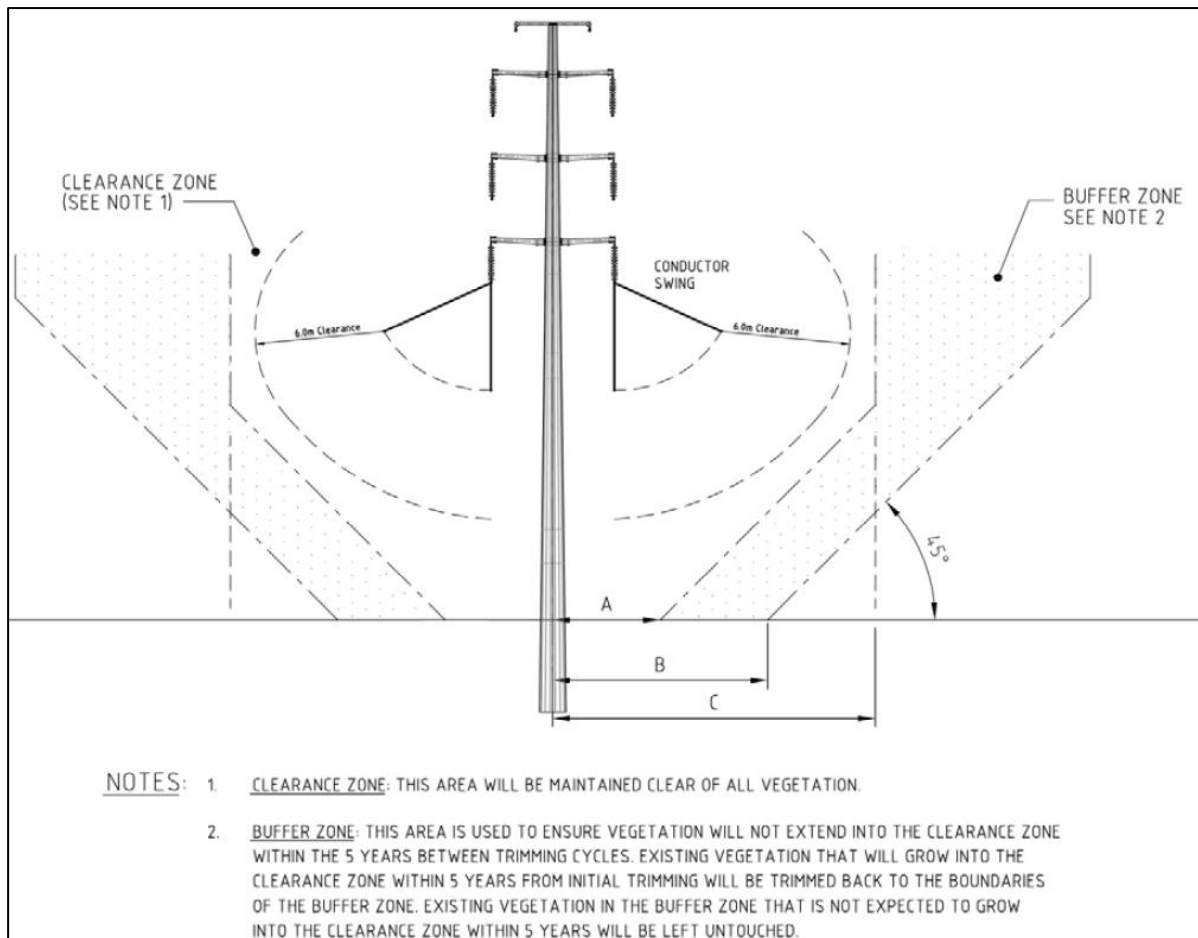
For the purposes of this Restoration Plan, the corridor width is considered to constitute the full Proposed Activity Footprint and maximum potential extent of disturbance. Notwithstanding, actual disturbance associated with construction and installation of physical infrastructure (poles and access tracks) will likely be much less.

## Vegetation Clearing

Vegetation clearing will be very minimal as the alignment for the proposed activity is primarily through open pasture.

Clearing requirements are dependent on the powerline voltage. For the proposed 66 kV powerline, a full clearing width of 5m (clearing zone) and an exclusion zone width of 10m (buffer zone) is required. Plate 1 illustrates the clearance and buffer zones for the powerline.

**Plate 1 Clearance and Buffer Zones**



## Pole Installation

The main construction work for the proposed activity will be the installation of powerline poles to support the overhead powerline. It is estimated that an average pole span of 150 m, and up to 250 m when spanning creeks, will be required within the proposed activity footprint. Each powerline pole location will need to be levelled for the pole pad to support the crane throughout construction. The area to be levelled and cleared for the poles will be defined by concentric circles between the radius of 2m and 8m.

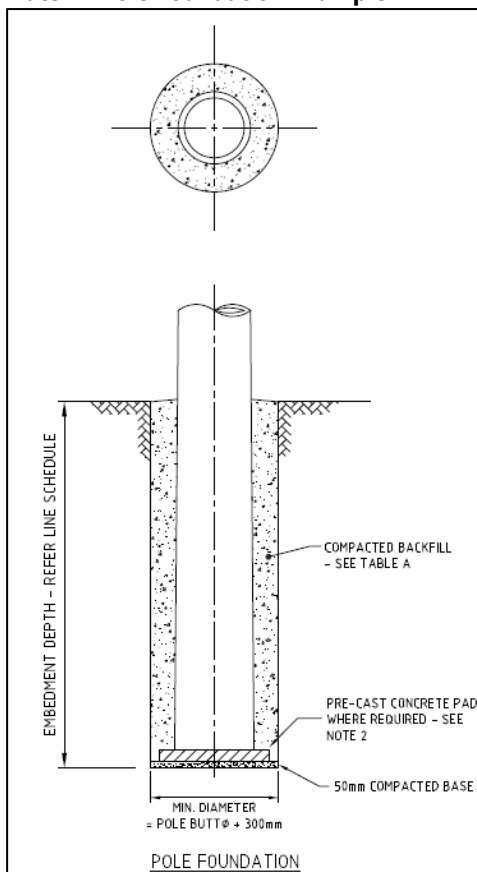
1. A general construction procedure for the powerline poles includes the following activities:
2. Excavate by earth auger drilling (where the soil type allows) at the pole location.

3. Remove loose spoil from the bottom of the hole and power ram bottom surface.
4. Spread and level a 50 mm layer of stabilised backfill as a base for all foundation types.
5. Firmly imbed the pre-cast concrete pad into the base material and level. Minimum pad diameter shall be equal to the pole butt diameter plus 100 mm.
6. Place the pole in position, ensuring it is oriented correctly and vertically plumb in each direction or raked.
7. Place the backfill in layers not exceeding 200 mm and power ram.

The excavation shall not be left open for more than 24 hours, unless backfilled with sand or as otherwise agreed by the site supervisor.

The foundation type and depth/size to be used at each site will be subject to detailed design and based on what is found during excavation of the pole hole. This may be determined through soils tests performed prior to construction, hand-penetrometer tests during construction or previous experience with adjacent sites.

**Plate 2 Pole Foundation Example**



## Benching

Major benching is not anticipated to be required throughout the larger sections of level or near level graded areas; however, benching may be required at areas with major changes in grade, for example at waterway crossings and where such features cannot be spanned.

## Construction and Maintenance Access

An access track measuring approximately 3 m wide and extending throughout the length of the Proposed Activity Footprint corridor will be established beside the centre line of poles for heavy machinery access during construction. These tracks will likely be maintained for the life of the proposed activity to be used for maintenance of the powerline (should access not be consolidated with existing access tracks under adjacent powerlines/easements).

### 4.2.2 Risks Associated with the Proposed Disturbance Activity

Risks that may be associated with the disturbance activity on the SCL area include the following;

- compaction of soils through the access of vehicles,
- the introduction of weed and evasive species from outside the disturbance area;
- erosion from disturbance of soils in the disturbance area by vehicles and installation of infrastructure; and
- mixing of soil resources (topsoil and subsoils) which reduces the soil resource quality.

## 4.3 Activities to Restore SCL to Pre-Disturbance Condition

### 4.3.1 Land Suitability and SCL Assessment

GTE conducted an assessment of soil and land suitability survey (GTE, 2020) (Appendix B) and SCL survey (as defined by SCL trigger mapping at the time of study [GTE, 2021] Appendix A). A summary of these assessments, which have been updated where required with the latest SCL assessment (GTE, 2021) are presented below.

Land suitability has been previously assessed for the Project according to the Queensland Technical Guidelines for Mining (DME, 1995), the Guideline for Agricultural Land Evaluation in Queensland, second edition (Department of Science, Information Technology and Innovation (DSITI) and the Department of Natural Resources and Mines (DNRM), [DSITI & DNRM, 2015]) and Regional Land Suitability Frameworks for Queensland (DNRM, 2013) for the Inland Fitzroy and Southern Burdekin area.

These assessments account for climate, soils, geology, geomorphology, soil erosion, topography and past land uses and classifies overall class against the suitability subclasses for various land management uses, rainfed broadacre cropping and beef cattle grazing.

These assessments use a land suitability class system of five classes, with land suitability decreasing progressively from class 1 to class 5. Table 6 provides an overview of the land suitability classification class system used.

**Table 6 Land Suitability Classes (GALE, 2015)**

Class	Suitability	Limitations	Description
1	Suitable	Negligible	Highly productive land requiring only simple management practices to maintain economic production.
2	Suitable	Minor	Land with limitations that either constrain production or require more than the simple management practices of class 1 land to maintain economic production.



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

The limitations for cropping and beef cattle grazing were assessed for identified SMUs by GTE (2020) in the affected SCL trigger map of the Project Site. The overall land suitability for a SMU was based on the most severe limitation relating to the nominated subclasses for cropping and beef cattle grazing.

The limitation values and subclass rule set were selected from the guidelines (LSAT, 1995) and (DNRM, 2013) for the land management options. A summary of the land management options, limitations and corresponding SMUs/MUPs are presented in Table 7.

**Table 7 Land Suitability Assessments, Limitations and Assessed SMUs/MUPs**

Land Suitability Assessment	Land Management Options	Limitations	Limitations applied to SMU / MUP
Land Suitability Classification for cropping and grazing in the semi-arid sub-tropics of Queensland (LSAT, 1995)	Rainfed Broadacre Cropping	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); vegetation (v).	B1 / 13 E2 / 17
Land Suitability Classification for cropping and grazing in the semi-arid sub-tropics of Queensland (LSAT, 1995)	Beef Cattle Grazing	water availability (m); nutrient deficiency (n); physical factors (p); salinity (sa); rockiness (r); gilgai (g); pH; ESP; wetness (w); water erosion (e); flooding (f);	A2g / 7 B1 / 13 B2bl / 6 B2s / 8 B3bl / 16 E1r / 14 E2 / 17
Regional Frameworks, Overall Class (DNRM, 2013)	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) Wheat (dryland)	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).	A2g / 7 B2bl / 6 B2s / 8 B3bl / 16 E1r / 14 E2 / 17

The limitations were assessed against their suitability subclasses (rules) for rainfed cropping, beef cattle grazing (LSAT, 1995) and Regional Frameworks (DNRM, 2013) land management uses as referenced in the land suitability assessments. These are presented in Appendix C.

A summary of the land assessments from GTE (2020) are presented in Tables 8, 9 and 10.

**Table 8 Land Suitability Assessments, Limitation Values and Suitability Class Summary (GTE, 2020)**

SMU	Rainfed Broadacre Cropping		Beef Cattle Grazing	
	Limitations	Suitability Class	Limitations	Suitability Class
B1	m2, n2, p2	2	m1, n1, p1	1
E2	m2, n2, p2	2	m1, n1, p2	2

**Table 9 Beef Cattle Grazing Assessment, Limitation Values and Suitability Class Summary (GTE, 2020)**

SMU	Water Availability	Nutrient Deficiency <sup>1</sup>	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
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
E1r	3	-	2	1	1	1	2	1	1	1	1	3

1- Nutrient deficiency not assessed as phosphorus for the MUPs

**Table 10 Land Suitability Classes, GTE SCL Regional Frameworks Assessment Summary (GTE, 2020)**

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
B1	4	4	3	3	4	3	4	3	3	3	3	4	4	3
B2s	4	4	3	3	4	3	4	3	3	3	3	4	4	3
B2g	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	4	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
E2	4	4	3	3	4	3	4	3	3	3	3	4	4	3

The classification of the SMUs/MUPs for rainfed cropping, beef cattle grazing, and Regional Frameworks were reviewed, and an Agricultural Land Class (ALC) based on guidelines in GALE (2015) was selected. The classification ranges from A (A1, A2), Crop land, B, Limited crop land, C (C1, C2, C3) Pasture land to D, non-agricultural land.

Table 11 summaries these results are assessed for the Land Suitability Assessments.

**Table 11 SMUs, Limitations, Land Suitability Assessments and Agricultural Land Class Summary**

SMU	SCL Map Unit Polygon	ASC <sup>1</sup>	Main Limitations and Value (Cropping)	Land Suitability for Rainfed Cropping (LSAT, 1995)	Land Suitability for Regional Frameworks, Overall Class (DNRM, 2013)	Land Suitability for Beef Cattle Grazing (LSAT, 1995)	Agricultural land class
A2g	7	Crusting Grey Vertosol	Soil Water Availability (M3) Narrow Moisture Range (Pm5)	-	3	2	A1
B1 <sup>3</sup>	13	Black vertosol	Water availability (m2), Nutrient deficiency (n2), Soil Physical Factors (p2)	2	3	1	A1
B2bl	6	Black Dermosol	Erosion Hazard (Es32) Soil Water Availability (M4) Narrow Moisture Range (Pm5)	-	4	3	B
B2s	8	Black Dermosol <sup>2</sup>	Soil Water Availability (M3)	-	3	2	A1
B3bl	16	Black Vertosol	Erosion Hazard (Es33) Soil Water Availability (M3) Narrow Moisture Range (Pm7)	-	4	3	B
E1r	14	Red Chromosol	Soil Water Availability (M4)	-	4	3	B
E2 <sup>3</sup>	17	Black Vertosol	Soil Water Availability (M3)	2	3	2	A1

1. Australian Soil Classification has been updated based on since review of additional SCL results
2. Previously assessed as Black Chromosol.
3. SMU Land Suitability Assessment, GT Environmental Services (2012).

SMU / MUPs B2bl and B3bl were assessed as unsuitable (Class 4) for the Regional Frameworks due to the identified limitations. These limitations were considered marginal and therefore GTE assessed SMU / MUPs B2bl and B3bl as Limited cropping land, and assessed as ALC B.

GTE conducted a SCL assessment of the mapped Trigger Map across the project. Table 12 presents the following SCL status (GTE, 2021) for MUPs intersected. The SCL assessment report, Strategic Cropping Land Assessment (GTE, 2021) is presented in Appendix A.

**Table 12 SMUs, Limitations, Land Suitability Assessments and Agricultural Land Class Summary**

SMU	MUP	ASC <sup>1</sup>	Main SCL Limitations	SCL Status
A2g	7	Crusting Grey Vertosol	No SCL criteria exceedances reported	Likely SCL
B1 <sup>3</sup>	13	Black vertosol	pH exceedance – Site 7-SCL Remaining two sites have no SCL criteria exceedances reported	Likely SCL
B2bl	6	Black Dermosol	pH exceedance – Sites N26, N27, N32 and 80-SCL Soil water storage (SWS) exceedance – Site 91-SCL	Not SCL

SMU	MUP	ASC <sup>1</sup>	Main SCL Limitations	SCL Status
B2s	8	Black Dermosol <sup>2</sup>	No SCL criteria exceedances reported	Likely SCL
B3bl	16	Black Vertosol	No SCL criteria exceedances reported	Likely SCL
E1r	14	Red Chromosol	SWS – Site 10-SCL, N41 and N42	Not SCL
E2 <sup>3</sup>	17	Black Vertosol	No SCL criteria exceedances reported	Likely SCL

### 4.3.2 Land Suitability and SCL Assessment Differences

It is noted that there are differences between the land suitability and SCL assessments. As above, the limitations of SMU / MUPs B2bl and B3bl were considered overall unsuitable for the Regional Frameworks, i.e., class 4, however assessed as Limited Cropping Land for ALC (Class B) as the potential to crop on the area is likely with only marginal engineering, amelioration and/or financial changes considered.

The SCL assessment when compared to the Regional Frameworks is simplified due to assessment differences between the SCL criteria and nominated limitations. These are related to but not limited to sodicity, pH, soil water storage.

### 4.3.3 Defining Restoration Criteria

In order to establish restoration criteria to return proposed disturbed SCL areas to pre-disturbance activities, comparison to land suitability criteria determined by GTE (2021 and GTE (2020) [Appendix A and B]) is recommended.

Restoration criteria will be based on the pre-mine land suitability assessment classes outlined in Table 13. Table 13 provides restoration criteria for relevant tenures, associated SMUs, SCL map units, land suitability and SCL trigger map and GTE assessment status within the Project disturbance area. Figure 1 presents these SMUs and MUPs in the Project site.

**Table 13 Restoration Criteria for mapped SCL proposed to be disturbed**

SMU / MUP	Lot and Plan	SCL Map Units	Land Suitability for Rainfed Cropping	Land Suitability for Regional Frameworks, Overall Class	Agricultural land class	DRNM SCL Trigger Map / GTE SCL
A2g / 7	101, SP310393	7	-	3	A1	Yes / Yes
B1 / 13	101, SP310393	13	2	-	A1	Yes / Yes
B2bl / 6	101, SP310393	6	-	4	B	Yes / Not SCL
B2s / 8	101, SP310393	8	-	3	A1	Yes / Yes
B3bl / 16	101, SP310393	16	-	4	B	Yes / Yes
E1r / 14	101, SP310393	14	-	4	B	Yes / Not SCL
E2 / 17	101, SP310393	17	2	3	A1	Yes / Yes

## 4.4 Restoration Methods

Trigger mapped SCL has been identified for the Project Site on the following tenure:

- Lot 101 on SP310393.

Associated SMUs and individual SCL map units are detailed in Table 4 and include restoration criteria (outlined as land suitability criteria for rainfed cropping and regional frameworks) that will be required to be met to establish pre-activity land uses. Pre-activity land suitability's to be achieved are:

- Rainfed Cropping Class 2, ALC A1, SCL (SMU/MUP B1/13),
- Regional Frameworks Class 3, ALC A1, SCL (SMU/MUP A2g/7, B2s/8, and E2/17),
- Regional Frameworks Class 4, ACL B, SCL (SMU/MUP B3bl/16 and E1r), and,
- Regional Frameworks Class 4, ACL B, Non-SCL (SMU/MUP B2bl/6 and E1r/14).

Methodologies are listed below for restoration to pre-mine suitability and include mitigation measures and recommendations for the Project Site.

### 4.4.1 Previous Studies

Several studies have been conducted to describe and assess the soils encountered in the Project Site and surrounding areas. These have been reviewed as a basis for developing the RP methodologies:

- 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,
- CSIRO (1967), Land Systems of the Isaac-Comet Area,
- Emmerton, B (2005) Soil and Land Suitability Survey, in Potential Disturbance Areas in Advance of Mining, Saraji Mine 2004 Survey,
- GTE (2020), Baseline Land Resources and Soil Suitability Assessment,
- GTES (2012), Saraji East Coal Mine Project, Soils and Land Suitability,
- GTES (2007), Soil Evaluation on Proposed Easement for Power Line, Golden Mile Road to Saraji Mine,
- GTE (2021), Strategic Cropping Land Assessment,
- J.W.Burgess (2003), Land Resource Assessment of the Windeyers Hill Area, Isaac-Connors and Mackenzie River Catchments, Central Queensland, Volume 1 and 2, and,
- SKM/GTES (2013), Saraji Mine and Saraji East, Assessment of Strategic Cropping Land.

### 4.4.2 Restoration Plan Procedures, Schedule and Costs

The RP general procedures include all infrastructure and associated materials be removed. All materials will be removed including but not limited to cables, poles, concrete foundations, and fill materials as well as signage and miscellaneous items associated with access roads. Once

completed, inspected, and recorded, the amelioration and revegetation of impacted areas such as access tracks may commence.

Removal of infrastructure and associated materials shall be completed in a time no longer than installation, pending the site conditions and weather. Restoration works will only be undertaken when soils are dry.

Schedule for restoration will be at the end of the life of the powerline. The following schedule presented in Table 14 outlines the restoration work, actions, and approximate costs at current estimated rates where available. Additional subsections 4.4.3 to 4.4.8 outline further recommendations in detail.

Estimated costs are based on supplied costs by the client, based on current rates and similar projects. To establish indicative costs for 50 years' time for illustrative purposes, various cost escalation rates can be nominally applied. For example, a 0.8% per annum escalation rate over a 50-year period would equate to an overall cost escalation factor of 40%, which can be applied to the current rates outlined in Table 14 below. This approach is considered to provide a reasonable estimate of future restoration costs, suffice for the purpose of this Restoration Plan.

Contingency costs for any sites that are unable to be restored to the pre-activity condition and/or productive capacity shall be 10% of the total cost, calculated for 2020.

**Table 14 Restoration Milestones, Actions, Estimated Schedule and Cost Estimates**

<b>Restoration Work Milestones</b>	<b>Action to be undertaken</b>	<b>Estimated Timeframe (Months)</b>	<b>Estimated Cost (2020) (\$)</b>
Commencement of restoration works	Restoration works will begin following the cessation of mining and in conjunction with the decommissioning, rehabilitation and restoration requirements of the Environmental Authority for the mining activities	Month 0	n/a
Infrastructure removal	All services disconnected: <ul style="list-style-type: none"> <li>Disconnection point for safe removal of infrastructure.</li> </ul>	Month 3	35,000
	Infrastructure removed: <ul style="list-style-type: none"> <li>Removal of power lines on poles: <ul style="list-style-type: none"> <li>Steel.</li> <li>Wooden.</li> <li>Concrete.</li> </ul> </li> <li>Removal of Switchyards.</li> <li>Removal of Substations.</li> <li>Removal of concrete pads: <ul style="list-style-type: none"> <li>&lt;300mm thick.</li> <li>&gt;300mm thick.</li> </ul> </li> </ul>	Month 9	30,204/km 19,199/km 33,618/km 600/m2 55/m2  15/m2 65/m2
	Visual survey and observation of removed infrastructure area by suitably qualified civil engineer.	Month 10	2,500
Landform re-profiling and development	Pole location pits backfilled and assessed.	Month 11	Not available [pending further/future review] (n/a)
	Topsoil removed prior to installation of infrastructure (i.e. poles) is returned.		
Surface preparation	Visual survey and observation of final landform by suitably qualified geotechnical engineer.	Month 12	n/a
	Assessment completed of infrastructure corridor soil health and suitability by a suitably qualified person .	Month 13	n/a
	Ripping of topsoil, grading and re-seed: <ul style="list-style-type: none"> <li>Track (no surface prep).</li> </ul>	Month 25	1,746/km

Restoration Work Milestones	Action to be undertaken	Estimated Timeframe (Months)	Estimated Cost (2020) (\$)
Revegetation (pre-disturbance status)	<ul style="list-style-type: none"> <li>Track (gravel).</li> <li>Track (crushed rock).</li> </ul>		5,322/km 8,869/ha
	Areas requiring revegetation will need seeding of target vegetation species such as Lucerne - seeding rates may be assessed based on soil analysis, current climate and best practices of nearby land use		n/a
	Amelioration of access tracks and infrastructure soils based on visual, laboratory assessment, as determined necessary: <ul style="list-style-type: none"> <li>Fertilizer (to increase soil fertility).</li> <li>Gypsum (to reduce dispersive attributes).</li> <li>Lime (to increase pH).</li> </ul>		4,660 <sup>1</sup> 6,825 <sup>2</sup> n/a
	Treatment of weeds and pest species as required		
Revegetation / restoration criteria success	Survey by a suitability qualified person to include but not limited to: <ul style="list-style-type: none"> <li>Restoration vegetation with nearby established vegetation at selected reference sites, ecosystem and based on percent ground covered.</li> <li>Weed and pest species are equal to or below selected reference sites.</li> <li>No active erosion and drainage follow appropriate drainage paths.</li> <li>Specific vegetation identified for the PCR sites are presented in Section 4.4.5.</li> </ul>	Month 61	n/a
Ongoing monitoring	Suitably qualified person to conduct assessment of restoration plan area.	Refer Table 8	n/a

1. DAP (Index Mundi, 2021) \$740.08/ton, 300kg/ha (GTE nominated)

2. Grade 1 Approx. (\$130/Ton) (BHP,2019), applied at 2.5t/ha (Incitec, 2017) is approx.

#### 4.4.3 General Recommendations during Project Site Activities

The following are recommended general management procedures for activities in the construction, ongoing project site activities and restoration in the project site:

- Limiting vehicle traffic to defined tracks only along the corridor,
- Limiting construction activity when soils are dry and weather forecasts indicate dry conditions,
- The selection of lighter equipment, plant, vehicles, and payloads where possible for transportation, construction, and restoration of the project site, and,
- Vehicles accessing the project site activities are to be visually clean with no excessive soil or mud present to reduce the introduction of weed and evasive species

#### 4.4.4 Soil Surface Preparation

The following are recommended general management procedures for soil preparation in the disturbance and restoration to pre-disturbance condition:

- Supervisors and competent operators should be familiar with the restoration works area, existing soils mapping and recommended topsoil and subsoil depth (refer to Table 16 and Figure 1),
- Current weather forecast should be checked prior to preparing of soils to reduce exposure of bare sodic, erosive soils and sediment runoff,
- Removal of any foreign material brought in, not limited to gravels, road stabilizers, concrete footings, should be undertaken prior to soil replacement,
- Areas of land downgradient, low-lying areas or areas of observed runoff should have suitable erosion and sediment control measures in place prior to construction commencing, and,
- Topsoil suspected of being mixed with subsoils during surface roughening or removal of backfill during pole installation should be analysed and separated until results have been reviewed, appropriate amelioration methods recommended, and an area selected to re-distribute.

#### **4.4.5 Revegetation**

The following are recommended procedures for revegetation activities in the disturbance and restoration to pre-disturbance condition:

- Suitable machinery should be utilised in topsoil ripping activities. Ripping should be undertaken with care to minimise the mixing of subsoils,
- Soils are recommended to be ripped at the depths indicated in Table 16 below with reference to depths assessed in (GTE, 2020) for topsoil. Subsoils may be required to ripped prior to placement of topsoil to reduce the impact of compaction during vehicle traffic,
- After the ripping of soils, additional seeding with native, pasture grasses and tree species will assist with encouraging vegetation regrowth,
- The selection of native, pasture grasses and tree species may include Lucerne, which has additional benefits such as loosening soil compaction due to its extensive root system,
- Sediment and erosion controls may be utilised within low lying areas to ensure that loss of soil resources is minimal, and product can be recovered,
- Amelioration of soils to be undertaken as required based on the soil assessment. The assessment will confirm soil conditions and any appropriate amelioration prior to vegetation establishment. The density of soils samples to be taken should cover at minimum, the identified SMUs that transect the project site as per Figure 1, and
- Re-vegetation should be considered the vegetation identified during previous soil survey assessments. Based on the disturbance area, the vegetation restoration should seek to include the following outlined in Table 15. Vegetation such as brigalow,



blackbutt scrub and poplar box woodland may be considered along boundary fences where areas have not been cleared previously.

**Table 15 PCR Site and Identified Vegetation**

PCR Site	Vegetation Observed	Vegetation Restoration Minimum
N2	Various shrubs and grasses. No crops.	Pasture / forage crops and grasses
7-SCL	Forage Crops	Pasture / forage crops and grasses
80-SCL	Grasses, Brigalow nearby	Pasture / forage crops and grasses
N12	Grasses	Pasture / forage crops and grasses
5-SCL	Grasses, shrubs	Pasture / forage crops and grasses
N41	Grasses, shrubs	Pasture / forage crops and grasses
110-SCL	Crops (Forage)	Pasture / forage crops and grasses

**Table 16 Topsoil, Subsoil Depths (GTE, 2020a), General and Specific Recommendations**

SMU / MUP	Topsoil Depth (mbgl <sup>1</sup> )	Subsoil Depth (mbgl)	General and Specific Recommendations – Restoration Plan
A2g / 7	0.00-0.10	0.10-0.30	<p><u>General Recommendations</u></p> <p>Topsoil and subsoil are suitable to be placed after infrastructure (pole installations) are removed. No further disturbance is expected on site.</p> <p><u>Specific Recommendations – Restoration Plan</u></p> <p>Chloride levels below 800 mg/kg (RPI 08/14), no salinity issues.</p> <p>Compaction of clay soils may occur with plant and equipment traffic over the disturbance area for the MUP.</p> <p>Recommendation for light tillage / surface roughing of the disturbance area tracks and inclusion of organic matter to improve soil structure and reduce compaction and erosion.</p> <p>The introduction of plant species such as Lucerne which will assist in reducing soil compaction will be included</p>
B1 / 13	0.00-0.50	0.50-0.90	<p><u>General Recommendations</u></p> <p>Topsoil and subsoil are suitable to be placed after infrastructure (pole installations) are removed. No further disturbance is expected on site.</p> <p><u>Specific Recommendations – Restoration Plan</u></p> <p>Chloride levels below 800 mg/kg (RPI 08/14), no salinity issues.</p> <p>Compaction of clay soils may occur with plant and equipment traffic over the disturbance area for the MUP. Recommendation for light tillage / surface roughing of the disturbance area tracks and inclusion of organic matter to improve soil structure and reduce compaction and erosion.</p> <p>The introduction of plant species such as Lucerne which will assist in reducing soil compaction will be included</p>
B2bl / 6	0.00-0.10	0.10-0.80	<p><u>General Recommendations</u></p> <p>Topsoil and subsoil are suitable to be placed after infrastructure (pole installations) are removed. No further disturbance is expected on site.</p> <p><u>Specific Recommendations – Restoration Plan</u></p> <p>Chloride levels above 800 mg/kg (RPI 08/14) at 0.90-1.00 mbgl – Chloride 1026 mg/kg. Chemical amelioration of subsoils is not recommended due to the amount of subsoil disturbed. It is recommended that the site disturbed be tilled to roughen the surface, reduce compaction and erosion and have water (free of salts) applied to the area to encourage leaching.</p>

SMU / MUP	Topsoil Depth (mbgl <sup>1</sup> )	Subsoil Depth (mbgl)	General and Specific Recommendations – Restoration Plan
			Subsoil removed during placement of infrastructure returned as primary compacted backfill, or if deemed unsuitable due to foundation type; soil is to be placed and compacted around the infrastructure foundation.
B2s / 8	0.00-0.15	0.15-0.60	<p><u>General Recommendations</u></p> <p>Topsoil and subsoil are suitable to be placed after infrastructure (pole installations) are removed. No further disturbance is expected on site.</p> <p><u>Specific Recommendations – Restoration Plan</u></p> <p>Chloride levels above 800 mg/kg (RPI 08/14) at 0.90-1.00 mbgl – Chloride 826 mg/kg. Chemical amelioration of subsoils is not recommended due to the amount of subsoil disturbed. It is recommended that the site disturbed be tilled to roughen the surface, reduce compaction and erosion and have water (free of salts) applied to the area to encourage leaching.</p> <p>Subsoil removed during placement of infrastructure returned as primary compacted backfill, or if deemed unsuitable due to foundation type; soil is to be placed and compacted around the infrastructure.</p> <p>The introduction of plant species such as Lucerne which will assist in reducing soil compaction will be included</p>
B3bl / 16	0.00-0.10	0.10-1.00	<p><u>General Recommendations</u></p> <p>Topsoil and subsoil are suitable to be placed after infrastructure (pole installations) are removed. No further disturbance is expected on site.</p> <p><u>Specific Recommendations – Restoration Plan</u></p> <p>Chloride levels below 800 mg/kg (RPI 08/14), no salinity issues.</p> <p>Compaction of clay soils may occur with plant and equipment traffic over the disturbance area for the MUP.</p> <p>Recommendation for light tillage / surface roughing of the disturbance area tracks and inclusion of organic matter to improve soil structure and reduce compaction and erosion.</p> <p>The introduction of plant species such as Lucerne which will assist in reducing soil compaction will be included</p>
E1r / 14	Not suitable	0.15-1.00	<p><u>General Recommendations</u></p> <p>Rehabilitation use for topsoils of the MUP is not recommended for general rehabilitation reuse due to soil texture being sandy loam (marginal sandy loams) based on assessment against Elliot and Veness, 1981 (Table 83, GTE, 2020).</p> <p>Topsoil (0.00-0.15) and subsoil are suitable to be placed after infrastructure (pole installations) are removed. No further disturbance is expected on site.</p> <p><u>Specific Recommendations – Restoration Plan</u></p> <p>Chloride levels below 800 mg/kg (RPI 08/14) , no salinity issues.</p> <p>Compaction of soils may occur with plant and equipment traffic over the disturbance area for the MUP.</p> <p>As per clay soils, recommendation for light tillage / surface roughing of the disturbance area tracks and inclusion of organic matter to improve soil structure and reduce compaction and erosion.</p> <p>The introduction of plant species such as Lucerne which will assist in reducing soil compaction will be included</p> <p>Erosion potential in surface soils is assessed as low with exchangeable sodium percentage below 6, therefore visual assessment of soils during the disturbance phase will indicate if and what erosion and sediment controls are required.</p>
E2 / 17	0.00-0.40	0.00	<p><u>General Recommendations</u></p> <p>Topsoil and subsoil are suitable to be placed after infrastructure (pole installations) are removed. No further disturbance is expected on site.</p>

SMU / MUP	Topsoil Depth (mbgl <sup>1</sup> )	Subsoil Depth (mbgl)	General and Specific Recommendations – Restoration Plan
			<p><u>Specific Recommendations – Restoration Plan</u></p> <p>Chloride levels below 800 mg/kg (RPI 08/14), no salinity issues.</p> <p>Compaction of clay soils may occur with plant and equipment traffic over the disturbance area for the MUP.</p> <p>Recommendation for light tillage / surface roughing of the disturbance area tracks and inclusion of organic matter to improve soil structure and reduce compaction and erosion.</p> <p>The introduction of plant species such as Lucerne which will assist in reducing soil compaction will be included</p>

1. Metres below ground level (mbgl)

#### 4.4.6 Recommended Soil Management, Treatments and Amelioration

The restoration reuse of soil resources, specifically on tracked areas may be assisted with the following treatments and amelioration recommendations:

- If the establishment of vegetation is inadequate, the application of multi nutrient fertilizer such as Mono-ammonium phosphate (MAP) or Di-ammonium phosphate (DAP) may be suitable to boost nutrient levels,
- Gypsum ameliorants may be used to reduce any dispersive attributes for soils. Most soils currently disturbed in the project site present non-dispersive attributes. SMU B3bl may present some dispersive attributes, based on the dominant SMU B3 (GTE,2020) it is a variant of, therefore the application of fine grade gypsum distributed using a broadcasting method over the site will minimise this,
- Reduce time bare soils is exposed by planting native grasses and encouraging organic matter horizon, preferably during dry season, and,
- Contour ripping of topsoils and subsoils where necessary during the rehabilitation process will reduce erosion and hard setting of surfaces prior to vegetation establishment. Table X outlines the topsoil and subsoil depths where recommended ripping depths should be guided.

#### 4.4.7 Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan (ESCP) shall be designed by a suitably qualified and experienced person which will outline proposed measures during the construction and operation phases of the disturbance. This will include review of the available information presented above, in documents GTE, (2020) and GTE (2021) and the final design of the infrastructure disturbance.

#### 4.4.8 Monitoring Program

Table 17 details notification and monitoring procedures recommended for project site restoration.

**Table 17 Monitoring Program for Restoration Plan**

<b>Item</b>	<b>Action</b>	<b>Monitoring</b>	<b>Frequency</b>
Notification of restoration works	Department of Resources is to be notified by the client when restoration works is to commence.	Confirmation of written notification and date.	Prior to the commencement of restoration activities.
Approvals and clearances	Obtain the appropriate approvals and clearance documentation prior to commencing work.	Check validity of approvals and clearance permits.	Prior to clearance activities.
Infrastructure removal	Ensure infrastructure has been fully removed.	Survey and visual observation of removed infrastructure area by suitably qualified civil engineer.	After clearance activities.
Surface preparation	Ensure that final landform meets final design.	Survey and visual observation of final landform by suitably qualified geotechnical engineer.	Within six months of clearance activities
Soil resource status	Soil sampling and analysis to monitor soil fertility and quality.	Samples should be collected to reassess key soil fertility indicators including but not limited to; pH, Electrical conductivity, Chloride, Cation exchange capacity, Nitrogen, Phosphorus and Total organic matter. Texture (particle size analysis) may also be included on the final analysis.	Prior to restoration activities commencing.
Soil resource condition	Prior to surface preparation and revegetation, soils are the appropriate moisture content.	Visual inspection by operators and environmental officers.	Prior to and during surface preparation and revegetation activities.
Monitoring Sites, outside and in the disturbed area.	<p>Nominated PRC Sites (Table 2) and areas within disturbance footprint, located within each MUP will be monitored.</p> <p>Sites nominated within or near the disturbance areas include;</p> <ul style="list-style-type: none"> <li>• N13,</li> <li>• N1,</li> <li>• 99-SCL (West of the site),</li> <li>• 100-SCL (East of the site),</li> <li>• N42 (East of the site),</li> <li>• 4-SCL (East of the site).</li> </ul>	Monitoring of the PCR site and nominated disturbance sites will include survey and visual observation on soil surface conditions, erosion, vegetation growth and coverage.	Monitoring to occur every six months from commencement of restoration activities until it may be shown that disturbed areas are to be pre-activity condition and productive capacity for a period of one year.

Item	Action	Monitoring	Frequency
	A site is not located near the disturbance area for SMU/MUP 16/B3bl, therefore a site located to the east of 5-SCL is recommended.		
Restoration Criteria Success	Monitor soil resources in the disturbance area have been restored.	Visual inspection, photos and associated laboratory result review by environmental officers	Provided with the Annual Monitoring Reports.
Annual Monitoring Reports	Monitoring of restoration works reports to be provided to the Department of Resources.	Restoration works to be detailed per financial year detailing status of monitoring and restoration works.	Monitoring reports will be provided annually from the commencement of the restoration works until the end and/or the first five years.  Pending any further comment or action requested by the Department of Resources, reporting will be reduced to every two years for the ten-year period, then reduced to every five years for 20-year period.
Alternate Mitigation Strategies	If restoration sites are unable to be restored to their pre-activity condition or productive capacity, then alternate measures may be investigated.	Confirmation by environmental officers that disturbance areas are not able to be restored.  Internal, third-party consultants and DoR may discuss best practice measures and new agronomic, amelioration analysis and measures may be reviewed.	As per the timeframe of monitoring sites and annual monitoring reports.

#### 4.4.9 Restoration Criteria Success

The RP may be assessed against the pre-disturbance land suitability and limitations in which the SMUs presented prior to disturbance.

Restoration success may be assessed when the following has been demonstrated:

- Soil resources in the disturbance area have been restored including monitoring reports, photos, and associated laboratory results within 6 months of final restoration works,
- Monitoring notes and photos of native vegetation establishment and pre-disturbance land use in the project site, within three years of final restoration works, and,
- Independent review and field inspection by a third-party consultant.

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## 6 FIGURES

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### **Figure 1      Project Disturbance, SCL Map Unit Polygons and Soil Mapping Units**



# Figure 1: Soils Mapping Units

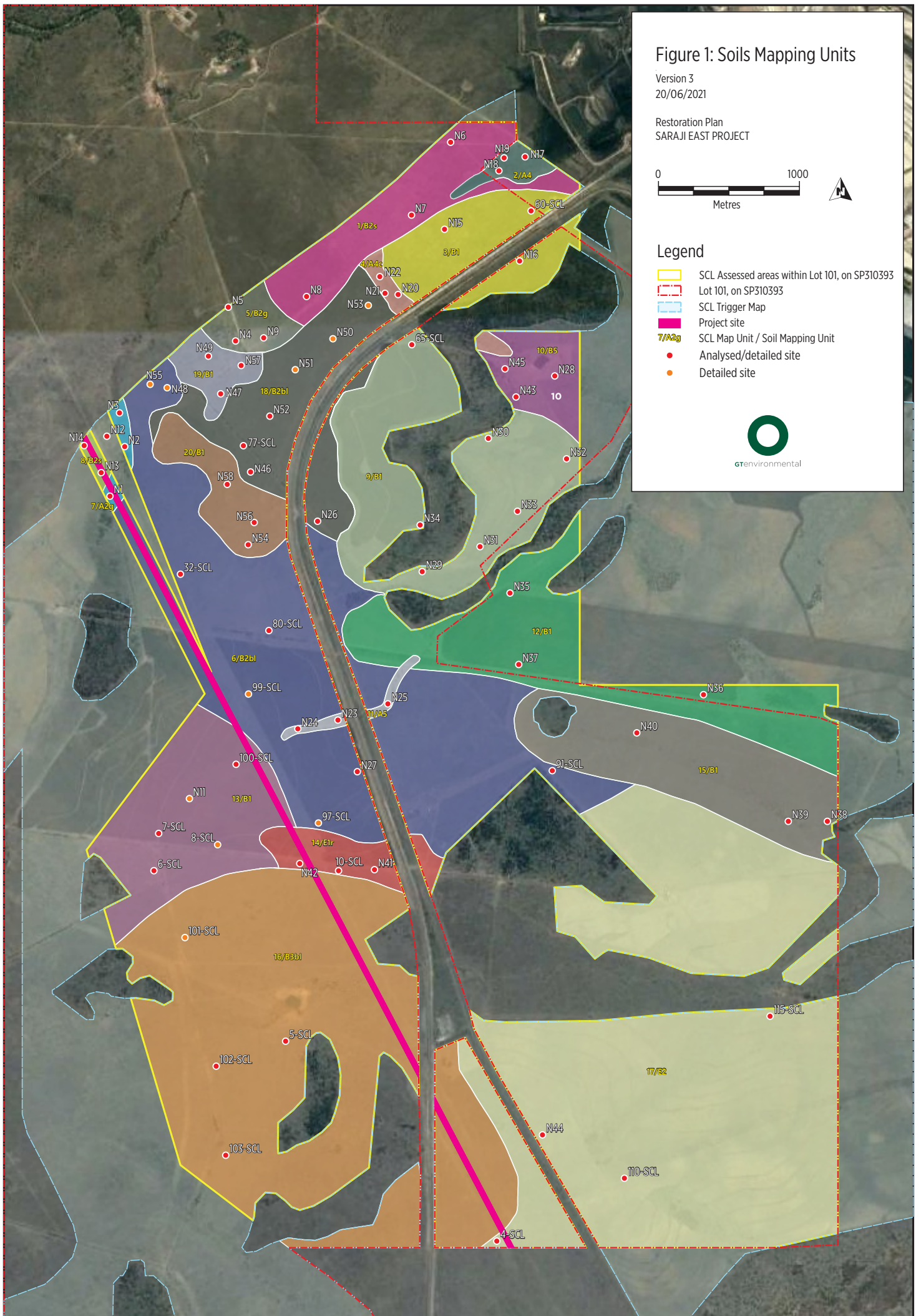
Version 3  
20/06/2021

Restoration Plan  
SARAJI EAST PROJECT



## Legend

- SCL Assessed areas within Lot 101, on SP310393
- Lot 101, on SP310393
- SCL Trigger Map
- Project site
- SCL Map Unit / Soil Mapping Unit
- Analysed/detailed site
- Detailed site





## **7 APPENDICES**

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### **Appendix A**

### **GT Environmental (2021), Saraji East Coal Mine Project, Strategic Cropping Land Assessment**

# Strategic Cropping Land Assessment

Saraji East Project  
BHP Coal Pty Ltd

14 July 2021



**GT**environmental

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# TABLE OF CONTENTS

---

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
<b>1.1</b>	<b>STUDY BACKGROUND</b>	<b>1</b>
<b>1.2</b>	<b>STUDY SCOPE AND STRUCTURE</b>	<b>1</b>
<b>2</b>	<b>SCL METHODOLOGY .....</b>	<b>3</b>
<b>2.1</b>	<b>DESKTOP STUDY</b>	<b>3</b>
<b>2.2</b>	<b>SCL FIELD SURVEY</b>	<b>3</b>
	2.2.1 Detailed Sites	4
	2.2.2 Analysed Sites	5
	2.2.3 Check Sites	6
<b>2.3</b>	<b>SCL MAPPING</b>	<b>6</b>
<b>2.4</b>	<b>SCL ASSESSMENT</b>	<b>6</b>
	2.4.1 Slope	7
	2.4.2 Rockiness	7
	2.4.3 Gilgai	7
	2.4.4 Soil depth	8
	2.4.5 Soil wetness	8
	2.4.6 Soil pH	8
	2.4.7 Soil salinity	8
	2.4.8 Soil water storage	8
<b>3</b>	<b>SOIL MAPPING AND DESCRIPTIONS .....</b>	<b>10</b>
<b>3.1</b>	<b>MAP UNIT 1</b>	<b>12</b>
<b>3.2</b>	<b>MAP UNIT 2</b>	<b>16</b>
<b>3.3</b>	<b>MAP UNIT 3</b>	<b>20</b>
<b>3.4</b>	<b>MAP UNIT 4</b>	<b>24</b>
<b>3.5</b>	<b>MAP UNIT 5</b>	<b>28</b>
<b>3.6</b>	<b>MAP UNIT 6</b>	<b>32</b>
<b>3.7</b>	<b>MAP UNIT 7</b>	<b>37</b>
<b>3.8</b>	<b>MAP UNIT 8</b>	<b>41</b>
<b>3.9</b>	<b>MAP UNIT 9</b>	<b>45</b>
<b>3.10</b>	<b>MAP UNIT 10</b>	<b>50</b>
<b>3.11</b>	<b>MAP UNIT 11</b>	<b>54</b>
<b>3.12</b>	<b>MAP UNIT 12</b>	<b>58</b>
<b>3.13</b>	<b>MAP UNIT 13</b>	<b>62</b>

<b>3.14</b>	<b>MAP UNIT 14</b>	<b>66</b>
<b>3.15</b>	<b>MAP UNIT 15</b>	<b>70</b>
<b>3.16</b>	<b>MAP UNIT 16</b>	<b>74</b>
<b>3.17</b>	<b>MAP UNIT 17</b>	<b>79</b>
<b>3.18</b>	<b>MAP UNIT 18</b>	<b>83</b>
<b>3.19</b>	<b>MAP UNIT 19</b>	<b>88</b>
<b>3.20</b>	<b>MAP UNIT 20</b>	<b>92</b>
<b>4</b>	<b>SCL ASSESSMENT .....</b>	<b>96</b>
<b>4.1</b>	<b>MAP UNIT 1</b>	<b>97</b>
<b>4.2</b>	<b>MAP UNIT 2</b>	<b>97</b>
<b>4.3</b>	<b>MAP UNIT 3</b>	<b>98</b>
<b>4.4</b>	<b>MAP UNIT 4</b>	<b>99</b>
<b>4.5</b>	<b>MAP UNIT 5</b>	<b>100</b>
<b>4.6</b>	<b>MAP UNIT 6</b>	<b>101</b>
<b>4.7</b>	<b>MAP UNIT 7</b>	<b>102</b>
<b>4.8</b>	<b>MAP UNIT 8</b>	<b>102</b>
<b>4.9</b>	<b>MAP UNIT 9</b>	<b>103</b>
<b>4.10</b>	<b>MAP UNIT 10</b>	<b>103</b>
<b>4.11</b>	<b>MAP UNIT 11</b>	<b>104</b>
<b>4.12</b>	<b>MAP UNIT 12</b>	<b>105</b>
<b>4.13</b>	<b>MAP UNIT 13</b>	<b>105</b>
<b>4.14</b>	<b>MAP UNIT 14</b>	<b>106</b>
<b>4.15</b>	<b>MAP UNIT 15</b>	<b>107</b>
<b>4.16</b>	<b>MAP UNIT 16</b>	<b>107</b>
<b>4.17</b>	<b>MAP UNIT 17</b>	<b>108</b>
<b>4.18</b>	<b>MAP UNIT 18</b>	<b>108</b>
<b>4.19</b>	<b>MAP UNIT 19</b>	<b>109</b>
<b>4.20</b>	<b>MAP UNIT 20</b>	<b>110</b>
	<b>CONCLUSIONS .....</b>	<b>111</b>
<b>5</b>	<b>REFERENCES.....</b>	<b>112</b>
<b>6</b>	<b>GLOSSARY OF TERMS .....</b>	<b>113</b>
<b>7</b>	<b>FIGURES.....</b>	<b>115</b>
	<b>FIGURE 1 SCL TRIGGER MAP</b>	<b>115</b>
	<b>FIGURE 2 MAP UNITS</b>	<b>115</b>

<b>FIGURE 3</b>	<b>STRATEGIC CROPPING LAND</b>	<b>115</b>
<b>8</b>	<b>APPENDICES .....</b>	<b>116</b>
<b>APPENDIX A</b>	<b>DETAILED SITE DESCRIPTIONS</b>	
<b>APPENDIX B</b>	<b>CHECK SITE DESCRIPTIONS</b>	
<b>APPENDIX C</b>	<b>SOIL WATER STORAGE CALCULATIONS</b>	
<b>APPENDIX D</b>	<b>PAWCER CALCULATIONS</b>	
<b>APPENDIX E</b>	<b>LABORATORY CERTIFICATES</b>	

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# 1 INTRODUCTION

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GT Environmental Pty Ltd (GTE) was commissioned by AECOM Australia Pty Ltd (AECOM) on behalf of BHP Coal Pty Ltd to complete a Strategic Cropping Land (SCL) 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 encompasses areas of the SCL trigger map which fall in Exploration Permit for Coal (EPC) 837 and Mining Lease Application (MLA) 70383 (Figure 1), herein known as the "Project Site". The project site encompasses 2,068 hectares (ha) of land.

## 1.1 Study Background

The *Regional Planning Interests Act 2014* (RPI Act) regulates impacts from mining activities on identified areas of regional interest, including the strategic cropping area (SCA). The SCA comprises the areas of potential SCL that are shown on the SCL trigger map (Figure 1).

SCL is land that is, or is likely to be, highly suitable for cropping because of a combination of the land's soil, climate and landscape features. The SCL trigger map indicates the location of land that is potentially SCL. The SCL trigger map is maintained and certified by the Department of Resources (DoR).

An assessment of site-specific soil conditions against the SCL criteria listed in Schedule 3, Part 2 of the RPI Act is required to confirm the actual extent of SCL at a local scale. This report presents a site-specific SCL assessment for the project site.

The information presented in this report is intended to be used by DoR to review the SCL trigger mapping for the project site.

## 1.2 Study Scope and Structure

This scope of work for this SCL assessment was developed in accordance with RPI Act Statutory Guideline 08/14 which describes how to demonstrate that land in the SCA does not meet the criteria for SCL (Queensland Government, 2017). The scope of work comprised:

- A desktop study of relevant information for the project site, including satellite imagery, topographic information and regional soils information. This information was used to review the current identified soil types and physical cropping limitations at the project site;
- A SCL field investigation to ground-truth the preliminary soil mapping and collect detailed information on soil distribution, topographic constraints, and physical and chemical soil conditions across the project site;
- Ground-truthed soil mapping at an appropriate scale for SCL assessment; and
- A site-specific assessment of SCL map unit polygons against the SCL criteria.

The following sections are outlined;

- The assessment methodology is presented in Section 2;
- The map units are presented in Section 3;
- SCL assessment for each of the map units is presented in Section 4; and,
- Conclusions of the assessment are presented in Section 5.

Appendices A to B provide detailed descriptions of each observation site, Appendix C presents the laboratory analysis and Appendices D and E provide soil water storage assessments and supporting calculations, respectively.



## 2 SCL METHODOLOGY

---

### 2.1 Desktop Study

A desktop study was undertaken prior to the field investigation.

The purpose of the desktop study was to obtain background information on the potential soil types and landscapes likely to occur across the project site, information on the topography of the project site, and to understand potential SCL limitations.

The desktop assessment involved database searches, interpretation of recent high-resolution satellite imagery, a review of unpublished soils report, mapping, and reviews of previous relevant soils resources, including:

- Gunn et al. (1968), Lands of Dawson-Fitzroy Area, Queensland;
- GT Environmental Services (2011), Saraji East Coal Mine Project, Soils and Land Suitability (unpublished) [BHP Billiton Mitsubishi Alliance (2012), Saraji East EIS Project, Chapter 4 Land Resources (unpublished)]; and,
- CSIRO land system boundaries showing landscape patterns identified from air photo interpretation with some field descriptions. from Google Earth (accessed on June 2018).

This information was used to develop a map of soils and physical cropping limitations at the project site.

### 2.2 SCL Field Survey

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. The field surveys were undertaken by Associate Environmental Scientist Reece McCann and Environmental Consultant Greg Tuck.

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 174 observation sites were surveyed throughout the project site comprising:

- 81 detailed sites (Figure 2) 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;

- 66 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); and,
- 93 check sites, including exclusion sites (Figure 2) to collect detail to allocate the site to a specific soil type and map unit.

Naming conventions for observation sites are as follows:

- Detailed sites with “-SCL” suffix indicates this is an existing site location (GT Environmental Services [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 location; and,
- Check sites with prefix “NC” indicate this is a new check site.

The field investigation layout is shown on Figure 2. 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.

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.

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 observation site methodology is described in Sections 2.2.1 to 2.2.3.

### **2.2.1 Detailed Sites**

Detailed sites were undertaken at 81 locations (Figure 2). The detailed sites were used to describe the range of soil profile morphological attributes as per the *National Committee on Soil and Terrain Guidelines* (2009) (including soil colour as per *Munsell Soil Colour Charts* [2009]), in addition to landforms, slope, surface conditions, rock cover and major vegetation (RPI 08/14).

Soil profiles were primarily sampled using 50-millimetre (mm) hand augers. The hand auger method is a suitable method and was undertaken in accordance with the *Guidelines for Surveying Soil and Land Resources* (McKenzie et al. 2008).

The information recorded for detailed sites included:

- site identification code;
- GPS location (GDA94);

- type of soil observation (e.g. erosion exposed cutting or hand auger);
- major vegetation types;
- landform type, position of the site and slope gradient;
- surface condition (e.g. presence of cracks, surface crust, rocks, stones and cobbles, 'erosion status, gilgai);
- types and vertical extent of soil horizons;
- colour (*Munsell Soil Colour Charts*, 2009) and mottling of each horizon;
- observations of field texture, pH, presence and abundance of segregations, coarse fragments, structure, consistence and pedality, moisture content and boundary type for each horizon;
- presence of organic matter, roots and prevalence of biological activity;
- presence of gleyed horizons, iron staining, jarosite presence and field pH; and,
- photographs of the soil profile, surface and surrounding landscape.

Detailed site descriptions for the project are presented in Appendix A.

### **2.2.2 Analysed Sites**

Detailed sites were selected for chemical analysis based on the density and map unit distribution.

Soil samples were collected from detailed sites for chemical analysis. Soil sampling of profiles was conducted as per McKenzie et al. (2008), with samples taken at standard depths incorporating the surface and every horizon change in the soil profile (typically at depths of 0.0-0.10 metres (m), 0.20-0.30 m, 0.50-0.60 m, 0.7-0.8 m and 0.90-1.00 m).

Where appropriate, these depths were modified for sites where field observations revealed soil horizons intersecting at these nominated depths, to ensure samples were collected in each separate horizon, and not across multiple horizons or in sub-horizon boundaries.

The detailed sites were analysed based on the western cropping zone requirements (RPI 08/14) for field identified rigid and non-rigid soils including:

- pH<sub>1:5</sub>;
- chloride;
- cation exchange capacity, (rigid soils only);
- exchangeable sodium percentage (rigid soils only);
- calcium and magnesium ratio (Ca:Mg ratio) (rigid soils only);
- particle size analysis; and,
- soil moisture content at -1.5Mpa (where required).

Laboratory results are presented in Appendix E.

### 2.2.3 Check Sites

Check sites were undertaken at 93 locations (Figure 2). These sites are used where defining attributes of the characteristic soil in a map unit could not be readily identified. Site attributes recorded include surface soil colour, texture, condition, presence of gilgai, vegetation, landform, site identification code, GPS coordinates, and where necessary for reference, photographs taken.

These sites record information and data for each site including a site identification code, GPS coordinates and SCL assessment criteria for slope, rockiness and/or gilgai (RPI 08/14). These sites may be used for the verification of slope, surface cover of rocks, gilgai coverage and depth.

Check site descriptions for the project site are presented in Appendix B.

## 2.3 SCL Mapping

The findings of the field investigation were used to produce a ground-truthed map of soil types (Figure 2) in the project site. The properties of each map unit have been assessed against the SCL assessment criteria.

## 2.4 SCL Assessment

The SCL assessment criteria thresholds for the SCA Western Cropping Zone are listed in Table 2-1.

**Table 2-1: SCL Assessment Criteria**

Criteria	Thresholds for Western Cropping Zone
Slope	Equal to or less than 3%
Rockiness	Equal to or less than 20% for rocks greater than 60mm in diameter
Gilgai	Less than 50% of land surface being gilgai of greater than 500mm in depth
Soil depth	Equal to or greater than 600mm
Soil wetness	Has favourable drainage
Soil pH	For rigid soils, the soil at 300mm and 600mm soil depth must be within the range of pH1:5 5.1 to pH1:5 8.9 inclusive For non-rigid soils, the soil at 300mm and 600mm soil depth must be greater than pH1:5 5.0.
Salinity	Chloride content is less than 800mg/kg at 600mm soil depth
Soil water storage	Equal to or greater than 100mm to a soil depth or soil physico-chemical limitation of equal to or less than 1000mm

Each map unit has been assessed against the SCL criteria thresholds for the SCA's Western Cropping Zone. This assessment was undertaken in accordance with the specific assessment techniques for each criterion described in RPI Act Statutory Guideline 08/14 Appendix 1: Measurement methods and reporting requirements. Map units must be within all SCL criteria to be considered SCL. Map units that do not meet one or more of the SCL criteria are not SCL.

The assessment techniques undertaken for each criterion are described below.

#### **2.4.1 Slope**

Slope was primarily assessed during fieldworks using a hand-held clinometer for on-ground measurements. The following procedures were applied to demonstrate either compliance or non-compliance with the slope criterion:

- Observation sites within exclusion areas were selected on an unbiased basis;
- Slope was measured over a minimum distance of 20m up to 50m with at least two measurements, an up and down gradient spanning the observation site;
- The site being assessed for slope did not include any significant changes or breaks of slope; and,
- Artificial features such as contour banks and tracks were excluded.

A minimum of three detailed sites and two check sites within each map unit were obtained with the average of recorded slope values determined to two decimal points and compared to the threshold values in A1.1 of the RPI Act Statutory Guideline 08/14.

GTE reviewed available soil survey information to highlight potential areas of concern to target during fieldwork and to assist in giving confidence that field observation sites accurately represent areas less than, equal to or more than 3.0% slope.

#### **2.4.2 Rockiness**

Rockiness was assessed by visually estimating the surface cover of coarse fragments (average maximum dimension larger than 60 mm) and rock outcrops within a ten-metre radius. Where rockiness was present and visually observed either at or above criterion, measurement tape was used over a random selected line in the site, with individual photos taken of each 1.0m<sup>2</sup> area for further assessment.

#### **2.4.3 Gilgai**

Gilgai was assessed during fieldworks by determining the depth of the gilgai (greater than 500 mm) and density of the gilgai depressions (greater than 50% of the land surface). Where sites may have been considered an exclusion site or where initial assessment required further measurement, the following would be completed.

- A horizontal tape was used between adjacent mounds and the height measured from the tape to the lowest part of the intervening depression.; and,

- GPS coordinates were recorded for the ten measurements to assist in assessing the density.

#### **2.4.4 Soil depth**

Soil depth was determined primarily by use of hand auger to expose the soil profile. The description of detailed sites soil profiles (Appendix A) includes any physical barrier encountered such as hard pans, gravel layers or bedrock.

#### **2.4.5 Soil wetness**

Soil wetness was determined by examining the soil profile for characteristics indicating severely impaired soil drainage. This was assessed by reviewing the soil horizons and mottle colours using a standard soil colour chart (Munsell Soil Colour Charts, 2009).

Colours of the soil matrix and all mottles have been identified for each soil horizon. All colours have been reported in a moist soil state other than conspicuously bleached horizons, where dry soil colour has been reported.

#### **2.4.6 Soil pH**

Determination of soil pH was measured by a National Association of Testing Authorities (NATA) accredited and Australasian Soil and Plant Analysis Council (ASPAC) certified laboratory using suitable methods (4A1 in Raymont & Lyons [2011]). pH 1:5 values were tested at all sampling depths including 300 mm and 600 mm soil depths.

#### **2.4.7 Soil salinity**

Soil salinity was determined by measurement of chloride by an accredited NATA and ASPAC accredited laboratory using suitable methods (5A2 in Raymont & Lyons [2011]). Chloride values were tested at all sampling depths including 300 mm and 600 mm soil depths.

#### **2.4.8 Soil water storage**

Soil water storage was determined by calculating the amount of water that is capable of being stored in a soil horizon layer within the effective rooting depth (ERD) in a soil profile and that is available for plant use. The ERD is whichever represents the lesser of the following:

- A depth of 1000 mm; or
- The depth at which a physio-chemical limitation is encountered; or,
- The depth of a physical barrier.

Physico-chemical limitation on effective rooting depth is represented by the following:

- a chloride content of more than 800mg/kg for any soil in the Western Cropping zone or Eastern Darling Downs zone; or,
- a pH1:5 value of 5.0 or less for any soil in any zone; or
- for rigid soils in any zone that are (1) not sandy loam or lighter textured soils, and (2) have a Cation Exchange Capacity (CEC) value greater than 3 cmol+/kg and have:

- a pH1:5 of more than 8.9; or
- an exchangeable sodium percentage value of more than 15; or,
- a calcium to magnesium ratio of 0.1 or less.

The RPI Act Statutory Guideline 08/14 provides a two-stage method for estimating soil water storage:

- Stage 1 uses a soil texture lookup table (Table A1.2 of the RPI Act Statutory Guideline 08/14; and,
- Stage 2 uses the PAWCER pedotransfer function (gravimetric water content, -1.5 MPa), herein referred to as PAWCER.

Stage 1 assessment is suitable where particle size analysis and soil texture lookup values are more than 15% below the SCL criterion threshold. If the Stage 1 assessment indicates marginal soil water storage (i.e. within 15% below the SCL criterion threshold) it is necessary to undertake a Stage 2 assessment.

The PAWCER calculation and assessments are presented in Appendix D.

### 3 SOIL MAPPING AND DESCRIPTIONS

A total of 20 map units were identified in the project site with spatial distribution shown on Figure 2. Table 3-1 provides a summary of each map unit including its concept, Australian Soil Classification (ASC) and Rigid or Non-Rigid status.

The soil type mapping shown on Figure 2 was compared with the SCL mapping criteria. The purpose of the SCL mapping criteria is to ensure that ground-truthed soil mapping is produced at a suitable scale. Soil types therefore meet the minimum SCL mapping criteria and are large enough to be mapped as map units on Figure 3.

A detailed description of each map unit based on the field investigation is provided in Sections 3.1 to 3.17.

**Table 3-1: Summary of Map Units**

Map Unit	Concept	Australian Soil Classification	Rigid or Non-Rigid <sup>1</sup>
1	Mixed brigalow scrub on black clay soils	Black Dermosol	Rigid
2	Dark sandy loams on sodic clay subsoils drainage lines	Black Sodosol	Rigid
3	Dark black clay soils on cleared gently undulating plains	Black Vertosol	Non-Rigid
4	Dark grey, greyish brown clay loams to clay near drainage lines	Black Dermosol	Rigid
5	Dark duplex sandy loam to clay soils on gently undulating plains	Black dermosol (with minor grey dermosol variant)	Rigid
6	Dark sandy clay loams with coarser structured clay subsoils on gently undulating plains	Black Dermosol	Rigid
7	Crusting grey clay with subdominant black soils on gently undulating plains with mixed shrubbery	Crusting Grey Vertosol (with sub-dominant black vertosol variant)	Non-Rigid
8	Dark greyish brown weak to moderately structured clay soils on cleared gently undulating plains	Black Dermosol	Rigid
9	Black vertosol on gently undulating plains	Black Vertosol	Non-rigid
10	Deep sandy clay loams with clay subsoils on gently undulating plains of tall woodlands	Black Sodosol	Rigid
11	Dark grey clay loams to grey brown clays within forested drainage line areas.	Grey Dermosol	Rigid
12	Black, well-structured clays on gently undulating plains	Black Vertosol	Non-rigid
13	Black, well-structured clays on gently undulating plains	Black Vertosol	Non-rigid



Map Unit	Concept	Australian Soil Classification	Rigid or Non-Rigid <sup>1</sup>
14	Sandy loams over red clay subsoils on cleared gently undulating plains	Red Chromosol	Rigid
15	Dark uniform to gradational clay soils on lower sloped plains	Black Vertosol	Non-rigid
16	Dark brown clay soils with gilgai microrelief on gently undulating plains of mixed regrowth	Black Vertosol	Non-rigid
17	Dark cracking clays with cropping on undulating plains	Black Vertosol	Non-rigid
18	Dark gradational sandy clay loams on clays on undulating plains	Black Dermosol	Rigid
19	Dark self-mulching clay soil on undulating plains	Black self-mulching Vertosol	Non-rigid
20	Dark self-mulching, cracking clay soil on gently undulating lower slopes and flat plains with minor areas of microrelief	Black self-mulching Vertosol	Non-rigid
1- Rigid and non-rigid assessment based on the RPI Regulation (2014) and The Australian Soils Classification, Third Edition (2021).			

## 3.1 Map Unit 1

### **Overview**

Map Unit 1 consists of light black clay with coarser structured subsoils on uplands of mixed brigalow scrub. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 70.6 ha.

### **Observation Sites**

A total of 6 observation sites were completed within this map unit and are summarised in Table 3-2. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 11.76 ha.

**Table 3-2: Observation Sites for Map Unit 1**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
3	3 (3)

A land summary of detailed Site N6 is presented in Table 3-3, soil profile description in Table 3-4 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site N6, Site N7 and Site N8, were selected to undergo chemical analysis for Map Unit 1. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-5 to 3-8.


### **Map Unit Observations**

No further observations were made regarding the SCL assessment of the map unit.

**Table 3-3: Map Unit 1**

Item	Description
<b>Representative Site</b>	N6
<b>Representative Site photograph</b>	
<b>Location</b>	643271mE 7514881mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Buffel grass
<b>Disturbance</b>	Semi-disturbed
<b>Landform element /pattern</b>	Very gently undulating plain midslope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	3.0/3.0
<b>Drainage</b>	Imperfect
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Cracking, soft
<b>ASC Order (s)</b>	Black dermosol
<b>Total area (ha)</b>	70.6

**Table 3-4: Soil Profile Morphology Summary Map Unit 1**

<b>Site N6</b> <b>(Previous N6-SCL as per photo)</b>										
	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	Clay Loam	Moderate, firm<30mm sub-angular	Nil	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 0.80-0.90 0.90-1.00	Nil
	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		

**Table 3-5: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N6	Clay loam	Clay loam	Medium clay	Silty clay loam	Clay loam
N7	Clay loam	Clay loam	Light clay	Light clay	Light clay
N8	Sandy loam	Loam	Light clay	Light clay	Light medium clay

**Table 3-6: Soil Chemistry Results for Detailed Site N6**

	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	7.15	8.27	8.94	8.66	8.68
Soil Cl (mg/kg)	9	7	320	1429	1213
PSA-Sand (>20µm %)	54.4	56.7	29.0	36.9	47.5
PSA-Fine Silt (2-20µm %)	19.3	13.1	20.1	25.9	16.3
PSA-Clay (<2µm%)	26.2	30.2	51.0	37.2	36.3
15 Bar (%)	22	23	31	26	22
CEC (meq/100g)	38.0	36.2	41.9	43.7	40.0
Ca/Mg (ratio)	2.0	1.8	1.2	1.0	1.0
ESP (%NaCEC)	1	5	12	14	13

**Table 3-7: Soil Chemistry Results for Detailed Site N7**

	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	7.61	8.52	9.15	8.90	8.80
Soil Cl (mg/kg)	21	50	306	980	1014
PSA-Sand (>20µm %)	64.1	66.7	59.9	53.7	49.6
PSA-Fine Silt (2-20µm %)	12.4	9.9	4.3	11.3	11.3
PSA-Clay (<2µm%)	23.5	23.3	35.8	35.1	39.1
15 Bar (%)	14	17	20	23	22
CEC (meq/100g)	24.1	26.4	31.1	35.9	40.5
Ca/Mg (ratio)	2.7	2.2	0.8	0.6	0.6
ESP (%NaCEC)	1	2	9	13	13

**Table 3-8: Soil Chemistry Results for Detailed Site N8**

	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	7.29	8.87	9.37	9.16	8.98
Soil Cl (mg/kg)	15	82	166	643	949
PSA-Sand (>20µm %)	77.3	69.9	58.5	53.2	47.2
PSA-Fine Silt (2-20µm %)	6.0	10.7	7.4	7.3	9.9
PSA-Clay (<2µm%)	16.7	19.4	34.1	39.6	42.9
15 Bar (%)	13	17	24	26	26
CEC (meq/100g)	25.5	32.1	40.8	40.6	48.1
Ca/Mg (ratio)	1.6	1.0	0.6	0.5	0.5
ESP (%NaCEC)	0	4	11	13	13

## 3.2 Map Unit 2

### Overview

Map Unit 2 consists of dark sands on sodic clay subsoils near drainage lines. This map unit is in the north portion of the project site and covers an area within the SCL trigger map of 9.6 ha.

### Observation Sites

A total of 7 observation sites were completed within this map unit and are summarised in Table 3-9. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 1.37 ha.

**Table 3-9: Observation Sites for Map Unit 2**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
4	3 (3)

A land summary of detailed Site N17 is presented in Table 3-10, soil profile description in Table 3-11 and detailed site descriptions are presented in Appendix A.


Three representative detailed sites, Site N17, Site N18 and Site N19, were selected to undergo chemical analysis for Map Unit 2. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-12 to 3-15.

### Map Unit Observations


No further observations were made regarding the SCL assessment of the map unit.



**Table 3-10: Map Unit 2**

Item	Description
<b>Representative Site</b>	N17
<b>Representative Site photograph</b>	
<b>Location</b>	643797mE 7514822mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Brigalow, Mount Coolibah
<b>Disturbance</b>	Nil disturbance
<b>Landform element /pattern</b>	Gently undulating plain, stream channel / depression
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	<2% / <2%
<b>Drainage</b>	Well-moderate
<b>Surface coarse fragments</b>	No coarse fragments
<b>Surface condition</b>	Soft
<b>ASC Order (s)</b>	Black Sodosol
<b>Total area (ha)</b>	9.6 (Extends outside the project site > 10 ha)

**Table 3-11: Soil Profile Morphology Summary Map Unit 2**

<div>Site N17</div>										
	Horizon Depth (m), Boundar -y (Bdy)	Field Texture	Structure Strength	Inclusions Segregatio -ns	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH / EC dS/m	Samples (m)	Observati -ons
	A1 0.00-0.10 Abrupt	Loamy sand	Massive, loose	<1% coarse fragments	10YR3/1 Nil mottles / bleaching	Dry, well	Yes	0.10 / 8.5	0.00-0.10	Nil
	B21 0.10-0.20 Abrupt	Sandy loam	Moderate, very firm sub- angular <20mm	<1% coarse fragments	10YR3/1 Nil mottles / bleaching	Dry, well – moderate	Yes	0.20 / 8.5	0.10-0.20	
	B21 0.20-0.47 Abrupt	Sandy loam	Moderate, very firm sub- angular <10mm	<10% coarse fragments	10YR3/1 Nil mottles / bleaching	Dry, well – moderate	Yes	0.30 / 8.5	0.20-0.30	
B21 0.47-0.88 End of Borehole (EOBH)	Sandy loam	Moderate, very firm sub- angular <10mm	<20% coarse fragments	10YR4/2 Nil mottles / bleaching	Dry, well – moderate	Yes – 0.60m bgl	0.60 / 8.5	0.50-0.60 0.80-0.88		

**Table 3-12: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N17	Sandy loam	Sandy clay loam	Sandy clay loam	Clay loam	Clay loam
N18	Sandy loam	Sandy clay	Light clay	Light clay	Light clay
N19	Loamy sand	Clay loam	Sandy clay loam	Sandy clay loam	Clay loam



**Table 3-13: Soil Chemistry Results for Detailed Site N17**

	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)	16.2	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

**Table 3-14: Soil Chemistry Results for Detailed Site N18**

	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	7.26	8.94	9.34	9.51	8.94
Soil Cl (mg/kg)	9	112	508	916	1194
PSA-Sand (>20µm %)	73.6	62.3	55.0	49.8	51.4
PSA-Fine Silt (2-20µm %)	4.9	3.2	4.5	12.9	11.2
PSA-Clay (<2µm%)	21.5	34.6	40.6	37.4	37.5
CEC (meq/100g)	14.54	20.26	21.74	24.98	29.45
ESP (%NaCEC)	1.4	13.4	20.7	23.5	24.7
Ca/Mg (ratio)	3.0	0.9	0.6	0.5	0.4

**Table 3-15: Soil Chemistry Results for Detailed Site N19**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-0.95
Soil pH	8.28	8.78	9.25	9.39	9.42
Soil Cl (mg/kg)	22	20	147	258	461
PSA-Sand (>20µm %)	87.8	65.5	73.2	70.7	65.6
PSA-Fine Silt (2-20µm %)	5.9	3.7	-1.5	5.8	7.0
PSA-Clay (<2µm%)	6.3	30.8	28.2	23.5	27.4
CEC (meq/100g)	15.09	18.99	17.52	16.55	17.69
ESP (%NaCEC)	1.6	5.6	12.6	16.6	19.4
Ca/Mg (ratio)	3.8	1.6	0.8	0.7	0.6

### 3.3 Map Unit 3

#### **Overview**

Map Unit 3 consists of black clay soils on cleared gently undulating plains. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 59.3 ha.

#### **Observation Sites**

A total of 5 observation sites were completed within this map unit and are summarised in Table 3-16. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 11.86 ha.

**Table 3-16: Observation Sites for Map Unit 3**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
2	3 (3)

A land summary of detailed site 60-SCL is presented in Table 3-17, soil profile description in Table 3-18 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site 60-SCL, Site N15 and Site N16, were selected to undergo chemical analysis for Map Unit 3. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-19 to 3-22.


#### **Map Unit Observations**

No further observations were made regarding the SCL assessment of the map unit.

**Table 3-17: Map Unit 3**

Item	Description
<b>Representative Site</b>	60-SCL
<b>Representative Site photograph</b>	
<b>Location</b>	643839mE 7514447mN
<b>Current Use</b>	Cropping, Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Grasses
<b>Disturbance</b>	Extensively disturbed
<b>Landform element /pattern</b>	Very gently undulating plains, upper slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	0 / 2
<b>Drainage</b>	Well to well moderate
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Self-mulching with cracking
<b>ASC Order (s)</b>	Black Vertosol
<b>Total area (ha)</b>	59.3

**Table 3-18: Soil Profile Morphology Summary Map Unit 3**

Site 60-SCL									
	Horizon Depth (m), Boundar -y (Bdy)	Field Texture	Structure Strength	Inclusions Segregatio- ns	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Samples (m)
A1 0.0 – 0.13 Abrupt	Light clay	Moderate, Sub- rounded, peds <10 mm, soft	Nil	10YR3/2 Nil mottle / 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
B21 0.13 – 0.41 Abrupt	Medium clay	Moderate, Subangular blocky, peds <20 mm, firm	Nil	10YR2/1 Nil mottle / 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 Nil mottle / bleaching	Dry, moderately well drained	Nil roots	0.60 / 7.0 0.90 / 7.0		

**Table 3-19 Sites Particle Size Analysis Texture Assessment**

<b>Site</b>	<b>Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)</b>				
	<b>0.00-0.10</b>	<b>0.20-0.30</b>	<b>0.50-0.60</b>	<b>0.80-0.90</b>	<b>0.90-1.00</b>
60-SCL	Light clay	Medium clay	Medium clay	Light medium clay	Medium clay
N15	Light clay	Light clay	Light clay	Light medium clay	Medium clay
N16	Light clay	Light medium clay	Medium clay	Medium clay	Medium clay

**Table 3-20: Soil Chemistry Results for Detailed Site 60-SCL**

	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	7.72	8.90	8.38	8.72	8.73
Soil Cl (mg/kg)	9	17	163	458	633
PSA-Sand (>20µm %)	56.8	48.3	42.8	40.9	40.4
PSA-Fine Silt (2-20µm %)	6.6	10.4	10.2	9.0	5.9
PSA-Clay (<2µm %)	36.6	41.4	47.0	50.2	53.7

**Table 3-21: Soil Chemistry Results for Detailed Site N15**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.10	0.20-0.30	0.55-0.60	0.80-0.90	0.90-1.00
Soil pH	8.13	8.64	8.97	8.55	8.76
Soil Cl (mg/kg)	24	27	196	409	634
PSA-Sand (>20µm %)	59.9%	47.5%	46.2%	48.1%	39.9%
PSA-Fine Silt (2-20µm %)	2.8%	6.4%	7.5%	8.5%	8.0%
PSA-Clay (<2µm%)	37.2%	46.0%	46.3%	43.4%	52.1%

**Table 3-22: Soil Chemistry Results for Detailed Site N16**

	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	7.92	8.67	8.74	8.72	8.78
Soil Cl (mg/kg)	9	38	120	255	354
PSA-Sand (>20µm %)	59.5%	58.1%	53.3%	44.6%	46.7%
PSA-Fine Silt (2-20µm %)	7.9%	4.8%	7.5%	12.2%	5.2%
PSA-Clay (<2µm%)	32.6%	37.1%	39.2%	43.2%	48.1%

### 3.4 Map Unit 4

#### Overview

Map Unit 4 consists of greyish brown clay loams to clay near drainage lines. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 8.3 ha.

#### Observation Sites

A total of 6 observation sites were completed within this map unit and are summarised in Table 3-23. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 1.38 ha.

**Table 3-23: Observation Sites for Map Unit 4**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
3	3 (3)

A land summary of detailed Site N20 is presented in Table 3-24, soil profile description in Table 3-25 and detailed site descriptions are presented in Appendix A.


Three representative detailed sites, Site N20, Site N21 and Site N22, were selected to undergo chemical analysis for Map Unit 4. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-26 to 3-29.

#### Map Unit Observations


Cracking was observed on the surface, however these did not meet the requirements of at least 5mm consistently.



**Table 3-24: Map Unit 4**

Item	Description
<b>Representative Site</b>	N20
<b>Representative Site photograph</b>	
<b>Location</b>	642943mE 7513907mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Brigalow
<b>Disturbance</b>	Nil disturbance, clearing nearby outside the immediate drainage line area
<b>Landform element /pattern</b>	Very gently undulating plain, Alluvial depression, stream channel
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nearby sheet and gully erosion
<b>Slope (%)</b>	1.0 / 0.0
<b>Drainage</b>	Well to well and moderate
<b>Surface coarse fragments</b>	<10% <5mm
<b>Surface condition</b>	Soft
<b>ASC Order (s)</b>	Black Dermosol
<b>Total area (ha)</b>	8.3 (Extends outside the project site > 10 ha)

**Table 3-25: Soil Profile Morphology Summary Map Unit 4**

Site N20									
	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)
A1 0.00-0.12 Abrupt	Sandy loam	Weak to moderate, soft sub-rounded <10mm	Nil	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	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	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	Nil	0.90 / 8.5		

**Table 3-26: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N20	Clay loam	Sandy clay loam	Sandy clay loam	Light clay	Medium clay
N21	Sandy clay loam	Sandy clay	Light clay	Light medium clay	Medium clay
N22	Sandy clay loam	Sandy clay	Sandy clay	Light clay	Light medium clay



**Table 3-27: Soil Chemistry Results for Detailed Site N20**

	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

**Table 3-28: Soil Chemistry Results for Detailed Site N21**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.10	0.20-0.30	0.50-0.58	0.80-0.90	0.90-1.00
Soil pH	7.19	8.10	9.08	9.23	9.04
Soil Cl (mg/kg)	3	27	87	304	591
PSA-Sand (>20µm %)	66.6	61.9	58.1	51.8	41.2
PSA-Fine Silt (2-20µm %)	4.0	6.7	5.1	5.9	7.2
PSA-Clay (<2µm%)	29.4	31.4	36.8	42.3	51.6
CEC (meq/100g)	24.20	22.93	28.42	26.27	42.90
ESP (%NaCEC)	0.6	3.1	10.5	10.7	15.8
Ca/Mg (ratio)	2.2	1.6	0.9	0.8	0.6

**Table 3-29: Soil Chemistry Results for Detailed Site N22**

	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	7.41	8.35	8.96	9.04	8.98
Soil Cl (mg/kg)	11	22	83	182	359
PSA-Sand (>20µm %)	64.9	62.1	61.9	60.7	55.5
PSA-Fine Silt (2-20µm %)	8.3	7.4	8.7	2.1	3.7
PSA-Clay (<2µm%)	26.8	30.4	29.4	37.3	40.8
CEC (meq/100g)	23.12	28.16	28.48	27.22	34.80
ESP (%NaCEC)	1.0	4.3	8.9	12.4	14.1
Ca/Mg (ratio)	2.7	1.8	1.1	0.8	0.7

### 3.5 Map Unit 5

#### Overview

Map Unit 5 consists of a dark duplex sandy loam to clay soils on gently undulating plains. It was observed a minor sub-dominant colour of brown duplex soils within the map unit with check site to the north indicating that the area is small. Map Unit 5 is in the northern portion of the project site and covers an area within the SCL trigger map of 18.3 ha.

#### Observation Sites

A total of 5 observation sites were identified within this map unit which are summarised in Table 3-30. Check site to the south (NC-13) indicates that the minor grey dermosol site observed is a very minor sub-dominant soil type in the map unit. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 3.66 ha.

**Table 3-30: Observation Sites for Map Unit 5**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
2 (Outside the map unit)	3 (3)


A land summary of Detailed Site N5 for the map unit is presented in Table 3-31, soil profile description in Table 3-32 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site N4, Site N5 and Site N9, were selected to undergo chemical analysis. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and chemistry results for the three selected detailed sites are presented in Tables 3-34 to 3-36.


#### Map Unit Observations

No further observations were made regarding the SCL assessment of the map unit.

**Table 3-31: Map Unit 5**

Item	Description
<b>Representative Site</b>	N5
<b>Representative Site photograph</b>	
<b>Location</b>	641792mE 7513825mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Eucalyptus species
<b>Disturbance</b>	Semi-disturbed
<b>Landform element /pattern</b>	Very gently undulating plain mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	3.0/3.0
<b>Drainage</b>	Moderate
<b>Surface coarse fragments</b>	Nil
<b>Surface condition</b>	Soft
<b>ASC Order (s)</b>	Black dermosol (with minor grey dermosol variant, site N4)
<b>Total area (ha)</b>	18.3

**Table 3-32: Soil Profile Morphology Summary Map Unit 5**

<p><b>Site N5</b> (Previously N5-SCL as per photo)</p>									
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	Sandy loam	Weak, soft <10mm sub-rounded	Nil	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
B21 0.12-0.45 Abrupt	Light clay with minor sand	Moderate, firm <30mm sub-angular	Nil	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 EOBH	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		

**Table 3-33: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N4	Sand	Clay Loam	Clay Loam	Clay Loam	Clay Loam
N5	Sandy Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam
N9	Sandy Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam

**Table 3-34: Soil Chemistry Results for Detailed Site N4**

	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	3	5	8	9

**Table 3-35: Soil Chemistry Results for Detailed Site N5**

	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	6.82	8.05	9.03	9.04	9.03
Soil Cl (mg/kg)	63	15	201	649	918
PSA-Sand (>20µm %)	78.6	67.0	65.0	62.2	61.6
PSA-Fine Silt (2-20µm %)	7.3	10.3	7.5	5.0	9.3
PSA-Clay (<2µm%)	14.1	22.6	27.5	32.9	29.1
15 Bar (%)	14	18	20	20	21
CEC (meq/100g)	18.6	27.8	36.6	33.8	32.0
Ca/Mg (ratio)	2.0	1.6	0.9	0.7	0.6
ESP (%NaCEC)	1	3	9	11	10

**Table 3-36: Soil Chemistry Results for Detailed Site N9**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.09	0.20-0.30	0.55-0.65	0.75-0.85	0.90-1.00
Soil pH	7.77	7.90	9.20	9.14	9.01
Soil Cl (mg/kg)	12	6	235	543	929
PSA-Sand (>20µm %)	81.8	76.4	65.1	59.9	55.5
PSA-Fine Silt (2-20µm %)	7.0	4.1	6.4	15.9	17.1
PSA-Clay (<2µm%)	11.2	19.5	28.5	24.2	27.4
15 Bar (%)	12	13	19	17	18
CEC (meq/100g)	17.0	18.8	32.9	25.4	29.8
Ca/Mg (ratio)	2.0	1.6	0.8	0.6	0.6
ESP (%NaCEC)	2	4	10	11	11

### 3.6 Map Unit 6

#### **Overview**

Map Unit 6 consists of dark sandy clay loams with coarser structured clay subsoils on gently undulating plains. This map unit is in the northern portion of the project site and covers an area within the SCL trigger map of 307 ha.

#### **Observation Sites**

A total of 20 observation sites were completed within this map unit and are summarised in Table 3-37. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 15 ha.

**Table 3-37: Observation Sites for Map Unit 6**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
12	8 (4)

A land summary of detailed site 91-SCL is presented in Table 3-38, soil profile description in Table 3-39 and detailed site descriptions are presented in Appendix A.

Six representative detailed sites, Site N26, Site N27, Site 32-SCL, Site 77-SCL, Site 80-SCL and Site 91-SCL, were selected to undergo chemical analysis for Map Unit 6. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-40 to 3-44.

#### **Map Unit Observations**


A sub-dominant soil type was observed in the northern area of Map Unit 6, site N48, less than 10 ha. The site and area have been aggregated into Map Unit 6.

**Table 3-38: Map Unit 6**

Item	Description
<b>Representative Site</b>	91-SCL
<b>Representative Site photograph</b>	
<b>Location</b>	643899mE 7510777mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Cleared, nearby remnant Belah
<b>Disturbance</b>	Extensive disturbance
<b>Landform element /pattern</b>	Very gently undulating plain, mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	2.0/1.0
<b>Drainage</b>	Moderate
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Firm
<b>ASC Order (s)</b>	Black Dermosol
<b>Total area (ha)</b>	307



**Table 3-39: Soil Profile Morphology Summary Map Unit 6**

Site 91-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 0.00-0.12 Abrupt	Sandy Clay	Moderate, weak <20mm sub- angular	Nil	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	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			

**Table 3-40: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
91-SCL	Sandy loam	Loam	Light clay	Light clay	Light clay
N27	Sandy clay loam	Sandy clay loam	Light medium clay	Light medium clay	Light medium clay
32-SCL	Sandy clay loam	Light clay	Clay loam	Clay loam	Clay loam
80-SCL	Sandy clay loam	Clay loam	Clay loam	Clay loam	Clay loam



**Table 3-41: Soil Chemistry Results for Detailed Site 91-SCL**

	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

**Table 3-42: Soil Chemistry Results for Detailed Site N27**

	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	8.27	8.54	9.10	9.02	8.85
Soil Cl (mg/kg)	15	28	230	393	447
PSA-Sand (>20µm %)	71.2%	71.0%	54.0%	50.0%	44.4%
PSA-Fine Silt (2-20µm %)	2.2%	2.7%	5.0%	9.6%	11.3%
PSA-Clay (<2µm%)	26.6%	26.3%	41.0%	40.4%	44.3%
CEC (meq/100g)	21.28	20.20	31.88	31.67	26.34
ESP (%NaCEC)	0.3	4.0	13.6	15.5	12.4
Ca/Mg (ratio)	4.7	1.8	1.0	1.0	1.2

**Table 3-43: Soil Chemistry Results for Detailed Site 32-SCL**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.10	0.20-0.30	0.50-0.60	0.83-0.90	0.90-1.00
Soil pH	7.73	8.69	9.25	9.31	9.27
Soil Cl (mg/kg)	14	15	64	225	321
PSA-Sand (>20µm %)	68.0%	55.9%	60.6%	57.5%	60.2%
PSA-Fine Silt (2-20µm %)	8.4%	5.9%	8.2%	13.6%	7.2%
PSA-Clay (<2µm%)	23.7%	38.2%	31.3%	29.0%	32.6%
CEC (meq/100g)	14.30	21.03	15.64	16.48	17.98
ESP (%NaCEC)	1.0	2.9	8.0	12.7	14.9
Ca/Mg (ratio)	3.0	1.7	0.9	0.7	0.6

**Table 3-44: Soil Chemistry Results for Detailed Site 80-SCL**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.10	0.22-0.30	0.50-0.60	0.83-0.90	0.90-1.00
Soil pH	7.09	7.82	9.24	9.40	9.29
Soil Cl (mg/kg)	17	16	62	257	358
PSA-Sand (>20µm %)	79.7%	68.1%	63.3%	60.8%	63.3%
PSA-Fine Silt (2-20µm %)	1.9%	9.2%	5.8%	5.7%	6.2%
PSA-Clay (<2µm%)	18.4%	22.7%	30.9%	33.5%	30.5%
CEC (meq/100g)	13.57	14.57	19.82	21.29	21.16
ESP (%NaCEC)	0.6	2.9	10.0	20.2	20.7
Ca/Mg (ratio)	2.4	2.2	0.8	0.6	0.5

## 3.7 Map Unit 7

### Overview

Map Unit 7 consists of a crusting grey clay soils on gently undulating alluvial plains with mixed shrubbery and woodlands. It was observed a minor sub-dominant colour of black soils within the map unit; however, this was aggregated within the larger dominant observed grey vertosol.

This map unit is in the north-west portion of the project site and covers an area within the SCL trigger map of 5.1 ha.

### Observation Sites

A total of 5 observation sites were identified within Map Unit 7 and are summarised in Table 3-45. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 1.02 ha.

**Table 3-45 Observation Sites for Map Unit 7**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
2	3 (3)

A land summary of detailed site N1 for Map Unit 7 is presented in Table 3-46, soil profile description in Table 3-47 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site N1, Site N2 and Site N3, were selected to undergo chemical analysis. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-48 to 3-51.


### Map Unit Observations

Site 7 is a sub-dominant soil type, Crusting Black Vertosol and is included with the dominant soil type, Crusting Grey Vertosol of the map unit.

**Table 3-46: Map Unit 7**

Item	Description
<b>Representative Site</b>	N2
<b>Representative Site photograph</b>	
<b>Location</b>	641096mE 7512914mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Various shrubs
<b>Disturbance</b>	Nil to semi-cleared
<b>Landform element / pattern</b>	Very gently undulating plain
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	2.0/1.0
<b>Drainage</b>	Moderate
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Firm <10mm peds, cracking 2-6mm, crust
<b>ASC Order (s)</b>	Crusting Grey Vertosol (minor sub-dominant black vertosol [Site N1])
<b>Total area (ha)</b>	5.1 (Extends outside the project site > 10 ha)

**Table 3-47: Soil Profile Morphology Summary Map Unit 7**

Site N2 (Previously N2-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 0.00-0.14 Abrupt	Light clay	Moderate, soft <10mm sub-angular	Nil	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 0.09-1.00	Nil	
B2 0.14-1.00 EOBH	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			

**Table 3-48: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N1	Heavy clay	Heavy clay	Heavy clay	Heavy clay	Heavy clay
N2	Medium clay	Medium clay	Medium clay	Medium clay	Medium clay
N3	Medium clay	Medium clay	Medium clay	Medium clay	Medium clay

**Table 3-49: Soil Chemistry Results for Detailed Site N1**

	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

**Table 3-50: Soil Chemistry Results for Detailed Site N2**

	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	7.67	8.23	8.52	8.47	8.48
Soil Cl (mg/kg)	39	59	50	73	114
PSA-Sand (>20µm %)	42.2	32.2	27.7	36.0	32.1
PSA-Fine Silt (2-20µm %)	11.6	18.1	18.7	12.6	16.9
PSA-Clay (<2µm%)	46.1	49.7	53.7	51.4	51.0
15 Bar (%)	30	30	31	31	31

**Table 3-51: Soil Chemistry Results for Detailed Site N3**

	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	7.78	8.34	8.52	8.61	8.66
Soil Cl (mg/kg)	35	15	14	14	21
PSA-Sand (>20µm %)	38.0	32.4	40.5	37.8	33.2
PSA-Fine Silt (2-20µm %)	9.7	16.9	11.3	9.7	16.8
PSA-Clay (<2µm%)	52.3	50.8	48.2	52.6	50.0
15 Bar (%)	30	29	29	29	29

### 3.8 Map Unit 8

#### Overview

Map Unit 8 consists of dark greyish brown weak to moderately structured clay soils on cleared gently undulating plains. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 3.3 ha.

#### Observation Sites

A total of 5 observation sites were completed within this map unit and are summarised in Table 3-52. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 0.66 ha.

**Table 3-52: Observation Sites for Map Unit 8**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
2	3 (3)

A land summary of detailed site N13 is presented in Table 3-53, soil profile description in Table 3-54 and detailed site descriptions are presented in Appendix A.


Three representative detailed sites, Site N12, Site N13 and Site N14, were selected to undergo chemical analysis for Map Unit 8. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-55 to 3-58.

#### Map Unit Observations

No further observations were made regarding the SCL assessment of the map unit.




**Table 3-53: Map Unit 8**

Item	Description
<b>Representative Site</b>	N13
<b>Representative Site photograph</b>	
<b>Location</b>	640940mE 7512735mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Grasses
<b>Disturbance</b>	Extensive disturbance
<b>Landform element / pattern</b>	Gently undulating plains, mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	<2.0/<2.0
<b>Drainage</b>	Moderate – well
<b>Surface coarse fragments</b>	Nil
<b>Surface condition</b>	Firm
<b>ASC Order (s)</b>	Black Dermosol
<b>Total area (ha)</b>	3.3 (Extends outside the project site > 10 ha)



**Table 3-54: Soil Profile Morphology Summary Map Unit 8**

									
<b>Site N13</b>									
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 0.00-0.15 Abrupt	Sandy clay loam	Weak to moderate. Soft, sub rounded <10mm	Nil	10YR3/2 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 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 Nil mottles/bleaching	Dry, moderate – well	Present	0.90 / 7.5		

**Table 3-55: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N12	Clay loam	Light clay	Medium clay	Light medium clay	Light medium clay
N13	Sandy clay loam	Light medium clay	Medium clay	Light medium clay	Medium clay
N14	Sandy loam	Medium clay	Light medium clay	Light medium clay	Medium clay

**Table 3-56: Soil Chemistry Results for Detailed Site N12**

	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	7.23	7.93	8.63	8.59	8.53
Soil Cl (mg/kg)	22	155	481	793	747
PSA-Sand (>20µm %)	66.3%	57.5%	44.2%	45.2%	50.6%
PSA-Fine Silt (2-20µm %)	10.6%	6.0%	9.4%	10.0%	9.3%
PSA-Clay (<2µm%)	23.1%	36.5%	46.3%	44.8%	40.0%
CEC (meq/100g)	15.52	23.08	30.45	30.79	32.41
ESP (%NaCEC)	2.2	6.9	8.3	9.2	9.8
Ca/Mg (ratio)	1.6	1.3	0.9	0.8	0.8

**Table 3-57: Soil Chemistry Results for Detailed Site N13**

	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

**Table 3-58: Soil Chemistry Results for Detailed Site N14**

	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	6.85	8.29	8.78	8.62	8.57
Soil Cl (mg/kg)	9	86	368	671	768
PSA-Sand (>20µm %)	72.3%	47.1%	47.4%	49.1%	44.7%
PSA-Fine Silt (2-20µm %)	10.6%	6.1%	8.6%	8.1%	9.2%
PSA-Clay (<2µm%)	17.1%	46.8%	44.0%	42.7%	46.1%
CEC (meq/100g)	10.26	23.98	29.98	27.95	27.41
ESP (%NaCEC)	1.6	7.0	8.2	9.0	9.1
Ca/Mg (ratio)	1.7	1.2	0.9	0.8	0.8

## 3.9 Map Unit 9

### Overview

Map Unit 9 consists of black vertosol on gently undulating plains. This map unit is in the centre-north portion of the project site and covers an area within the SCL trigger map of 142.3 ha.

### Observation Sites

A total of 13 observation sites were completed within this map unit and are summarised in Table 3-59. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 10.95 ha.

**Table 3-59: Observation Sites for Map Unit 9**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
6	7 (7)

A land summary of detailed Site 65-SCL is presented in Table 3-60, soil profile description in Table 3-61 and detailed site descriptions are presented in Appendix A.

Seven representative detailed sites, Site 65-SCL, Site N29, Site N30, Site N31, Site N32, Site N33 and Site N34 were selected to undergo chemical analysis for Map Unit 9. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-62 to 3-69.

### Map Unit Observations


No further observations were made regarding the SCL assessment of the map unit.

**Table 3-60: Map Unit 9**

Item	Description
<b>Representative Site</b>	65-SCL
<b>Representative Site photograph</b>	
<b>Location</b>	643019mE 7513552mN
<b>Current Use</b>	Cropping
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Cropping
<b>Disturbance</b>	Extensive disturbance
<b>Landform element /pattern</b>	Very gently undulating plain Flat plain
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	1.0/1.0
<b>Drainage</b>	Moderate
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Soft, self-mulching
<b>ASC Order (s)</b>	Black Vertosol
<b>Total area (ha)</b>	142.3



**Table 3-61: Soil Profile Morphology Summary Map Unit 9**

<div>Site 65-SCL</div>										
	Horizon Depth (m), Boundar -y (Bdy)	Field Texture	Structure Strength	Inclusions Segregatio- ns	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH / EC dS/m	Samples (m)	Observati -ons
	A1 0.00-0.11 Abrupt	Light clay	Moderate, weak <10mm sub- angular	Nil	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
	B21 0.11-0.80 Abrupt	Medium clay	Moderate, weak <10mm sub- angular	Nil	10YR2/2 Very dark brown Nil mottles/ bleach	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0		
B22 0.80-1.00 EOBH	Medium clay	Moderate, weak <10mm sub- angular	2% calcium carbonate nodules	10YR3/3 Dark brown Nil mottles/ bleach	Dry, moderate	Very fine, very few	0.90 / 7.5			

**Table 3-62: Sites Particle Size Analysis Texture Assessment**

<b>Site</b>	<b>Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)</b>				
	<b>0.00-0.10</b>	<b>0.20-0.30</b>	<b>0.50-0.60</b>	<b>0.80-0.90</b>	<b>0.90-1.00</b>
65-SCL	Light medium clay	Light medium clay	Medium clay	Medium clay	Medium clay
N29	Light medium clay	Light clay	Light clay	Medium clay	Light medium clay
N30	Light medium clay	Light clay	Light clay	Light medium clay	Light clay
N31	Light medium clay	Light medium clay	Medium clay	Medium clay	Medium clay
N32	Light clay	Light medium clay	Light medium clay	Medium clay	Medium clay
N33	Light medium clay	Light clay	Medium clay	Medium clay	Medium clay

**Table 3-63: Soil Chemistry Results for Detailed Site 65-SCL**

	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	7.83	8.47	8.90	8.93	8.96
Soil Cl (mg/kg)	12	10	18	101	159
PSA-Sand (>20µm %)	28.9	41.6	26.8	25.8	28.0
PSA-Fine Silt (2-20µm %)	28.0	14.1	25.6	23.4	20.5
PSA-Clay (<2µm%)	43.1	44.3	47.6	50.8	51.6
15 Bar (%)	27	28	30	31	31

**Table 3-64: Soil Chemistry Results for Detailed Site N29**

	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	8.69	8.87	9.18	9.39	9.42
Soil Cl (mg/kg)	8	13	30	18	14
PSA-Sand (>20µm %)	50	57	53	44	45
PSA-Fine Silt (2-20µm %)	8	6	7	10	11
PSA-Clay (<2µm%)	41	37	40	46	44

**Table 3-65: Soil Chemistry Results for Detailed Site N30**

	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	8.35	8.80	9.21	9.41	9.07
Soil Cl (mg/kg)	24	11	14	17	11
PSA-Sand (>20µm %)	47	61	57	54	58
PSA-Fine Silt (2-20µm %)	6	7	4	5	3
PSA-Clay (<2µm%)	46	32	40	41	39

**Table 3-66: Soil Chemistry Results for Detailed Site N31**

	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	8.54	8.34	8.44	8.88	9.02
Soil Cl (mg/kg)	12	21	18	21	12
PSA-Sand (>20µm %)	57	49	39	40	41
PSA-Fine Silt (2-20µm %)	0	8	11	6	6
PSA-Clay (<2µm%)	43	43	50	53	53

**Table 3-67: Soil Chemistry Results for Detailed Site N32**

	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	8.32	8.51	8.90	9.12	9.11
Soil Cl (mg/kg)	16	15	16	14	14
PSA-Sand (>20µm %)	54	50	51	41	40
PSA-Fine Silt (2-20µm %)	8	6	7	10	10
PSA-Clay (<2µm%)	38	44	42	49	51

**Table 3-68: Soil Chemistry Results for Detailed Site N33**

	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	8.22	8.92	9.23	8.71	9.27
Soil Cl (mg/kg)	24	15	11	14	12
PSA-Sand (>20µm %)	51	52	45	39	38
PSA-Fine Silt (2-20µm %)	8	8	0	11	8
PSA-Clay (<2µm%)	42	40	55	51	54

**Table 3-69: Soil Chemistry Results for Detailed Site N34**

	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	9.06	8.88	9.19	9.41	9.48
Soil Cl (mg/kg)	24	14	11	22	25
PSA-Sand (>20µm %)	55	59	64	52	49
PSA-Fine Silt (2-20µm %)	7	5	1	6	10
PSA-Clay (<2µm%)	38	36	35	42	41



### 3.10 Map Unit 10

#### **Overview**

Map Unit 10 consists of clay loams with sodic clay subsoils on gently undulating plains. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 32.9 ha.

#### **Observation Sites**

A total of 5 observation sites were completed within this map unit and are summarised in Table 3-70. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 6.58 ha.

**Table 3-70: Observation Sites for Map Unit 10**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
2	3 (3)


A land summary of detailed site N43 is presented in Table 3-71, soil profile description in Table 3-72 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site N28, Site N43 and Site N45, were selected to undergo chemical analysis for Map Unit 10. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-73 to 3-76.


#### **Map Unit Observations**

No further observations were made regarding the SCL assessment of the map unit.

**Table 3-71: Map Unit 10**

Item	Description
<b>Representative Site</b>	N43
<b>Representative Site photograph</b>	
<b>Location</b>	643716mE 7513193mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Eucalyptus species
<b>Disturbance</b>	Semi disturbed,
<b>Landform element /pattern</b>	Gently Undulating Plains, Upper slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	<2 / <2
<b>Drainage</b>	Well to well-moderate
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Firm
<b>ASC Order (s)</b>	Black Sodosol
<b>Total area (ha)</b>	32.9

**Table 3-72: Soil Profile Morphology Summary Map Unit 10**

Site N43										
	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 0.0 – 0.06 Abrupt	Sandy clay loam	Massive	Nil	10YR3/2 Nil mottles / bleaching	Dry, well drained	Present	0.10 / 7.5	0.00-0.10	Nil
	A12 0.06 – 0.20 Gradual	Sandy clay loam	Weak, sub-rounded peds <10 mm	Nil	10YR3/2 Nil mottles / bleaching	Dry, well drained	Present	0.20 / 7.5	0.20-0.30	
	B21 0.20 – 0.46 Gradual	Sandy clay loam	Subangular blocky, moderate, peds <20 mm, firm	Nil	10YR3/2 Nil mottles / bleaching	Dry, well drained	Present	0.30 / 7.5	0.50-0.60	
	B22 0.46 – 1.00 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, firm	<20% calcium carbonate	10YR3/3 Nil mottles / bleaching	Dry, well – moderate drained	Present	0.60 / 7.5 0.90 / 7.5	0.80-0.90 0.9-1.00	

**Table 3-73: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N28	Clay loam	Clay loam	Light clay	Light clay	Light clay
N43	Clay loam	Clay loam	Light clay	Light clay	Light clay
N45	Clay loam	Light clay	Medium clay	Light medium clay	Medium clay

**Table 3-74: Soil Chemistry Results for Detailed Site N28**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.05	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
Soil pH	8.10	8.46	8.99	9.09	9.04
Soil Cl (mg/kg)	13	23	227	522	686
PSA-Sand (>20µm %)	72	66	48	55	49
PSA-Fine Silt (2-20µm %)	9	6	6	7	7
PSA-Clay (<2µm%)	20	29	46	38	44
15 Bar (%)	17	17	25	22	22
CEC (meq/100g)	21.46	21.65	30.84	24.84	26.78
ESP (%NaCEC)	0.3	2.0	9.4	11.2	12.1
Ca/Mg (ratio)	7.3	2.6	0.8	0.7	0.6

**Table 3-75: Soil Chemistry Results for Detailed Site N43**

	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

**Table 3-76: Soil Chemistry Results for Detailed Site N45**

	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	8.36	8.80	8.92	8.93	8.94
Soil Cl (mg/kg)	14	40	333	803	840
PSA-Sand (>20µm %)	61	57	44	52	44
PSA-Fine Silt (2-20µm %)	13	6	5	5	5
PSA-Clay (<2µm%)	25	37	51	42	51
CEC (meq/100g)	26.63	27.55	31.88	29.14	30.59
ESP (%NaCEC)	0.3	5.1	10.9	13.1	12.9
Ca/Mg (ratio)	6.0	1.5	0.8	0.7	0.7

### 3.11 Map Unit 11

#### Overview

Map Unit 11 consists of dark grey clay loams to grey brown clays within forested drainage line areas. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 6 ha.

#### Observation Sites

A total of 5 observation sites were completed within this map unit and are summarised in Table 3-77. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 1.2 ha.

**Table 3-77: Observation Sites for Map Unit 11**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
2	3 (3)

A land summary of detailed Site N23 is presented in Table 3-78, soil profile description in Table 3-79 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site N23, Site N24 and Site N25, were selected to undergo chemical analysis for Map Unit 1. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-80 to 3-83.

#### Map Unit Observations


Cracking was observed on the surface; however these did not meet the requirements of at least 5 mm consistently.

The map unit was assessed against having vertic properties, however the surface field texture did not meet a clayey field texture (Light clay, medium clay, heavy clay) [R.F.Isbell, 2021], laboratory textures were marginal for one site (34.4% for N24) and below 35% for sites N23 and N25. Cracks observed were not strong and the structure of soils, was not assessed as slickenside and/or lenticular structure.


It may be a marginal assessment of site N24 as a non-rigid soil, however the proximity of the other two rigid soil sites and narrow landform in which the polygon is based indicates that the assessment as a non-rigid map unit is acceptable.



**Table 3-78: Map Unit 11**

Item	Description
<b>Representative Site</b>	N23
<b>Representative Site photograph</b>	
<b>Location</b>	642838mE 7513991mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Mixed vegetation
<b>Disturbance</b>	Cropping nearby disturbance
<b>Landform element / pattern</b>	Depression
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Minor sheet erosion
<b>Slope (%)</b>	<1% / <1%
<b>Drainage</b>	Well to well-moderate
<b>Surface coarse fragments</b>	Soft, <10% cf <5mm
<b>Surface condition</b>	Firm, crust with minor self mulching
<b>ASC Order (s)</b>	Grey Dermosol
<b>Total area (ha)</b>	6

**Table 3-79: Soil Profile Morphology Summary Map Unit 11**

Site N23									
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	Clay loam	Weak, soft sub-rounded <10mm	Nil	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
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		

**Table 3-80: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N23	Clay loam	Light medium clay	Light medium clay	Medium clay	Medium clay
N24	Sandy clay	Light clay	Light clay	Light clay	Light clay
N25	Clay loam	Medium clay	Light medium clay	Medium clay	Medium clay



**Table 3-81: Soil Chemistry Results for Detailed Site N23**

	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

**Table 3-82: Soil Chemistry Results for Detailed Site N24**

	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	8.59	8.98	9.45	9.49	9.48
Soil Cl (mg/kg)	18	21	122	284	445
PSA-Sand (>20µm %)	59.9	54.8	47.0	37.7	43.9
PSA-Fine Silt (2-20µm %)	5.7	8.0	13.6	15.4	10.8
PSA-Clay (<2µm%)	34.4	37.1	39.4	46.8	45.2
CEC (meq/100g)	27.47	25.47	25.09	27.88	28.79
ESP (%NaCEC)	0.4	3.3	12.7	17.6	19.4
Ca/Mg (ratio)	3.8	1.4	0.6	0.4	0.4

**Table 3-83: Soil Chemistry Results for Detailed Site N25**

	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	8.36	9.11	9.33	9.30	9.23
Soil Cl (mg/kg)	22	108	317	563	792
PSA-Sand (>20µm %)	60.6	46.3	53.0	42.1	36.6
PSA-Fine Silt (2-20µm %)	8.0	4.3	4.6	8.7	8.8
PSA-Clay (<2µm%)	31.4	49.3	42.4	49.2	54.6
CEC (meq/100g)	34.74	42.08	39.17	31.05	33.12
ESP (%NaCEC)	0.6	8.0	14.9	17.4	18.4
Ca/Mg (ratio)	3.7	1.0	0.6	0.5	0.5

## 3.12 Map Unit 12

### Overview

Map Unit 12 consists of black, well-structured clays on gently undulating plains. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 137 ha.

### Observation Sites

A total of 8 observation sites were completed within this map unit and are summarised in Table 3-84. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 17 ha.

**Table 3-84: Observation Sites for Map Unit 12**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
5	3 (3)

A land summary of detailed Site N35 is presented in Table 3-85, soil profile description in Table 3-86 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site N35, Site N36 and Site N37 were selected to undergo chemical analysis for Map Unit 1. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-87 to 3-90.


### Map Unit Observations

No further observations were made regarding the SCL assessment of the map unit.

**Table 3-85: Map Unit 12**

Item	Description
<b>Representative Site</b>	N35
<b>Representative Site photograph</b>	
<b>Location</b>	643659mE 7511986mN
<b>Current Use</b>	Cropping
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Cropping
<b>Disturbance</b>	Extensive disturbed,
<b>Landform element / pattern</b>	Gently undulating plain, mid slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	2% / 2%
<b>Drainage</b>	Well to well-moderate drained
<b>Surface coarse fragments</b>	Nil
<b>Surface condition</b>	Self-mulching
<b>ASC Order (s)</b>	Black Vertosol
<b>Total area (ha)</b>	137

**Table 3-86: Soil Profile Morphology Summary Map Unit 12**

Site N35									
Horizon Depth (m), Boundar-y (Bdy)	Field Texture	Structure Strength	Inclusions Segregati-ons	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH / EC dS/m	Samples (m)	Observati-ons
A11 0.0 – 0.04 Abrupt	Light medium clay	Moderate, firm, sub-rounded peds 20-50 mm	Nil	10YR3/2 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
A12 0.04 – 0.20 Abrupt	Medium clay	Moderate, firm, sub-rounded peds 50-80 mm	Nil	10YR3/2 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	10YR2/1 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	10YR2/1 Nil mottles / bleaching	Dry, well-moderate drained	Nil	0.90 / 8.0		

**Table 3-87: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N35	Medium clay	Medium clay	Medium clay	Medium clay	Medium clay
N36	Light medium clay	Medium clay	Medium clay	Medium heavy clay	Medium clay
N37	Medium clay	Light medium clay	Light medium clay	Light medium clay	Medium heavy clay

**Table 3-88 Soil Chemistry Results for Detailed Site N35**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.04	0.20-0.30	0.50-0.60	0.77-0.87	0.90-1.00
Soil pH	8.70	8.68	8.99	9.10	9.12
Soil Cl (mg/kg)	7	24	33	75	149
PSA-Sand (>20µm %)	47	45	39	41	36
PSA-Fine Silt (2-20µm %)	5	7	5	7	11
PSA-Clay (<2µm%)	47	47	55	52	53

**Table 3-89: Soil Chemistry Results for Detailed Site N36**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.05	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
Soil pH	8.69	8.46	8.50	8.80	8.90
Soil Cl (mg/kg)	11	32	25	39	66
PSA-Sand (>20µm %)	49	41	42	24	35
PSA-Fine Silt (2-20µm %)	8	12	9	15	12
PSA-Clay (<2µm%)	44	47	49	61	54

**Table 3-90: Soil Chemistry Results for Detailed Site N37**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.05	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
Soil pH	8.70	8.67	8.86	8.99	9.04
Soil Cl (mg/kg)	8	17	24	49	99
PSA-Sand (>20µm %)	49	50	53	56	36
PSA-Fine Silt (2-20µm %)	6	7	2	2	1
PSA-Clay (<2µm%)	45	44	44	42	63

### 3.13 Map Unit 13

#### Overview

Map Unit 13 consists of black, well-structured clays on gently undulating plains. This map unit is in the north-east portion of the project site and covers an area within the SCL trigger map of 109 ha.

#### Observation Sites

A total of 8 observation sites were completed within this map unit and are summarised in Table 3-91. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 8 ha.

**Table 3-91: Observation Sites for Map Unit 13**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
7	5 (3)

A land summary of detailed Site 6-SCL is presented in Table 3-92, soil profile description in Table 3-93 and detailed site descriptions are presented in Appendix A.


Three representative detailed sites, Site 6-SCL, Site 7-SCL and Site 100-SCL, were selected to undergo chemical analysis for Map Unit 13. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-94 to 3-97.

#### Map Unit Observations

No further observations were made regarding the SCL assessment of the map unit.




**Table 3-92: Map Unit 13**

Item	Description
<b>Representative Site</b>	6-SCL
<b>Representative Site photograph</b>	
<b>Location</b>	641287mE 7510129mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Grasses
<b>Disturbance</b>	Extensively disturbance
<b>Landform element / pattern</b>	Gently undulating plains, mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	2.0/2.0
<b>Drainage</b>	Well – moderate
<b>Surface coarse fragments</b>	Coarse fragments' <5mm <5%
<b>Surface condition</b>	Humid self-mulching with crust 2-6 mm thick, fine sand on surface.
<b>ASC Order (s)</b>	Black Vertosol
<b>Total area (ha)</b>	109



**Table 3-93: Soil Profile Morphology Summary Map Unit 13**

<div>Site 6-SCL</div>										
	Horizon Depth (m), Boundar-y (Bdy)	Field Texture	Structure Strength	Inclusions Segregatio-ns	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH / EC dS/m	Samples (m)	Observati- ons
	A1 0.00 – 0.15 Abrupt	Light clay, sandy	Weak, firm Subangular blocky, peds 10-30 mm,	Nil	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
	B21 0.15 – 0.30 Abrupt	Medium heavy clay	Weak, firm Subangular blocky, peds 20-30 mm,	Nil	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	10YR4/2 Dark greyish brown Nil mottles / bleaching	Humid, Well – moderate drained	Nil roots	0.90 / 7.5			

**Table 3-94: Sites Particle Size Analysis Texture Assessment**

<b>Site</b>	<b>Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)</b>				
	<b>0.00-0.10</b>	<b>0.20-0.30</b>	<b>0.50-0.60</b>	<b>0.80-0.90</b>	<b>0.90-1.00</b>
6-SCL	Medium clay	Light medium clay	Medium clay	Medium clay	Light clay
7-SCL	Light clay	Light clay	Medium clay	Sandy clay	Light medium clay
100-SCL	Medium clay	Medium clay	Medium heavy clay	Medium heavy clay	Medium clay

**Table 3-95: Soil Chemistry Results for Detailed Site 6-SCL**

	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	7.88	8.43	8.61	8.55	8.72
Soil Cl (mg/kg)	22	117	626	1042	917
PSA-Sand (>20µm %)	38.2	52.4	43.2	41.5	54.3
PSA-Fine Silt (2-20µm %)	13.6	5.9	7.3	9.0	8.9
PSA-Clay (<2µm%)	48.2	41.6	49.5	49.5	36.8
CEC (meq/100g)	36.65	34.09	34.70	37.27	28.91
ESP (%NaCEC)	0.6	4.3	11.8	15.5	15.2
Ca/Mg (ratio)	2.3	1.8	1.1	1.0	1.0

**Table 3-96: Soil Chemistry Results for Detailed Site 7-SCL**

	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	7.47	9.05	9.18	9.16	9.16
Soil Cl (mg/kg)	10	29	232	354	417
PSA-Sand (>20µm %)	54.8	51.9	40.2	59.9	46.8
PSA-Fine Silt (2-20µm %)	9.8	8.4	13.8	6.6	12.0
PSA-Clay (<2µm%)	35.5	39.6	46.0	33.5	41.1
15 Bar (%)	19	24	26	20	21
CEC (meq/100g)	27.53	25.76	32.45	34.30	27.51
ESP (%NaCEC)	0.5	0.5	8.8	15.6	16.0
Ca/Mg (ratio)	3.2	3.2	1.3	1.0	1.0

**Table 3-97: Soil Chemistry Results for Detailed Site 100-SCL**

	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	7.92	8.44	8.60	8.53	8.63
Soil Cl (mg/kg)	8	57	244	467	449
PSA-Sand (>20µm %)	48.3	45.9	42.6	34.9	34.9
PSA-Fine Silt (2-20µm %)	9.2	12.7	11.6	9.8	14.2
PSA-Clay (<2µm%)	42.5	41.4	45.8	55.3	50.9
CEC (meq/100g)	29.18	33.32	38.02	37.41	36.61
ESP (%NaCEC)	0.8	4.8	10.0	11.6	10.5
Ca/Mg (ratio)	2.1	2.5	1.8	1.5	1.6

### 3.14 Map Unit 14

#### Overview

Map Unit 14 consists of a sandy loams over red clay subsoils on cleared gently undulating plains. This map unit is in the centre, south area of the project site and covers an area of 27 ha.

#### Observation Sites

A total of 8 observation sites were identified within the Map Unit 14 and are summarised in Table 3-98. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 2 ha.

**Table 3-98: Observation Sites for Map Unit 14**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
6	5 (3)


A land summary of detailed Site 10-SCL for the map unit is presented in Table 3-99, soil profile description in Table 3-100 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site 10-SCL, Site N41 and Site N42, were selected as to undergo chemical analysis. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-101 to 3-104.


#### Map Unit Observations

No further observations were made regarding the SCL assessment of the map unit.

**Table 3-99: Map Unit 14**

Item	Description
<b>Representative Site</b>	10-SCL
<b>Representative Site photograph</b>	
<b>Location</b>	642525mE 7510097mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Buffel Grass
<b>Disturbance</b>	Extensive disturbance
<b>Landform element /pattern</b>	Very gently undulating plain, Mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	2.0/1.0
<b>Drainage</b>	Moderate
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Soft
<b>ASC Order (s)</b>	Red Chromosol
<b>Total area (ha)</b>	27

**Table 3-100: Soil Profile Morphology Summary Map Unit 14**

<b>Site 10-SCL</b>									
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	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	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		

**Table 3-101: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
10-SCL	Sandy loam	Loam	Clay loam	Clay loam	Clay loam
N41	Sandy clay loam	Sandy clay	Clay loam	Sandy loam	Light clay
N42	Sandy loam	Light clay	Light clay	Light clay	Light clay

**Table 3-102: Soil Chemistry Results for Detailed Site 10-SCL**

	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

**Table 3-103: Soil Chemistry Results for Detailed Site N41**

	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	7.27	7.70	7.95	8.28	8.51
Soil Cl (mg/kg)	9	9	9	12	17
PSA-Sand (>20µm %)	71	63	53	81	55
PSA-Fine Silt (2-20µm %)	6	4	13	3	10
PSA-Clay (<2µm%)	23	33	34	15	35
CEC (meq/100g)	14.90	11.44	11.63	13.31	16.35
ESP (%NaCEC)	1.1	0.8	1.9	3.1	2.3
Ca/Mg (ratio)	2.0	1.6	1.2	1.0	1.1

**Table 3-104: Soil Chemistry Results for Detailed Site N42**

	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	7.02	7.79	7.97	8.32	8.80
Soil Cl (mg/kg)	8	9	7	12	21
PSA-Sand (>20µm %)	77	59	61	57	56
PSA-Fine Silt (2-20µm %)	5	6	2	6	6
PSA-Clay (<2µm%)	19	35	37	37	38
15 Bar (%)	12	15	16	18	18
CEC (meq/100g)	13.23	12.92	10.81	12.95	18.45
ESP (%NaCEC)	0.4	0.4	1.4	2.7	3.0
Ca/Mg (ratio)	2.3	1.8	1.3	1.1	1.0



### 3.15 Map Unit 15

#### **Overview**

Map Unit 15 consists of a dark uniform to gradational clay soils on lower sloped plains. This map unit is in the central east portion of the project site and covers an area within the SCL trigger map of 107.7 ha.

#### **Observation Sites**

A total of 5 observation sites were completed within this map unit and are summarised in Table 3-105. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 21.54 ha.

**Table 3-105: Observation Sites for Map Unit 15**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
2	3 (3)

A land summary of detailed Site N38 is presented in Table 3-106, soil profile description in Table 3-107 and detailed site descriptions are presented in Appendix A.


Three representative detailed sites, Site N38, Site N39 and Site N40, were selected to undergo chemical analysis for Map Unit 15. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-108 to 3-111.

#### **Map Unit Observations**


No further observations were made regarding the SCL assessment of the map unit.



**Table 3-106: Map Unit 15**

Item	Description
<b>Representative Site</b>	N38
<b>Representative Site photograph</b>	
<b>Location</b>	645726mE 7510395mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Mixed vegetation, eucalyptus species,
<b>Disturbance</b>	Semi disturbed
<b>Landform element / pattern</b>	GUP Lower slope to depression
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	1% / 2%
<b>Drainage</b>	Well to well-moderate drained
<b>Surface coarse fragments</b>	<2% coarse fragments <5mm
<b>Surface condition</b>	Crust
<b>ASC Order (s)</b>	Black Vertosol
<b>Total area (ha)</b>	107.7

**Table 3-107: Soil Profile Morphology Summary Map Unit 15**

Site N38										
	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 0.0 – 0.12 Abrupt	Light clay	Moderate, firm, sub-angular <20 mm	Nil	10YR3/2 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 0.9-1.00	Nil
	B21 0.12 – 0.90 Abrupt	Medium clay	Moderate-strong, strong, sub-angular <20 mm	Nil	10YR3/2 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 Nil mottles / bleaching	Dry, well-moderate drained	Present	0.90 / 8.0			

**Table 3-108: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N38	Light medium clay	Light medium clay	Light clay	Light clay	Light medium clay
N39	Light medium clay	Medium clay	Sandy clay	Medium clay	Light clay
N40	Light medium clay	Light clay	Light medium clay	Medium clay	Medium clay

**Table 3-109: Soil Chemistry Results for Detailed Site N38**

	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	8.03	7.72	8.04	8.59	8.59
Soil Cl (mg/kg)	37	68	221	640	802
PSA-Sand (>20µm %)	60	57	58	53	54
PSA-Fine Silt (2-20µm %)	4	2	5	8	4
PSA-Clay (<2µm%)	36	41	37	40	43

**Table 3-110: Soil Chemistry Results for Detailed Site N39**

	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	7.69	7.90	8.49	8.75	8.74
Soil Cl (mg/kg)	18	33	220	534	562
PSA-Sand (>20µm %)	52	45	60	51	57
PSA-Fine Silt (2-20µm %)	7	9	8	3	6
PSA-Clay (<2µm%)	41	46	32	46	37

**Table 3-111: Soil Chemistry Results for Detailed Site N40**

	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	7.92	8.76	9.04	8.98	8.80
Soil Cl (mg/kg)	8	11	107	384	669
PSA-Sand (>20µm %)	49	50	46	46	41
PSA-Fine Silt (2-20µm %)	8	9	9	7	11
PSA-Clay (<2µm%)	43	40	45	47	48

### 3.16 Map Unit 16

#### **Overview**

Map Unit 16 consists of dark brown clay soils with gilgai microrelief on gently undulating plains of mixed regrowth. This map unit is in the south-west portion of the project site and covers an area within the SCL trigger map of 383.0 ha.

#### **Observation Sites**

A total of 8 observation sites were completed within this map unit and are summarised in Table 3-112. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 47.87 ha.

**Table 3-112: Observation Sites for Map Unit 16**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
4	4 (3)

A land summary of detailed Site 5\_SCL is presented in Table 3-113, soil profile description in Table 3-114 and detailed site descriptions are presented in Appendix A.


Three representative detailed sites, Site 5-SCL, Site 102-SCL and Site 103-SCL, were selected to undergo chemical analysis for with two soil profiles for each (Mound [M] and Depression [D]) were analysed. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-115 to 3-121.

#### **Map Unit Observations**


No further observations were made regarding the SCL assessment of the map unit.



**Table 3-113: Map Unit 16**

Item	Description
<b>Representative Site</b>	5-SCL-M (Mound)
<b>Representative Site photograph</b>	
<b>Location</b>	641663mE 7508746mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed - 50mm hand auger
<b>Vegetation</b>	Grasses
<b>Disturbance</b>	Extensively disturbed
<b>Landform element / pattern</b>	Gently undulating plain, mid-slope
<b>Micro relief</b>	Gilgai microrelief present 40% coverage
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	2% / 1%
<b>Drainage</b>	Well to moderately drained
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Self-mulching with cracking
<b>ASC Order (s)</b>	Black Vertosol
<b>Total area (ha)</b>	383.0

**Table 3-114: Soil Profile Morphology Summary Map Unit 16**

Site 5-SCL-M									
Horizon Depth (m), Boundar -y (Bdy)	Field Texture	Structure Strength	Inclusions Segregatio- ns	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH / EC dS/m	Samples (m)	Observati -ons
A1 0.00-0.12 Abrupt	Light clay	Moderate, soft <20mm sub- angular	Nil	10YR2/1 Nil mottle / bleaching	Humid, Well drained	Comm on, mediu m	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
B21 0.12-0.60 Abrupt	Medium heavy clay	Moderate, Firm <30mm sub- angular	Nil	10YR3/1 Nil mottle / bleaching	Humid, Well drained	Few, mediu m	0.30 / 7.0		
B22 0.60-1.00 EOBH	Medium heavy clay	Moderate, Firm <30mm sub- angular	<2% Calcium carbonate	10YR3/1 Nil mottle / bleaching	Humid, Well - moderate drained	Few, fine	0.10 / 7.0		

**Table 3-115: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
5-SCL (Mound)	Medium clay	Medium clay	Medium clay	Medium heavy clay	Medium heavy clay
5-SCL (Depression)	Medium clay	Medium heavy clay	Medium heavy clay	Heavy clay	Heavy clay
102-SCL (Mound)	Medium clay	Medium heavy clay	Medium heavy clay	Medium heavy clay	Medium heavy clay
102-SCL (Depression)	Sandy clay	Light clay	Light medium clay	Medium clay	Medium clay
103-SCL (Mound)	Medium clay	Medium clay	Medium clay	Medium clay	Medium clay
103-SCL (Depression)	Light clay	Light clay	Light clay	Light clay	Light clay

**Table 3-116: Soil Chemistry Results for Detailed Site 5-SCL-M (Mound)**

	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

**Table 3-117: Soil Chemistry Results for Detailed Site 5-SCL-D (Depression)**

	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

**Table 3-118: Soil Chemistry Results for Detailed Site 102-SCL-M (Mound)**

	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	7.33	8.23	8.81	8.98	8.92
Soil Cl (mg/kg)	10	16	23	74	151
PSA-Sand (>20µm %)	64.	54.3	50.4	47.7	36.6
PSA-Fine Silt (2-20µm %)	6.4	7.6	8.3	7.2	15.7
PSA-Clay (<2µm%)	29.0	38.1	41.4	45.1	47.7

**Table 3-119: Soil Chemistry Results for Detailed Site 102-SCL-D (Depression)**

	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	7.56	8.19	8.80	8.74	8.54
Soil Cl (mg/kg)	24	32	95	230	426
PSA-Sand (>20µm %)	43.2	31.5	32.5	30.5	32.4
PSA-Fine Silt (2-20µm %)	11.2	11.2	8.0	10.2	8.5
PSA-Clay (<2µm%)	45.6	57.3	59.4	59.2	59.1



**Table 3-120: Soil Chemistry Results for Detailed Site 103-SCL-M (Mound)**

	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	8.65	8.36	9.20	9.15	9.09
Soil Cl (mg/kg)	11	78	174	485	665
PSA-Sand (>20µm %)	57.3	55.7	57.7	59.2	55.6
PSA-Fine Silt (2-20µm %)	7.3	5.6	4.1	7.4	6.2
PSA-Clay (<2µm%)	35.4	38.8	38.2	33.4	38.2

**Table 3-121: Soil Chemistry Results for Detailed Site 103-SCL-D (Depression)**

	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	7.11	7.90	7.80	6.99	6.28
Soil Cl (mg/kg)	11	53	463	818	821
PSA-Sand (>20µm %)	33.7	29.8	28.4	32.2	36.9
PSA-Fine Silt (2-20µm %)	16.4	13.1	13.0	12.3	12.0
PSA-Clay (<2µm%)	49.8	57.1	58.6	55.5	51.1

### 3.17 Map Unit 17

#### **Overview**

Map Unit 17 consists of dark cracking clays with cropping on undulating plains. This map unit is in the southern area of the project site and covers an area of 495.5 ha.

#### **Observation Sites**

A total of 11 observation sites were identified within Map Unit 17 and summarised in Table 3-122. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 45.05 ha.

**Table 3-122: Observation Sites for Map Unit 17**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
7	4 (3)

A land summary of detailed Site 4-SCL is presented in Table 3-123, soil profile description in Table 3-124 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, Site 4-SCL, Site 110-SCL and Site 115-SCL, were selected to undergo chemical analysis. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-125 to 3-128.


#### **Map Unit Observations**

No further observations were made regarding the SCL assessment of the map unit.

**Table 3-123: Map Unit 17**

Item	Description
<b>Representative Site</b>	4-SCL
<b>Representative Site photograph</b>	
<b>Location</b>	643527mE 7507664mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Cleared, very sparse mixed regrowth
<b>Disturbance</b>	Semi-Cleared
<b>Landform element /pattern</b>	Very gently undulating plains, mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	<1.0/1.0
<b>Drainage</b>	Moderate/imperfect
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Cracking, self-mulching
<b>ASC Order (s)</b>	Black Vertosol
<b>Total area (ha)</b>	495.5

**Table 3-124: Soil Profile Morphology Summary Map Unit 17**

Site 4-SCL									
	Horizon Depth (m), Boundar -y (Bdy)	Field Texture	Structure Strength	Inclusions Segregatio- ns	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH / EC dS/m	Samples (m)
A1 0.00-0.14 Abrupt	Light clay	Weak, firm, <10mm sub- angular	Nil inclusion or segregation s	10YR3/2 Very dark greyish brown Nil mottles/ble ach	Dry, moderate	Fine, 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
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/ble ach	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.5		
B22 0.90-1.00 EOBH	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		

**Table 3-125: Sites Particle Size Analysis Texture Assessment**

<b>Site</b>	<b>Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)</b>				
	<b>0.00-0.10</b>	<b>0.20-0.30</b>	<b>0.50-0.60</b>	<b>0.80-0.90</b>	<b>0.90-1.00</b>
4-SCL	Medium clay	Medium clay	Medium clay	Medium clay	Silty clay loam
110-SCL	Light clay	Medium clay	Medium clay	Medium clay	Loam
115-SCL	Clay loam	Light clay	Medium clay	Light clay	Medium clay

**Table 3-126: Soil Chemistry Results for Detailed Site 4-SCL**

	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	7.74	8.82	8.82	8.60	8.65
Soil Cl (mg/kg)	7	13	124	419	799
PSA-Sand (>20µm %)	36.5	28.6	30.3	32.9	36.7
PSA-Fine Silt (2-20µm %)	16.6	23.4	20.7	20.3	25.2
PSA-Clay (<2µm%)	46.8	48.0	49.0	46.8	38.1
15 Bar (%)	28	32	32	33	30

**Table 3-127: Soil Chemistry Results for Detailed Site 110-SCL**

	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	7.30	7.93	8.83	8.91	9.04
Soil Cl (mg/kg)	27	12	39	72	47
PSA-Sand (>20µm %)	56.3	43.4	36.6	28.8	55.5
PSA-Fine Silt (2-20µm %)	6.5	9.3	5.4	25.4	23.0
PSA-Clay (<2µm%)	37.2	47.3	58.0	45.8	21.5
15 Bar (%)	22	28	30	33	33

**Table 3-128: Soil Chemistry Results for Detailed Site 115-SCL**

	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	7.85	8.19	8.57	8.69	8.78
Soil Cl (mg/kg)	34	14	68	16	40
PSA-Sand (>20µm %)	46.1	38.7	44.1	36.2	38.9
PSA-Fine Silt (2-20µm %)	17.1	19.5	6.4	19.0	7.5
PSA-Clay (<2µm%)	36.8	41.8	49.6	44.7	53.7
15 Bar (%)	24	29	31	32	32

### 3.18 Map Unit 18

#### **Overview**

Map Unit 18 consists of dark gradational sandy clay loams on clays on undulating plains. This map unit is in the north to northwest area of the project site and covers an area of 91 ha.

#### **Observation Sites**

A total of 16 observation sites were identified within Map Unit 18 and summarised in Table 3-129. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 6 ha.

**Table 3-129: Observation Sites for Map Unit 17**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
9	7 (4)

A land summary of detailed Site N46 is presented in Table 3-130, soil profile description in Table 3-131 and detailed site descriptions are presented in Appendix A.


Four representative detailed sites, N26, N46, N52 and 77-SCL, were selected to undergo chemical analysis. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-132 to 3-136.

#### **Map Unit Observations**


The extent of the compliant SCL within Map Unit 18, which includes Site 77-SCL totalled 5.6 ha, which is less than 10 ha based on surrounding check, detailed and non-SCL compliant analytical sites.



**Table 3-130: Map Unit 18**

Item	Description
<b>Representative Site</b>	N46
<b>Representative Site photograph</b>	
<b>Location</b>	641947mE 7512737mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Spear grasses, sparse brigalow
<b>Disturbance</b>	Extensive clearing
<b>Landform element /pattern</b>	Gently undulating plains, mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	2.0/2.0
<b>Drainage</b>	Moderate well
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Firm
<b>ASC Order (s)</b>	Black Dermosol
<b>Total area (ha)</b>	91

**Table 3-131: Soil Profile Morphology Summary Map Unit 18**

<b>Site N46</b>										
	<b>Horizon Depth (m), Boundar -y (Bdy)</b>	<b>Field Texture</b>	<b>Structure Strength</b>	<b>Inclusions Segregatio- ns</b>	<b>Colour, Mottle, Bleaching</b>	<b>Moisture Drainage</b>	<b>Roots</b>	<b>Depth (m) / Field pH / EC dS/m</b>	<b>Samples (m)</b>	<b>Observati -ons</b>
	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 Comm on	6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
	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 Comm on	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	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		

**Table 3-132: Sites Particle Size Analysis Texture Assessment**

<b>Site</b>	<b>Sample Depth (m) Texture (PSA / Ternary Soil Texture Chart)</b>				
	<b>0.00-0.10</b>	<b>0.20-0.30</b>	<b>0.50-0.60</b>	<b>0.80-0.90</b>	<b>0.90-1.00</b>
N26	Sandy clay loam	Sandy clay	Light medium clay	Light medium clay	Light clay
N46	Sandy clay loam	Light medium clay	Medium clay	Medium clay	Medium clay
N52	Sandy clay loam	Light medium clay	Medium clay	Light medium clay	Light medium clay
77-SCL	Clay Loam (marginal)	Light medium clay	Light clay	Light medium clay	Medium clay

**Table 3-133: Soil Chemistry Results for Detailed Site N26**

	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	8.47	8.58	8.93	9.21	8.98
Soil Cl (mg/kg)	5	19	125	252	307
PSA-Sand (>20µm %)	67.4	59.8	50.3	46.3	54.1
PSA-Fine Silt (2-20µm %)	3.0	5.2	5.4	10.0	6.7
PSA-Clay (<2µm%)	29.6	35.0	44.3	43.8	39.1
CEC (meq/100g)	26.74	30.53	37.34	42.10	34.73
ESP (%NaCEC)	0.8	5.9	15.7	19.1	18.4
Ca/Mg (ratio)	4.6	1.6	0.8	0.7	0.7

**Table 3-134: Soil Chemistry Results for Detailed Site N46**

	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	7.26	8.96	9.13	9.08	8.96
Soil Cl (mg/kg)	72	29	99	156	407
PSA-Sand (>20µm %)	67	49	45	36	36
PSA-Fine Silt (2-20µm %)	7	8	9	10	12
PSA-Clay (<2µm%)	26	42	46	53	52
CEC (meq/100g)	23.9	32.0	35.3	37.4	37.6
ESP (%NaCEC)	0.7	2.5	7.1	8.9	9.5
Ca/Mg (ratio)	1.9	1.2	0.7	0.7	0.6

**Table 3-135: Soil Chemistry Results for Detailed Site N52**

	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	7.20	9.31	9.10	8.99	8.81
Soil Cl (mg/kg)	5	41	879	807	879
PSA-Sand (>20µm %)	70	51	41	47	45
PSA-Fine Silt (2-20µm %)	7	7	10	10	8
PSA-Clay (<2µm%)	23	42	49	43	47
CEC (meq/100g)	23.1	27.3	31.4	26.3	25.6
ESP (%NaCEC)	0.7	6.1	15.3	17.4	17.5
Ca/Mg (ratio)	1.9	0.9	0.4	0.4	0.4

**Table 3-136: Soil Chemistry Results for Detailed Site 77-SCL**

	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	7.71	8.47	8.71	8.71	8.48
Soil Cl (mg/kg)	8	6	75	404	759
PSA-Sand (>20µm %)	61.8	52.3	58.2	46.7	44.2
PSA-Fine Silt (2-20µm %)	7.6	7.3	4.3	8.8	8.0
PSA-Clay (<2µm%)	30.6	40.4	37.6	44.5	47.7
CEC (meq/100g)	27.26	33.68	32.53	39.41	42.78
ESP (%NaCEC)	0.5	2.6	7.7	11.9	14.2
Ca/Mg (ratio)	3.2	2.2	1.3	1.0	0.9

### 3.19 Map Unit 19

#### **Overview**

Map Unit 19 consists of dark self-mulching clay soil on undulating plains. This map unit is in the north area of the project site and covers an area of 18 ha.

#### **Observation Sites**

A total of 16 observation sites were identified within Map Unit 18 and summarised in Table 3-137. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 3 ha.

**Table 3-137: Observation Sites for Map Unit 17**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
4	3 (3)

A land summary of detailed Site N57 is presented in Table 3-138, soil profile description in Table 3-139 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, N47, N49 and N57, were selected to undergo chemical analysis. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-140 to 3-143.

#### **Map Unit Observations**

No further observations were made regarding the SCL assessment of the map unit.




**Table 3-138: Map Unit 19**

Item	Description
<b>Representative Site</b>	N57
<b>Representative Site photograph</b>	
<b>Location</b>	641884 mE 7513451mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Sparse brigalow nearby
<b>Disturbance</b>	Extensive clearing
<b>Landform element /pattern</b>	Gently undulating plains, mid-slope
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	1.0/1.0
<b>Drainage</b>	Moderate well
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Self-mulching
<b>ASC Order (s)</b>	Black Self mulching Vertosol
<b>Total area (ha)</b>	18



**Table 3-139: Soil Profile Morphology Summary Map Unit 19**

Site N57										
Horizon Depth (m), Boundar -y (Bdy)	Field Texture	Structure Strength	Inclusions Segregatio- ns	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH / EC dS/m	Samples (m)	Observati -ons	
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	Nil	
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			

**Table 3-140: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth (m) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.80-0.90	0.90-1.00
N47	Medium Clay	Medium Clay	Medium Clay	Medium Clay	Medium Clay
N49	Medium Clay	Medium Clay	Medium Clay	Medium Clay	Medium heavy clay
N57	Light clay	Medium Clay	Medium Clay	Medium Clay	Medium Clay

**Table 3-141: Soil Chemistry Results for Detailed Site N47**

Analysis (Unit)	Sample Depth (m)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
Soil pH	8.05	8.73	9.28	9.22	9.11
Soil Cl (mg/kg)	11	13	149	326	630
PSA-Sand (>20µm %)	29	45	48	50	47
PSA-Fine Silt (2-20µm %)	17	4	7	5	7
PSA-Clay (<2µm%)	54	51	45	45	47
CEC (meq/100g)	38.7	31.8	30.0	29.2	30.7
ESP (%NaCEC)	1.0	2.4	10.1	11.2	11.9
Ca/Mg (ratio)	2.4	1.5	0.6	0.5	0.5

**Table 3-142: Soil Chemistry Results for Detailed Site N49**

	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	7.78	9.08	9.18	9.13	9.07
Soil Cl (mg/kg)	60	41	299	414	704
PSA-Sand (>20µm %)	39	43	39	38	35
PSA-Fine Silt (2-20µm %)	14	9	9	8	9
PSA-Clay (<2µm%)	47	48	52	53	56
CEC (meq/100g)	35.4	37.5	37.4	40.2	39.0
ESP (%NaCEC)	0.8	3.8	7.1	8.3	8.5
Ca/Mg (ratio)	2.3	0.6	0.4	0.3	0.3

**Table 3-143: Soil Chemistry Results for Detailed Site N57**

	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	7.79	9.02	8.93	8.43	6.28
Soil Cl (mg/kg)	75	41	246	753	1003
PSA-Sand (>20µm %)	45	20	33	24	27
PSA-Fine Silt (2-20µm %)	14	12	9	12	12
PSA-Clay (<2µm%)	41	68	58	63	61
CEC (meq/100g)	32.4	40.0	33.3	34.0	31.6
ESP (%NaCEC)	0.8	4.5	9.3	12.0	11.4
Ca/Mg (ratio)	1.9	1.2	0.8	0.7	0.7

## 3.20 Map Unit 20

### Overview

Map Unit 20 consists of dark self-mulching, cracking clay soil on gently undulating lower slopes and flat plains with minor areas of microrelief. This map unit is in the north area of the project site and covers an area of 36 ha.

### Observation Sites

A total of 16 observation sites were identified within Map Unit 18 and summarised in Table 3-144. Density of sites in the map unit exceeds minimum density for western cropping zone as outlined in RPI 08/14 at one site per 4 ha.

**Table 3-144: Observation Sites for Map Unit 17**

Observation Sites	
Check	Detailed ( <i>analysed</i> )
7	3 (3)


A land summary of detailed Site N56 is presented in Table 3-145, soil profile description in Table 3-146 and detailed site descriptions are presented in Appendix A.

Three representative detailed sites, N54, N56 and N58, were selected to undergo chemical analysis. The soil particle size analysis (PSA) was assessed against the Marshall soil texture chart (NCST, 2009) and soil chemistry results for the three selected detailed sites are presented in Tables 3-147 to 3-150.


### Map Unit Observations

Microrelief observed in the map unit. The area was assessed to be less than 10 ha and is considered a sub-dominant attribute of the map unit.

**Table 3-145: Map Unit 20**

Item	Description
<b>Representative Site</b>	N56
<b>Representative Site photograph</b>	
<b>Location</b>	641970mE 7512389mN
<b>Current Use</b>	Grazing
<b>Site survey type</b>	Detailed, 50 mm hand auger.
<b>Vegetation</b>	Bull Mitchell grass
<b>Disturbance</b>	Complete clearing, not cultivated
<b>Landform element /pattern</b>	Gently undulating plains, flat
<b>Micro relief</b>	Nil microrelief
<b>Erosion</b>	Nil erosion
<b>Slope (%)</b>	1.0/1.0
<b>Drainage</b>	Moderate well
<b>Surface coarse fragments</b>	Nil coarse fragments
<b>Surface condition</b>	Self-mulching
<b>ASC Order (s)</b>	Black Self mulching Vertosol
<b>Total area (ha)</b>	36

**Table 3-146: Soil Profile Morphology Summary Map Unit 20**

<b>Site N56</b>										
	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 0.00-0.10 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	Nil
	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			

**Table 3-147: Sites Particle Size Analysis Texture Assessment**

Site	Sample Depth / Horizon (m approx.) Texture (PSA / Ternary Soil Texture Chart)				
	0.00-0.10	0.20-0.30	0.50-0.60	0.70-0.80	0.90-1.00
N54	Medium clay	Medium clay	Medium heavy clay	Medium heavy clay	Medium heavy clay
N56	Light clay	Medium clay	Medium clay	Medium heavy clay	Medium clay
N58	Medium clay	Light medium clay	Medium clay	Medium clay	Medium clay

**Table 3-148: Soil Chemistry Results for Detailed Site N54**

	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	7.20	8.92	8.98	8.71	8.40
Soil Cl (mg/kg)	11	34	258	831	1002
PSA-Sand (>20µm %)	42	41	17	25	27
PSA-Fine Silt (2-20µm %)	11	6	12	13	12
PSA-Clay (<2µm%)	47	53	71	61	61
CEC (meq/100g)	37.2	40.0	42.7	29.9	31.8
ESP (%NaCEC)	1.0	4.5	10.4	11.9	12.6
Ca/Mg (ratio)	1.6	1.3	0.7	0.7	0.7

**Table 3-149: Soil Chemistry Results for Detailed Site N56**

	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	7.59	9.11	9.03	8.94	8.81
Soil Cl (mg/kg)	97	40	302	696	919
PSA-Sand (>20µm %)	47	37	37	35	36
PSA-Fine Silt (2-20µm %)	11	10	10	9	10
PSA-Clay (<2µm%)	42	53	53	56	54
CEC (meq/100g)	32.7	37.5	39.5	38.6	41.1
ESP (%NaCEC)	0.9	6.0	11.5	12.2	13.1
Ca/Mg (ratio)	2.1	0.9	0.7	0.7	0.6

**Table 3-150: Soil Chemistry Results for Detailed Site N58**

	Sample Depth (m)				
Analysis (Unit)	0.00-0.10	0.20-0.30	0.50-0.60	0.66-0.76	0.90-1.00
Soil pH	7.82	8.79	9.12	9.00	8.97
Soil Cl (mg/kg)	6	22	72	153	175
PSA-Sand (>20µm %)	35	47	43	40	30
PSA-Fine Silt (2-20µm %)	13	10	9	12	15
PSA-Clay (<2µm%)	51	43	48	48	55
CEC (meq/100g)	29.7	36.6	35.4	37.7	43.4
ESP (%NaCEC)	0.5	1.8	6.0	7.8	9.6
Ca/Mg (ratio)	1.7	1.4	0.8	0.7	0.6



## 4 SCL ASSESSMENT

The SCL map units were assessed against the SCL criteria for the SCA's Western Cropping Zone. The findings of the SCL assessment are summarised in Table 4-1.

**Table 4-1: SCL Assessment of Map Units**

Map Unit	SCL Criteria Exceedances	SCL Status
1	pH – Sites N6-SCL, N7-SCL and N8-SCL	Not SCL
2	pH – Sites N17, N18 and N19	Not SCL
3	No SCL criteria exceedances reported	Likely SCL
4	pH – Sites N21 and N22. Chemical limitation for SWS – Site N20	Not SCL
5	pH – Sites N4-SCL, N5-SCL and N9-SCL	Not SCL
6	pH – Sites N26, N27, N32 and 80-SCL SWS – Site 91-SCL	Not SCL
7	No SCL criteria exceedances reported	Likely SCL
8	No SCL criteria exceedances reported	Likely SCL
9	No SCL criteria exceedances reported	Likely SCL
10	pH – Sites N28 and N43	Not SCL
11	pH – Sites N23, N24 and N25	Not SCL
12	No SCL criteria exceedances reported	Likely SCL
13	pH – Site 7-SCL Remaining two sites have no SCL criteria exceedances reported	Likely SCL
14	SWS – Site 10-SCL, N41 and N42	Not SCL
15	No SCL criteria exceedances reported	Likely SCL
16	No SCL criteria exceedances reported	Likely SCL
17	No SCL criteria exceedances reported	Likely SCL
18	pH – Sites N26, N46 and N52	Not SCL
19	No SCL criteria exceedances reported	Likely SCL
20	SWS – Marginal results Site N54 Remaining two sites have no SCL criteria exceedances reported	Likely SCL

This assessment shows that the map units in the project site which are not SCL. A detailed assessment of each map unit is presented in Sections 4.1 to 4.20.

## 4.1 Map Unit 1

The SCL assessment of Map Unit 1 is summarised below in Table 4-2.

**Table 4-2: SCL Assessment of Map Unit 1**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
Site N6-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.94 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
Site N7-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.15 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
Site N8-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.37 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 1 exhibited limitation relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 600 mm soil depth at Sites N6-SCL, N7-SCL and N8-SCL ranged from 8.94 to 9.37. These concentrations did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils.

None of the analysed sites meet the SCL criteria, therefore Map Unit 1 is not SCL.

## 4.2 Map Unit 2

The SCL assessment of Map Unit 1 is summarised below in Table 4-3.

**Table 4-3: SCL Assessment of Map Unit 2**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N17	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.25 at 0.20-0.30 mbgl)	Not required	Not required	Not SCL

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N18	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.94 at 0.20-0.30 mbgl)	Not required	Not required	Not SCL
N19	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.25 at 0.50-0.60 mbgl)	Not required	Not required	Not SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 2 exhibited limitations relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 300- and 600-mm soil depth at Sites N17, N18 and N19 from 8.94 to 9.25. These concentrations did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils.

None of the analysed sites meet the SCL criteria, therefore Map Unit 2 is not SCL.

### 4.3 Map Unit 3

The SCL assessment of Map Unit 3 is summarised below in Table 4-4.

**Table 4-4: SCL Assessment of Map Unit 3**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
60-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N15	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N16	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 3 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 3 is likely SCL.

## 4.4 Map Unit 4

The SCL assessment of Map Unit 4 is summarised below in Table 4-5.

**Table 4-5: SCL Assessment of Map Unit 4**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/ kg at 600mm	≥100mm to soil depth ≥1000m m	
N20	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Fail – Chemical limitation of pH 9.24 at 0.75-0.85 restricts PAWC	Not SCL
N21	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.01 at 0.50- 0.58 mbgl)	Not Required	Not Required	Not SCL
N22	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.96 at 0.50- 0.60 mbgl)	Not Required	Not Required	Not SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 4 exhibited limitations relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 600 mm soil depth at Sites N21 and N22 from 8.96 to 9.01. These concentrations did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils. pH levels were above 9.0 within Site N20 at 0.75-0.85 m, indicating a chemical limitation for PAWC.

None of the analysed sites meet the SCL criteria, therefore Map Unit 4 is not SCL.

## 4.5 Map Unit 5

The SCL assessment of Map Unit 5 is summarised below in Table 4-6.

**Table 4-6: SCL Assessment of Map Unit 4**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/ kg at 600mm	≥100mm to soil depth ≥1000m m	
Site N4-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.23 at 0.50- 0.60 mbgl)	Not required	Not required	Not SCL
Site N5-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.03 at 0.5- 0.60 mbgl)	Not required	Not required	Not SCL
Site N9-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.20 at 0.55- 0.65 mbgl)	Not required	Not required	Not SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 5 exhibited limitations relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 600 mm soil depth at Sites N4-SCL, N5-SCL and N9-SCL ranged from 9.03 to 9.23. These concentrations did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils.

None of the analysed sites meet the SCL criteria, therefore Map Unit 5 is not SCL.

## 4.6 Map Unit 6

The SCL assessment of Map Unit 6 is summarised below in Table 4-7.

**Table 4-7: SCL Assessment of Map Unit 6**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000mm	
91-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.13 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
N27	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.10 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
32-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.10 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
80-SCL	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.24 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 6 exhibited limitations relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 600 mm soil depth at Sites 26, 27, 32 and 80-SCL from 8.93 to 9.24. These concentrations did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils. SWS at site 91-SCL was 72.13 mm (Pawcer Pedotransfer function) and does not meet the SCL SWS criterion.

All the analysed sites did not meet the SCL criteria, therefore Map Unit 6 is not SCL.



## 4.7 Map Unit 7

The SCL assessment of Map Unit 7 is summarised below in Table 4-8.

**Table 4-8: SCL Assessment of Map Unit 7**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
Site N1-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
Site N2-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
Site N3-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 7 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 7 is likely SCL.

## 4.8 Map Unit 8

The SCL assessment of Map Unit 8 is summarised below in Table 4-9.

**Table 4-9: SCL Assessment of Map Unit 8**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N12	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N13	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N14	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 8 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 8 is likely SCL.

## 4.9 Map Unit 9

The SCL assessment of Map Unit 9 is summarised below in Table 4-10.

**Table 4-10: SCL Assessment of Map Unit 9**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
65-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N29	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N30	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N31	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N32	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N33	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 9 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 9 is likely SCL.

## 4.10 Map Unit 10

The SCL assessment of Map Unit 10 is summarised below in Table 4-11.

**Table 4-11: SCL Assessment of Map Unit 10**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N28	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.92 at 0.50-0.60 mbgl)	Not required	Not required	Not SCL
N43	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.99 at 0.50-0.60 mbgl)	Not required	Not required	Not SCL
N45	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 10 exhibited limitations relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 600 mm soil depth at Sites N28 and N43 from 8.92 to 8.99. These concentrations did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils.

Most of the analysed sites did not meet the SCL criteria, therefore Map Unit 10 is not SCL.

## 4.11 Map Unit 11

The SCL assessment of Map Unit 11 is summarised below in Table 4-12.

**Table 4-12: SCL Assessment of Map Unit 11**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N23	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.31 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
N24	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.98 at 0.20-0.30 mbgl)	Not Required	Not Required	Not SCL
N25	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.11 at 0.22-0.30 mbgl)	Not Required	Not Required	Not SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 11 exhibited limitations relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 300- and 600-mm soil depth at Sites N23, N24 and N25 from 8.98 to 9.31. These concentrations did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils.

All the analysed sites did not meet the SCL criteria, therefore Map Unit 11 is not SCL.

## 4.12 Map Unit 12

The SCL assessment of Map Unit 12 is summarised below in Table 4-13.

**Table 4-13: SCL Assessment of Map Unit 12**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/ kg at 600mm	≥100mm to soil depth ≥1000m m	
N35	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N36	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N37	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 12 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 12 is likely SCL.

## 4.13 Map Unit 13

The SCL assessment of Map Unit 13 is summarised below in Table 4-14.

**Table 4-14: SCL Assessment of Map Unit 13**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/ kg at 600mm	≥100mm to soil depth ≥1000m m	
6-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
7-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
100-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 13 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 13 is likely SCL.

## 4.14 Map Unit 14

The SCL assessment of Map Unit 14 is summarised below in Table 4-15.

**Table 4-15: SCL Assessment of Map Unit 14**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/ kg at 600mm	≥100mm to soil depth ≥1000m m	
Site 10-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Below limit at 83.79 mm Pedotran sfer Function	Not SCL
N41	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Below limit at 75 mm PAWC	Not SCL
N42	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Below limit at 98.64 mm Pedotran sfer Function	Not SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 14 exhibited limitations relating to SCL criterion SWS.

SWS at site 10-SCL, N41 and N42 were 83.79 mm (Pawcer Pedotransfer function), 75mm (SWS Lookup table) and 98.64 mm (Pawcer Pedotransfer function) and do not meet the SCL SWS criterion.

All the analysed sites did not meet the SCL criteria, therefore Map Unit 14 is not SCL.

## 4.15 Map Unit 15

The SCL assessment of Map Unit 15 is summarised below in Table 4-16.

**Table 4-16: SCL Assessment of Map Unit 15**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N38	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N39	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N40	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 15 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 15 is likely SCL.

## 4.16 Map Unit 16

The SCL assessment of Map Unit 15 is summarised below in Table 4-17.

**Table 4-17: SCL Assessment of Map Unit 15**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
5-SCL-M	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
5-SCL-D	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
102-SCL-M	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
102-SCL-D	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
103-SCL-M	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
103-SCL-D	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 16 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 16 is likely SCL.



## 4.17 Map Unit 17

The SCL assessment of Map Unit 17 is summarised below in Table 4-18.

**Table 4-18: SCL Assessment of Map Unit 17**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
Site 4-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
Site 110-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
Site 115-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 17 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 17 is likely SCL

## 4.18 Map Unit 18

The SCL assessment of Map Unit 18 is summarised below in Table 4-19.

**Table 4-19: SCL Assessment of Map Unit 18**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm within range of pH 5.1 – 8.9 inclusive	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N26	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.93 at 0.50-0.60 mbgl)	Not Required	Not Required	Not SCL
N46	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 8.96 at 0.20-0.30 mbgl)	Not Required	Not Required	Not SCL
N52	Pass	Pass	Pass	Pass	Pass	Exceeded (pH 9.31 at 0.20-0.30 mbgl)	Not Required	Not Required	Not SCL
77-SCL	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Not SCL</b>

Map Unit 18 exhibited limitations relating to SCL criterion soil pH.

pH levels were above pH 8.9 at 300 mm and 600 mm soil depth at Site N46 at 8.96, Site N52 at 9.31 and N26 at 8.93. This concentration did not meet the SCL pH criterion within range pH 5.1 and pH 8.9 for rigid soils.

Most of the analysed sites did meet the SCL criteria, therefore Map Unit 18 is not SCL.

## 4.19 Map Unit 19

The SCL assessment of Map Unit 19 is summarised below in Table 4-20.

**Table 4-20: SCL Assessment of Map Unit 19**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/ kg at 600mm	≥100mm to soil depth ≥1000m m	
N47	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N49	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N57	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 19 did not exhibit any limitations relating to SCL criteria. All the analysed sites met the SCL criteria, therefore Map Unit 19 is likely SCL.

## 4.20 Map Unit 20

The SCL assessment of Map Unit 20 is summarised below in Table 4-21.

**Table 4-21: SCL Assessment of Map Unit 20**

SCL Criterion	Slope	Rockiness	Gilgai	Soil Depth	Soil Wetness	Soil pH	Salinity	Soil Water Storage	SCL Status
Criterion Threshold	≤3%	≤20 rocks >60mm	<50% of gilgai >500m m depth	≥600 mm	Favourable drainage	300/600 mm greater than pH 5.0	<800mg/kg at 600mm	≥100mm to soil depth ≥1000m m	
N54	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Marginal Fail (Chloride 831 mg/kg at 0.70-0.80m, PAWC 84mm/1000mm) / PACWER – 102.09m m/100m m	Marginal Likely SCL
N56	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
N58	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Likely SCL
<b>Overall</b>									<b>Likely SCL</b>

Map Unit 20 exhibited limitations relating to SCL plant available water content criterion soil pH.

Chemical barrier of chloride in Site N54, 831 mg/kg at 0.70-0.80 mbgl reduced the PAWC calculated (refer Appendix X) to 84mm/1000mm, a marginal failure. Re-assessment of gravimetric water content using 15 bar analytical results indicates that the clay soil has 102.09mm/100mm water holding capacity. Therefore, it is considered a likely SCL.

Most of the analysed sites did meet the SCL criteria and on further assessment, Map Unit 20 is likely SCL.

## CONCLUSIONS

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The key conclusions of the SCL assessment are as follows:

- Twenty map units have been identified within the project site;
- Eleven map units, 3, 7, 8, 9, 12, 13, 15, 16, 17, 19 and 20 meet the SCL criteria;
- Six map units, 1, 2, 5, 10, 11, and 18 do not meet the SCL criterion for soil chemistry pH limitation exceedance;
- One map unit, Map Unit 14, does not meet the SCL criterion for soil water storage; and,
- Two map units 4, 6, do not meet the SCL criteria for pH and soil water storage.

## 5 REFERENCES

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## 6 GLOSSARY OF TERMS

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The following descriptions are of terms used in the text of this report.

**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.

**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.

**Chloride.** The concentration of chloride is usually an indicator of the severity of potential salinity.

**Chromosol.** Soils with a clear or abrupt textural B horizon and in which the major part<sup>1</sup> of the upper 0.2 m of the B2 horizon (or the major part of the entire B2 horizon if it is less than 0.2 m thick) is not strongly acid.

**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.

**Dermosol.** Soils with structured B2 horizons and lacking strong texture contrast between A and B horizons.

**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.

**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.  $ESP = (\text{Exchangeable sodium (meq/100g)} / \text{Cation exchange capacity (meq/100g)}) \times 100$

**Field 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.

**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.

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

**Mottles.** Areas of contrasting colour within 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.

**Non-rigid (soils).** Non-rigid soils are soils other than rigid soils.

**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.

**Profile.** The solum. This includes the soil A and B horizons and is basically the depth of soil to weathered rock.

**Rigid (soils).** Rigid soils are soils with minimal capacity to shrink and swell with changing water content. Minimum capacity to shrink and swell exists only if, when dry, the soil does not have, open cracks that are 5mm wide or more and extend from at least 300mm below the surface vertically upwards to the surface or immediately below a layer disturbed by human intervention, including, for example by ploughing or immediately below a thin (0.03m), natural surface layer or gilgai.

**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.

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

**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.

**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.

**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.



## **7      FIGURES**

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- Figure 1      SCL Trigger Map**
- Figure 2      Map Units**
- Figure 3      Strategic Cropping Land**



# Figure 1: SCL Trigger Map

Version 2  
02/09/2019

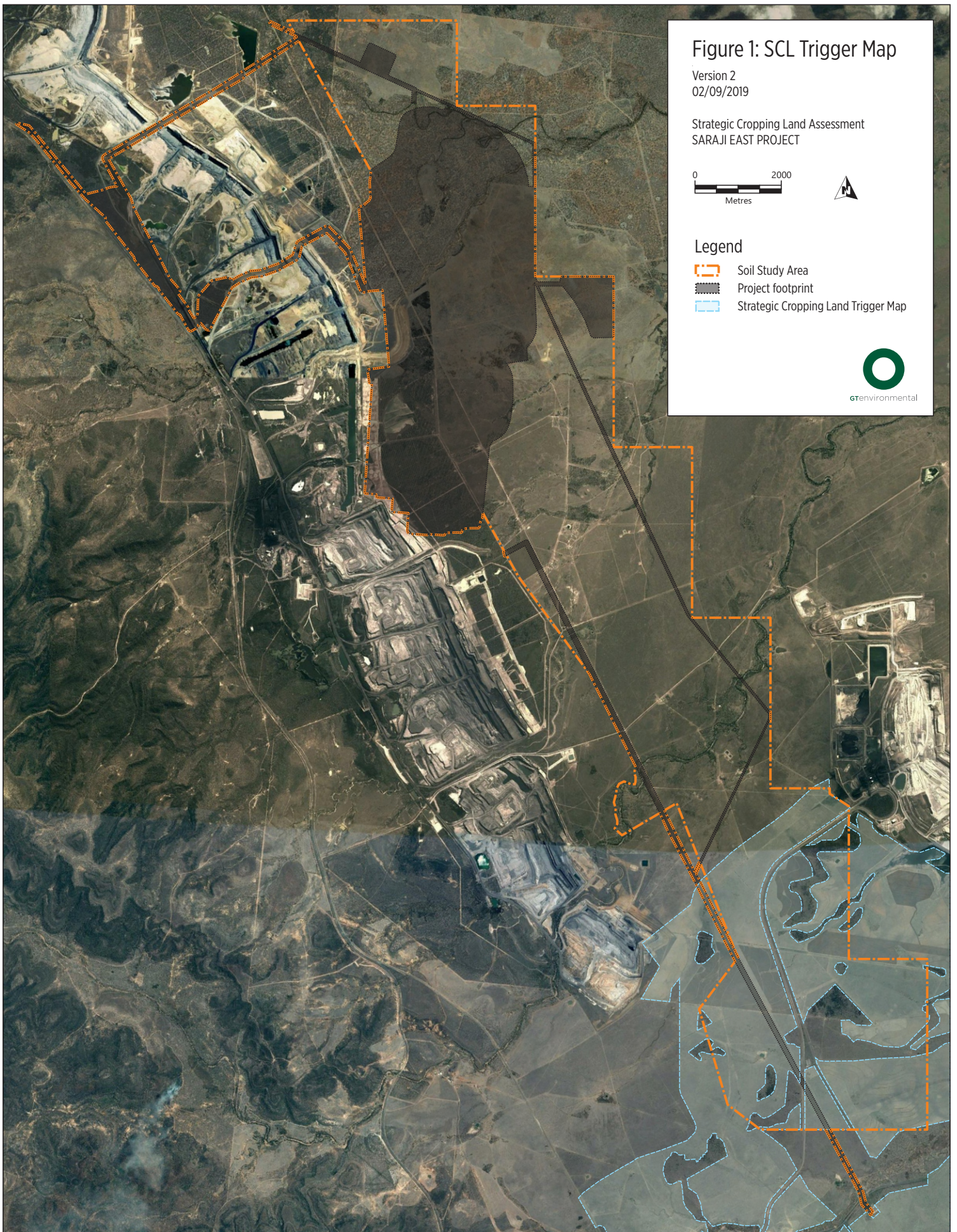
Strategic Cropping Land Assessment  
SARAJI EAST PROJECT

0 2000  
Metres



## Legend

-  Soil Study Area
-  Project footprint
-  Strategic Cropping Land Trigger Map





# Figure 2: Map Units

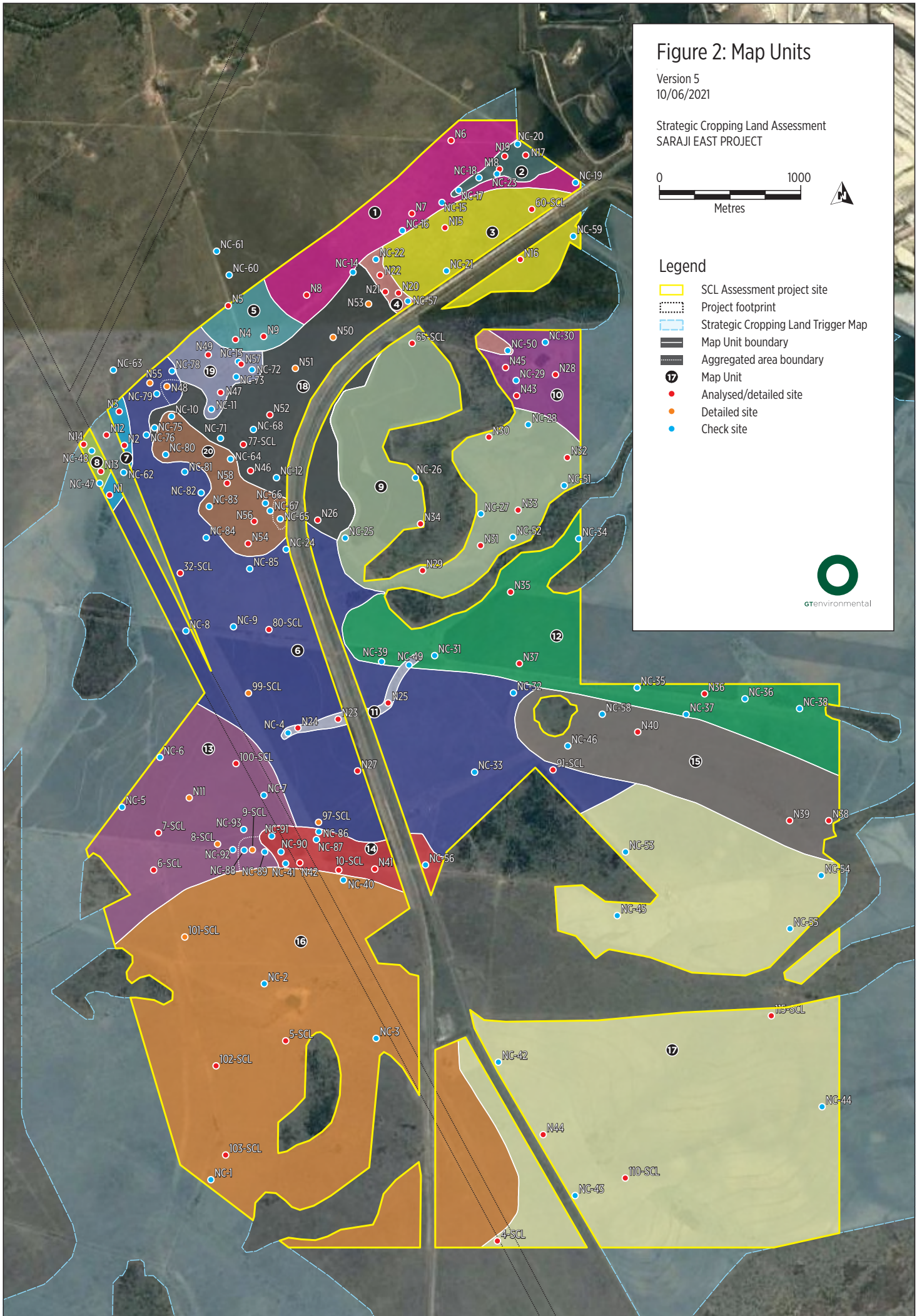
Version 5  
10/06/2021

Strategic Cropping Land Assessment  
SARAJI EAST PROJECT



## Legend

- SCL Assessment project site
- Project footprint
- Strategic Cropping Land Trigger Map
- Map Unit boundary
- Aggregated area boundary
- Map Unit
- Analysed/detailed site
- Detailed site
- Check site





### Figure 3: Strategic Cropping Land

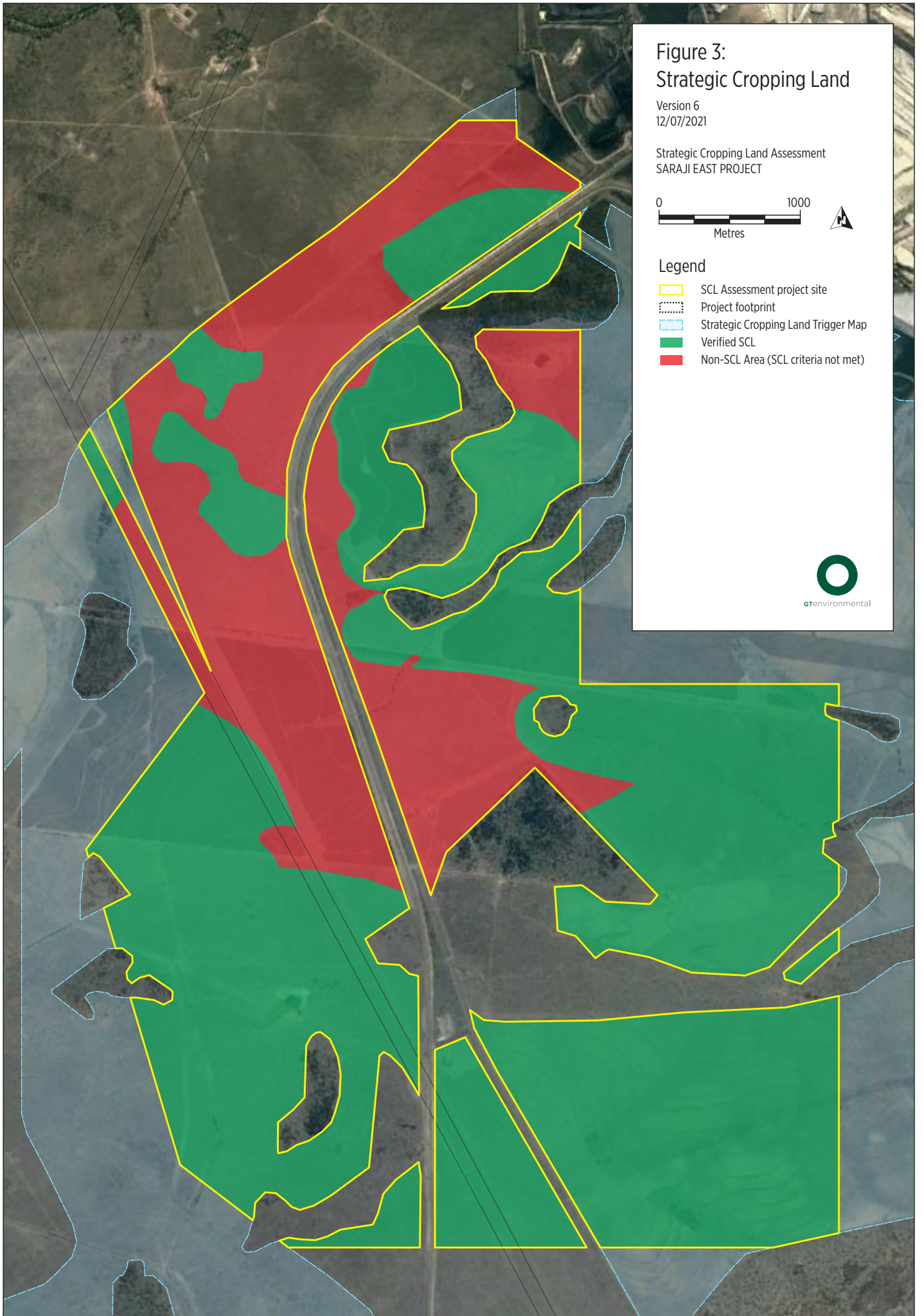
Version 6  
12/07/2021

Strategic Cropping Land Assessment  
SARAJI EAST PROJECT



#### Legend

- SCL Assessment project site
- Project footprint
- Strategic Cropping Land Trigger Map
- Verified SCL
- Non-SCL Area (SCL criteria not met)



## **8 APPENDICES**

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<b>Appendix A</b>	<b>Detailed site descriptions</b>
<b>Appendix B</b>	<b>Check site descriptions</b>
<b>Appendix C</b>	<b>Soil Water Storage Calculations</b>
<b>Appendix D</b>	<b>PAWCER Calculations</b>
<b>Appendix E</b>	<b>Laboratory Certificates</b>

## SITE N1

<b>Map Unit</b> 7	<b>Location (GDA94 ZONE 55):</b> 641005 mE 7512573 mN	<b>Aust. Soil Class.:</b> Crusting Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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, 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, firm 10- 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, firm 10- 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, firm 10- 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

<b>Map Unit</b> 7	<b>Location (GDA94 ZONE 55):</b> 641096mE 7512914mN	<b>Aust. Soil Class.:</b> Crusting Grey Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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 to semi disturbance Nil erosion	Firm, 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 EOBH	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

<b>Map Unit</b> 7	<b>Location (GDA94 ZONE 55):</b> 641074mE 7513152mN	<b>Aust. Soil Class.:</b> Crusting Grey Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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, Nil coarse fragments	A1 0.00-0.16 Abrupt	Light clay	Weak, 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 EOBH	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

<b>Map Unit</b> 5	<b>Location (GDA94 ZONE 55):</b> 641871mE 7513601mN	<b>Aust. Soil Class.:</b> Grey dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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

<b>Map Unit</b> 5	<b>Location (GDA94 ZONE 55):</b> 641792mE 7513825mN	<b>Aust. Soil Class.:</b> Black dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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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	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	0.20-0.30	
				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	0.50-0.60	
				B23 0.80-1.00 EOBH	Medium clay	Strong, 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	0.80-0.90 0.90-1.00	

## SITE N6

<b>Map Unit</b> 1	<b>Location (GDA94 ZONE 55):</b> 643271mE 7514881mN	<b>Aust. Soil Class.:</b> Black dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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 EOBH	Medium clay	Strong , 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

<b>Map Unit</b> 1	<b>Location (GDA94 ZONE 55):</b> 643071mE 7514453mN	<b>Aust. Soil Class.:</b> Black dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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, 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 EOBH	Medium clay	Strong, 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

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

<b>Map Unit</b> 5	<b>Location (GDA94 ZONE 55):</b> 642032mE 7513619mN	<b>Aust. Soil Class.:</b> Black dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 01/07/2018
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**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	0.00-0.09 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 EOBH	Medium clay	Strong, 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

<b>Map Unit</b> 13	<b>Location (GDA94 ZONE 55):</b> 641522mE 7510593mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 04/06/2019
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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 Extensive disturbance Nil erosion	Self-mulching with crust, minor sand on surface. Coarse fragments<5 mm <5%	A1 0.00 – 0.12 Abrupt	Light clay, sandy	Subangular blocky, Moderate 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, Strong 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, Strong 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

<b>Map Unit</b> 8	<b>Location (GDA94 ZONE 55):</b> 640984mE 7512975mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 05/06/2019
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**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	Firm, 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

<b>Map Unit</b> 8	<b>Location (GDA94 ZONE 55):</b> 640940mE 7512735mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 05/06/2019
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**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	Firm, 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

<b>Map Unit</b> 8	<b>Location (GDA94 ZONE 55):</b> 640810mE 7512936mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 05/06/2019
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**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	Firm. 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

<b>Map Unit</b> 3	<b>Location (GDA94 ZONE 55):</b> 643200mE 7514334mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 06/06/2019
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**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, upper-slope, 1%/2% slope	Grasses	Nil microrelief  Nil erosion  Extensively disturbed	Self-mulching, Nil coarse fragments	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 EOBH	Medium clay	Strong, 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

<b>Map Unit</b> 3	<b>Location (GDA94 ZONE 55):</b> 643734mE 7514136mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 06/06/2019
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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, upper-slope, 1%/1% slope	Grasses	Nil microrelief  Nil erosion  extensively disturbed	Self- mulching, Nil coarse fragments	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	Strong, 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 EOBH	Medium clay	Strong, 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

<b>Map Unit</b> 2	<b>Location (GDA94 ZONE 55):</b> 643797mE 7514822mN	<b>Aust. Soil Class.:</b> Black Sodosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 06/06/2019
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**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

<b>Map Unit</b> 2	<b>Location (GDA94 ZONE 55):</b> 643600mE 7514680mN	<b>Aust. Soil Class.:</b> Black Sodosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 06/06/2019
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**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

<b>Map Unit</b> 2	<b>Location (GDA94 ZONE 55):</b> 643668mE 7514813mN	<b>Aust. Soil Class.:</b> Black Sodosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 06/06/2019
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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 0.68-0.95 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

<b>Map Unit</b> 4	<b>Location (GDA94 ZONE 55):</b> 642943mE 7513907mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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	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

<b>Map Unit</b> 4	<b>Location (GDA94 ZONE 55):</b> 642847mE 7513907mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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	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	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	0.20-0.30	
				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	0.50-0.60	
				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	-	0.80-0.90	
				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			0.90-1.00	



## SITE N22

<b>Map Unit</b> 4	<b>Location (GDA94 ZONE 55):</b> 642838mE 7513991mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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	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

<b>Map Unit</b> 11	<b>Location (GDA94 ZONE 55):</b> 642506mE 7511103mN	<b>Aust. Soil Class.:</b> Grey Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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 Forage cropping nearby disturbance Nil erosion	Firm, crust with minor self-mulching 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	Strong, 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

<b>Map Unit</b> 11	<b>Location (GDA94 ZONE 55):</b> 642250mE 7511049mN	<b>Aust. Soil Class.:</b> Grey Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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 Forage cropping nearby disturbance Nil erosion	Firm, crust 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	Strong, 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

<b>Map Unit</b> 11	<b>Location (GDA94 ZONE 55):</b> 642810mE 7511185mN	<b>Aust. Soil Class.:</b> Grey Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 28/06/2019
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**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 Forage cropping nearby disturbance Nil erosion	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	Strong, 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

<b>Map Unit</b> 6	<b>Location (GDA94 ZONE 55):</b> 642370mE 7512434mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 28/06/2019
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**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	Firm, crust Nil coarse fragments	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

<b>Map Unit</b> 6	<b>Location (GDA94 ZONE 55):</b> 642614mE 7510764mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 28/06/2019
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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, 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 EOBH	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

<b>Map Unit</b> 10	<b>Location (GDA94 ZONE 55):</b> 643924mE 7513310mN	<b>Aust. Soil Class.:</b> Black Sodosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 28/07/2019
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**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	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

<b>Map Unit</b> 9	<b>Location (GDA94 ZONE 55):</b> 643062mE 7512049mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 28/06/2019
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**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, self mulching 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

<b>Map Unit</b> 9	<b>Location (GDA94 ZONE 55):</b> 643464mE 7512936mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 29/06/2019
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**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, self mulching, 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

<b>Map Unit</b> 9	<b>Location (GDA94 ZONE 55):</b> 643487mE 7512205mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 29 29/06/2019
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**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	Firm, self mulching 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

<b>Map Unit</b> 9	<b>Location (GDA94 ZONE 55):</b> 644077mE 7512794mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 29/06/2019
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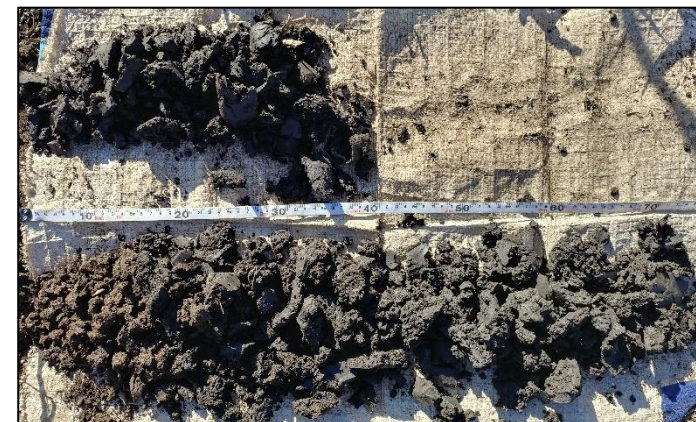
**Landscape**



**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	Firm, self mulching 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

<b>Map Unit</b> 9	<b>Location (GDA94 ZONE 55):</b> 643707mE 7512426mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 29/06/2019
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**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	Self-mulching, 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 0.60 – 1.00 EOBH	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

<b>Map Unit</b> 9	<b>Location (GDA94 ZONE 55):</b> 643069mE 7512379mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 29/06/2019
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### Landscape



### Surface



### Soil Profile



<u>Land use</u> <u>Landform</u> <u>Pattern,</u> <u>Element,</u> <u>Slope</u>	<u>Vegetation</u>	<u>Microrelief</u> <u>Disturbance</u> <u>Erosion</u>	<u>Surface</u> <u>condition,</u> <u>surface rock</u>	<u>Soil Profile Description</u>									
				<u>Horizon</u> <u>Depth (m),</u> <u>Boundary</u>	<u>Field</u> <u>Texture</u>	<u>Structure,</u> <u>Strength</u>	<u>Inclusions</u> <u>Segregations</u>	<u>Colour, Mottle,</u> <u>Bleaching</u>	<u>Moisture,</u> <u>Drainage</u>	<u>Roots</u>	<u>Depth (m) /</u> <u>Field pH</u>	<u>Sample (m)</u>	<u>Observations</u>
Grazing GUP mid slope 2% / 2%	Grasses, tall woodland nearby	Nil microrelief Extensive disturbed, contour banks nearby	Self mulching, 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

<b>Map Unit</b> 12	<b>Location (GDA94 ZONE 55):</b> 643659mE 7511986mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 29/06/2019
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**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 Segregation s	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	Self-mulching, crust, 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

<b>Map Unit</b> 12	<b>Location (GDA94 ZONE 55):</b> 644933mE 7511241mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2019
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**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 Segregation s	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	Self-mulching, crust, 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	0.00-0.05 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

<b>Map Unit</b> 12	<b>Location (GDA94 ZONE 55):</b> 643706mE 7511439mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2019
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**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	Self-mulching, crust, Nil coarse fragments	A11 0.00 – 0.05 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	0.00-0.05 0.20-0.30 0.50-0.60 0.80-0.90 0.90-1.00	Nil additional observations
				A12 0.05 – 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 – 0.47 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

<b>Map Unit</b> 15	<b>Location (GDA94 ZONE 55):</b> 645726mE 7510395mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2019
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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	Crust, <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

<b>Map Unit</b> 15	<b>Location (GDA94 ZONE 55):</b> 645496mE 7510399mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2019
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**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	Crust, <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

<b>Map Unit</b> 15	<b>Location (GDA94 ZONE 55):</b> 644518mE 7510978mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2019
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**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	Crust, <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

<b>Map Unit</b> 14	<b>Location (GDA94 ZONE 55):</b> 642742mE 7510104mN	<b>Aust. Soil Class.:</b> Red Chromosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2019
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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, shrubs	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, 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

<b>Map Unit</b> 14	<b>Location (GDA94 ZONE 55):</b> 642252mE 7510143mN	<b>Aust. Soil Class.:</b> Red Chromosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 01/07/2019
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**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, 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

<b>Map Unit</b> 10	<b>Location (GDA94 ZONE 55):</b> 643716mE 7513193mN	<b>Aust. Soil Class.:</b> Black Sodosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 011/07/2019
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**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	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

<b>Map Unit</b> 17	<b>Location (GDA94 ZONE 55):</b> 643817mE 7508323mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 01/07/2019
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**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	Cracking, self- mulching, Nil coarse fragments	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

<b>Map Unit</b> 10	<b>Location (GDA94 ZONE 55):</b> 643622mE 7513388mN	<b>Aust. Soil Class.:</b> Black Sodosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 01/07/2019
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**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	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 4-SCL

<b>Map Unit</b> 17	<b>Location (GDA94 ZONE 55):</b> 643527mE 7507664mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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, 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 EOBH	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

<b>Map Unit</b> 16	<b>Location (GDA94 ZONE 55):</b> 642166mE 7508999mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 04/06/2019
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**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 EOBH	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

<b>Map Unit</b> 16	<b>Location (GDA94 ZONE 55):</b> 642163mE 7508998mN	<b>Aust. Soil Class:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 04/06/2019
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**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 EOBH	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

<b>Map Unit</b> 13	<b>Location (GDA94 ZONE 55):</b> 641287mE 7510129mN	<b>Aust. Soil Class:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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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 Extensive disturbance Nil erosion	Humid self- mulching with crust 2-6, fine 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	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

<b>Map Unit</b> 13	<b>Location (GDA94 ZONE 55):</b> 641298mE 7510328mN	<b>Aust. Soil Class:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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**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 Extensive disturbance  Nil erosion	Self-mulching fine 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

<b>Map Unit</b> 13	<b>Location (GDA94 ZONE 55):</b> 641694mE 7510274 mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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**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 Extensive disturbance Nil erosion	Humid, self- mulching occasional coarse 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 EOBH	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

<b>Map Unit</b> 13	<b>Location (GDA94 ZONE 55):</b> 641919mE 7510236mN	<b>Aust. Soil Class.:</b> Brown Chromosol (Sub-dominant soil, aggregated into Map unit 13)	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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**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, Nil coarse 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
				B21 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		
				B22 0.60 – 1.00 EOBH	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

<b>Map Unit</b> 14	<b>Location (GDA94 ZONE 55):</b> 642525mE 7510097mN	<b>Aust. Soil Class.:</b> Red Chromosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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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	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	First borehole,
				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	0.20-0.30	0.20 mbgl
				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	0.50-0.60	Second
				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	0.70-0.80	borehole 0.40
												0.90-1.00	mbgl Refusal likely due to roots, no physical barrier



## SITE 32-SCL

<b>Map Unit</b> 6	<b>Location (GDA94 ZONE 55):</b> 641452mE 7512060mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 05/06/2019
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**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, 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, moderate y well drained	Nil roots	0.30 / 6.5		
				B23 0.55 – 1.00 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<2% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, moderate y well drained	Nil roots	0.60 / 7.0 0.90 / 6.5		

## SITE 60-SCL

<b>Map Unit</b> 3	<b>Location (GDA94 ZONE 55):</b> 643839mE 7514447mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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 Segregation s	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, upper-slope, 0% / 2% slope	Grasses	Nil microrelief Extensively disturbed Nil erosion	Self-mulching, cracking, 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 EOBH	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

<b>Map Unit</b> 9	<b>Location (GDA94 ZONE 55):</b> 643019mE 7513552mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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, self-mulching, 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 EOBH	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

<b>Map Unit</b> 18	<b>Location (GDA94 ZONE 55):</b> 641884mE 7512916mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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 upper-slope, 1% / 2% slope	Grasses, with Brigalow scrub nearby	Nil microrelief Extensive disturbance Nil erosion	Firm, minor crust Nil coarse fragments	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 gradual	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 EOBH	Medium clay	Strong, 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

<b>Map Unit</b> 6	<b>Location (GDA94 ZONE 55):</b> 642045mE 7511689mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 05/06/2019
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**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 Upper- slope, 2% slope	Grasses, with Brigalow nearby	Nil Microrelief  Nil erosion  Extensively cleared	Firm, 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

<b>Map Unit</b> 6	<b>Location (GDA94 ZONE 55):</b> 643899mE 7510777mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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	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

<b>Map Unit</b> 6	<b>Location (GDA94 ZONE 55):</b> 642351mE 7510427mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 04/06/2019
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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 Mid-slope, 1%/ 1% slope	Forage cropping	Nil Microrelief Extensive disturbance Nil erosion	Firm, 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 EOBH	Medium clay, sandy	Subangular blocky, moderate, peds <20 mm, very firm	<10% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.90 / 6.5		

## SITE 99-SCL

<b>Map Unit</b> 6	<b>Location (GDA94 ZONE 55):</b> 7510427mE 7511265mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 04/06/2019
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**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 Mid-slope, <1% / 1% slope	Forage cropping	Nil Microrelief Extensive disturbance Nil erosion	Firm, 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	10YR2/2 Very dark brown Nil mottles / bleaching	Humid, well drained	Nil roots	0.30 / 6.5		
				B22 0.50 – 1.00 EOBH	Light clay, sandy	Subangular blocky, moderate, peds <40 mm, very firm	<5% calcium carbonate	10YR3/3 Dark brown Mottles: Nil mottles / bleaching	Humid, moderately well drained	Nil roots	0.60 / 6.5		



## SITE 100-SCL

<b>Map Unit</b> 13	<b>Location (GDA94 ZONE 55):</b> 641820mE 7510822mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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**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 Gently undulating plain , upper- slope, 1% / 2% slope	Forage crops	Nil microrelief Extensive disturbance Nil erosion	Self-mulching, minor crust, Nil coarse fragments	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 EOBH	Medium clay	Subangular blocky, strong, 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

<b>Map Unit</b> 16	<b>Location (GDA94 ZONE 55):</b> 641451mE 7509683mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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**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 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, Nil coarse fragments	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 EOBH	Medium clay	Subangular blocky, strong, 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)

<b>Map Unit</b> 16	<b>Location (GDA94 ZONE 55):</b> 641663mE 7508746mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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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 mid-slope, 2% / 1%	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.2 m deep, 30% coverage Nil erosion Extensively disturbed	Self-mulching, 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 EOBH	Medium heavy clay	Subangular blocky, strong, 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)

<b>Map Unit</b> 16	<b>Location (GDA94 ZONE 55):</b> 641658mE 7508739mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 03/06/2019
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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 Segregation s	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Gently undulating plain mid-slope, 2%, Gilgai depression	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.2 m deep, 30% coverage Nil erosion Extensively disturbed	Self-mulching, Nil coarse fragments	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		
				B22 0.60 – 1.00 EOBH	Medium heavy clay	Subangular blocky, strong, 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)

<b>Map Unit</b> 16	<b>Location (GDA94 ZONE 55):</b> 641736mE 7508275mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 04/06/2019
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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 mid-slope, 2%, Gilgai depression	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.2 m deep, 50% coverage Nil erosion Extensively disturbed	Self-mulching, Nil coarse fragments	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 EOBH	Medium heavy clay	Subangular blocky, strong, 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)

<b>Map Unit</b> 16	<b>Location (GDA94 ZONE 55):</b> 641732mE 7508275mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 04/06/2019
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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 mid-slope, 2%, Gilgai depression	Grasses, recent regrowth and shrubs	Crabhole gilgai <0.22 m deep, 50% coverage Nil erosion Extensively disturbed	Self-mulching, Nil coarse fragments	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 EOBH	Medium heavy clay	Subangular blocky, strong, 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

<b>Map Unit</b> 17	<b>Location (GDA94 ZONE 55):</b> 644310mE 7508052mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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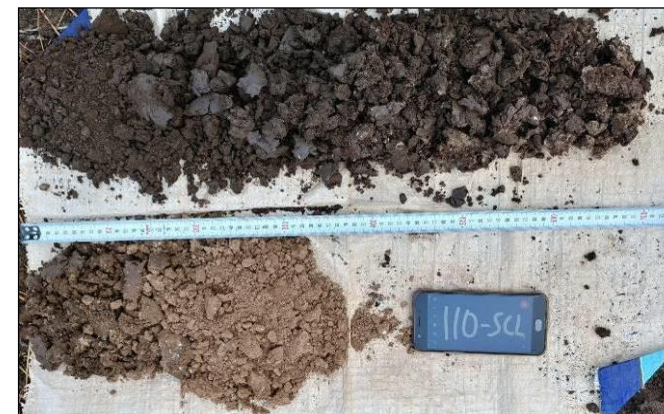
**Landscape**



**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, 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	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	0.20-0.30	
				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	0.50-0.60	
				B23 0.82 – 1.00 EOBH	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	0.70-0.80 0.90-1.00	

## SITE 115-SCL

<b>Map Unit</b> 17	<b>Location (GDA94 ZONE 55):</b> 645410mE 7509123mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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	Soft, loose 2-5% medium pebbles >600mm	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 EOBH	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		



<b>Site N46</b>	Map Unit: 18	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
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**Landscape**



**Surface**



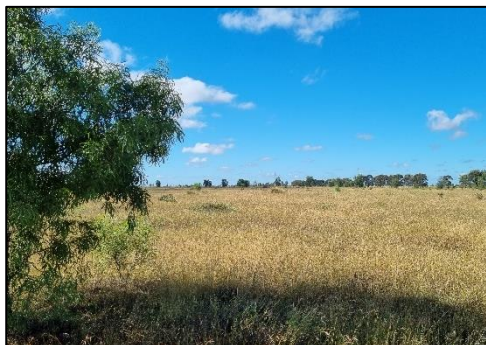
**Soil Profile**



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 0.20-0.30 0.50-0.60 0.70-0.80
			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	0.90-1.00
			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	Rainfall night before
			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	

<b>Site N47</b>	Map Unit: 19	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
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**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
			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	0.70-0.80 0.90-1.00
			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	



<b>Site N48</b>	<b>Map Unit:</b> 6 (Aggregated, soil map unit observed as <10 ha)	<b>Location (mE/mS GDA94 ZONE 55):</b> 641406 7513300	<b>Australian Soil Class:</b> Black Dermosol	<b>Soil Survey Type:</b> Detailed 50 mm hand auger	<b>Survey Date:</b> 01/05/2021
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**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
			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	0.90-1.00
			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	

<b>Site N49</b>	Map Unit: 19	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
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**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
			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	0.70-0.80 0.90-1.00
			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	



<b>Site N50</b>	Map Unit: 18	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
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**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	

<b>Site N51</b>	Map Unit: 18	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
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**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
			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	0.52-0.60 0.70-0.80 0.90-1.00
			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	



<b>Site N52</b>	Map Unit: 18	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
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**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	

<b>Site N53</b>	Map Unit: 18	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
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**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	



<b>Site N54</b>	Map Unit: 20	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
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**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	

<b>Site N55</b>	Map Unit: 6	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
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**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
			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	0.50-0.60 0.70-0.80 0.90-1.00
			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	



<b>Site N56</b>	Map Unit: 20	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
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**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	

<b>Site N57</b>	Map Unit: 19	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
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**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.%/1.1%	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
			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	0.20-0.30
			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	0.50-0.60
			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	0.70-0.80 0.90-1.00



<b>Site N58</b>	Map Unit: 20	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
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**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
			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	0.66-0.76 0.90-1.00
			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 No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-1	641651 7508111	16	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 55)	Map Unit	Comments	Pictures
NC-2	641972 7509347	16	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 55)	Map Unit	Comments	Pictures
NC-3	642749 7508963	16	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 55)	Map Unit	Comments	Pictures
NC-4	642189 7511009	11	Wide depression, drainage line Soft surface, with <2% <6mm coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-5	641073 7510547	13	Gently undulating plain, Cropping, extensively disturbed, lower slope Surface cracking, light clay, no coarse fragments	 





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-6	641305 7510835	13	Gently undulating plain, Cropping, extensively disturbed, lower slope Surface cracking, light clay, no coarse fragments	
NC-7	641985 7510605	13	Gently undulating plain, Cropping, extensively disturbed, lower slope Surface cracking, light clay, no coarse fragments	



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-8	641519 7511677	6	Gently undulating plain, mid slope Firm, sandy clay loam, no coarse fragments	
NC-9	641777 7511708	6	Gently undulating plain, mid slope, Sparse Brigalow Firm, sandy clay loam, no coarse fragments	




Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-10	641414 7513101	20	Gently undulating plain, lower slope, 1%, 2% Grass, various trees regrowth Surface – Crust, light clay	 



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-11	641676 7513156	19	Gently undulating plain, lower slope, 1%, 2% Limited disturbance, Brigalow Surface – cracking and self mulching, light clay	
NC-12	642118 7512668	6	Gently undulating plain, flat plain Limited disturbance, Brigalow Surface – Firm, clay loam sandy	





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-13	641869 7513464	19	Gently undulating plain, crest, 1%, 0% Limited disturbance, Brigalow Surface – Self mulching, black light clay	 


Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-14	642641 7514052	18	Gently undulating plain, crest, 1%, 0% Limited disturbance, Brigalow, Belah Surface -, clay loam sandy 10YR3/1	




Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-15	643244 7514499	1	<p>Gently undulating plain, lower slope &lt;2%</p> <p>Limited disturbance, Brigalow</p> <p>Surface – cracking 2-6 mm, light clay, no coarse fragments</p> <p>0.00 – 0.11 m</p> <p>Clay loam</p> <p>Moderate, firm, peds &lt;20 mm</p> <p>10YR3/1</p> <p>0.11 – 0.30+ m</p> <p>Medium clay</p> <p>Moderate, very firm, peds 20-40 mm</p> <p>10YR2/1</p>	 


Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-16	642934 7514283	1	<p>Gently undulating plain, mid slope &lt;2%</p> <p>Limited disturbance</p> <p>Surface – cracking 2-6 mm, light clay, no coarse fragments</p> <p>0.00 – 0.11 m</p> <p>Clay loam</p> <p>Moderate, firm, peds &lt;20 mm</p> <p>10YR3/2</p> <p>0.11 – 0.45+ m</p> <p>Medium clay</p> <p>Moderate, very firm, peds 20-40 mm</p> <p>10YR2/1</p>	



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-17	643327 7514558	2	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 55)	Map Unit	Comments	Pictures
NC-18	643487 7514650	2	Gully erosion, drainage line Gums Surface non-cracking	



NC-19	644123 7514610	1	<p>Gently undulating plain, upper slope 1%, 2% Limited disturbance, Surface – cracking &lt;2 mm, and self mulching, light clay, no coarse fragments</p> <p>0.00 – 0.11 m Clay loam Moderate, firm, peds &lt;10 mm 10YR3/2</p> <p>0.11 – 0.30 m Medium clay Moderate, subangular blocky, peds &lt;20 mm 10YR2/1</p> <p>0.30 – 0.40+ m Medium clay with &lt;2% calcium carbonate Moderate, subangular blocky, peds &lt;20 mm 10YR2/1</p>	
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Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
				


Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-20	643734 7514870	2	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 55)	Map Unit	Comments	Pictures
NC-21	643283 7514051	3	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 55)	Map Unit	Comments	Pictures
NC-22	642804 7514097	4	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	 



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-23	643584 7514647	2	Gently undulating plain, lower slope 1%, Surface light clay, cracking 2-6 mm, no coarse fragments	
NC-24	642191 7512204	6	Gently undulating plain, mid slope 1%, 1% Limited disturbance, Surface - Sandy clay loam 10YR3/1, firm, no coarse fragments	



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-25	642541 7512279	9	Gently undulating plain, flat plain Surface light clay, self mulching, no coarse fragments Cropping nearby	 





NC-26	643047 7512703	9	Gently undulating plain, lower slope 1%, Surface light clay, self mulching, no coarse fragments Cropping nearby	 
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NC-27	643449 7512385	9	Gently undulating plain, flat plain <1% slope Surface light clay, self mulching, no coarse fragments Cropping nearby	 
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NC-28	643790 7513018	9	Gently undulating plain, lower slope 1%, Surface light clay, self mulching, no coarse fragments Cropping nearby	 
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NC-29	643707 7513294	10	Gently undulating plain, upper slope 2%, 2% Surface sandy clay loam, no coarse fragments	 
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NC-30	643918 7513548	10	Gently undulating plain, upper slope 2% Surface sandy clay loam, <2% <2mm coarse fragments	 
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NC-31	643165 7511509	12	Gently undulating plain, lower slope 1% Surface light clay, minor crusting, no coarse fragments Limited disturbance	 
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NC-32	643661 7511295	6	Gently undulating plain, mid slope 1%, 1% Surface, soft, sandy clay loam, no coarse fragments Forage cropping disturbance	 
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Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-33	643394 7510738	6	<p>Gently undulating plain, upper slope 1%, 1% Surface, soft, no coarse fragments Forage cropping disturbance</p> <p>0.00 – 0.09 m Sandy loam, massive, weak, peds &lt;100mm 10YR3/2</p> <p>0.09 – 0.30+ m Sandy clay loam, peds &lt;200mm 10YR3/2</p> 	 





NC-34	644122 7512307	12	Gently undulating plain, flat plain Surface light clay 10YR3/2, cracking 2 mm, no coarse fragments Limited disturbance	 
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NC-35	644475 7511295	12	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments Cropping disturbance	 
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NC-36	645158 7511201	12	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking <2 mm, self mulching, no coarse fragments Cropping disturbance	 
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NC-37	644857 7511101	12	Gently undulating plain, upper slope <2%, <3% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments	 
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Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-38	645563 7511106	12	Gently undulating plain, upper slope 2%, 2% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments	 A close-up photograph of dark, moist soil with visible vertical and horizontal cracks. A black marker with a silver band is placed on the soil surface to provide a scale. Some dry, thin plant stems are scattered around the soil.

NC-39	642769 7511490	12	Gently undulating plain, mid slope 2%, 2% Surface light clay 10YR3/2, firm, no coarse fragments Forage cropping disturbance	 
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Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-40	642555 7510052	16	<p>Gently undulating plain, upper slope 1%, 1%</p> <p>Surface light clay 10YR3/2, self mulching, no coarse fragments.</p> <p>Gilgai located in area, map boundary</p> <p>Limited disturbance</p> <p>0.00 – 0.20 m</p> <p>Light clay, moderate, 10YR3/2</p> <p>0.20 – 0.40+ m</p> <p>Medium clay, subangular blocky, 10YR3/1</p>	  



NC-41	642161 7510152	14	<p>Brown surface colour to the north, change to grey surface colour nearby towards the south</p> <p>Surface - firm, sandy loam, 10YR3/3 No coarse fragments, mid slope 1%</p>	 
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Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-42	643510 7508834	17	<p>Gently undulating plain, upper slope 1%, 1%</p> <p>Surface cracking &lt;2 mm, self mulching, no coarse fragments</p> <p>Cropping disturbance</p> <p>0.00 – 0.10 m Light clay, 10YR3/2</p> <p>0.10 – 0.35 m Medium clay, 10YR3/2</p> <p>0.35 – 0.50+ m Medium clay, 10YR4/2</p>	 
				





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-43	644026 7507963	17	<p>Gently undulating plain, lower slope 2%, 2%</p> <p>Surface cracking 2-6 mm, no coarse fragments</p> <p>Cropping disturbance</p> <p>0.00 – 0.07 m Light clay, 10YR3/2 Weak, peds &lt;10 mm</p> <p>0.07 – 0.50 + m Medium clay, 10YR3/2 Moderate, subangular blocky, peds &lt;30 mm very firm</p>	 
				



NC-44	645697 7508528	17	Gently undulating plain, mid slope <2%, 1% Surface light clay 10YR3/2, cracking <2 mm, self mulching, <2% coarse fragments Cropping disturbance	 
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NC-45	644367 7509819	17	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking <2 mm, self mulching, <2% coarse fragments Cropping disturbance	 
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Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-46	644024 7510908	15	Gently undulating plain, lower slope 2%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, No coarse fragments	
NC-47	640942 7512659	8	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 55)	Map Unit	Comments	Pictures
NC-48	640883 7512861	8	Gently undulating plain, mid slope 1%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, no coarse fragments	
NC-49	642978 7511443	11	Wide depression, drainage line, lower slope 2%, 1% Surface sandy light clay,, No coarse fragments Sheet erosion	





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-50	643674 7513508	4	Wide depression, drainage line, lower slope 2% Surface sandy light clay,, No coarse fragments Sheet erosion	
NC-51	644005 7512609	9	Gently undulating plain, lower slope 2%, 2% Surface light clay,, self mulching, no coarse fragments Cropping disturbance	





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-52	643635 7512290	9	Gently undulating plain, lower slope 2%, 2% Surface light clay, self mulching, no coarse fragments Cropping disturbance	 

Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-53	644440 7510181	17	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 55)	Map Unit	Comments	Pictures
NC-54	645704 7510053	17	Gently undulating plain, upper slope 1%, 1% Surface light clay, self mulching, no coarse fragments Cropping disturbance	 





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-55	645506 7509704	17	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 55)	Map Unit	Comments	Pictures
NC-56	643093 7510114	14	<p>Gently undulating plain, mid slope 1%</p> <p>Surface - firm, sandy loam, 10YR3/3, no coarse fragments</p> <p>0.00 – 0.10 m Sandy loam 10YR3/3</p> <p>0.10 – 0.42 m Sandy clay loam 5YR4/3</p> <p>0.42 – 0.65 + m Sandy clay loam 7.5Y4/4 &lt;5% calcium carbonate</p>	 





NC-57	642985 7513858	4	<p>Gently undulating plain, lower slope 1%, 2%</p> <p>Wide depression, inactive drainage line</p> <p>Brigalow, Belah</p> <p>Surface – firm, cracking 2 mm, sandy clay loam</p> <p>&lt;2% coarse fragments &lt;2 mm</p>	 
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Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-58	644239 7511127	15	Gently undulating plain, mid slope 2%, 1% Surface light clay 10YR3/2, cracking 2-6 mm, No coarse fragments	
NC-59	644073 7514265	3	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 55)	Map Unit	Comments	Pictures
NC-60	641787 7514024	5	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.	
NC-61	641691 7514197	5	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 55)	Map Unit	Comments	Pictures
NC-62	641100 7512707	7	Wide depression, surface hard setting with cracking 2-6mm. Surface texture light clay.	
NC-63	641030 7513411	7	Wide depression, surface firm with cracking 2-6mm. Surface texture light clay.	






Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-64	641815 7512824	20	Nil microrelief, extensive clearing Surface light clay with cracking, 10YR3/2 very dark greyish brown	 



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-65	642145 7512424	20	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	20	Grazing, level plain, flat Nil microrelief Complete clearing Surface self-mulching with nil coarse fragments	

Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-67	642071 7512485	20	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	18	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 55)	Map Unit	Comments	Pictures
NC-69	641577 7513080	18	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 55)	Map Unit	Comments	Pictures
NC-70	641635 7513191	18	Grazing, gently undulating plain Surface firm, clay loam sandy	
NC-71	641749 7512962	18	Grazing, gently undulating plain, upper slope <2% Surface firm, clay loam sandy	

Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-72	641914 7513441	19	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 55)	Map Unit	Comments	Pictures
NC-73	641851 7513420	19	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 55)	Map Unit	Comments	Pictures
NC-74	641503 7513177	18	Grazing, gently undulating plain, mid slope Various regrowth, nil microrelief Surface firm, no cracking, clay loam sandy, 10YR3/2 very dark greyish brown	
NC-75	641318 7513030	18	Grazing, gently undulating plain, simple slope 3% / 3% Nil microrelief, complete clearing, cultivated Surface firm, clay loam sandy	



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-76	641267 7512983	6	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 55)	Map Unit	Comments	Pictures
NC-77	641559 7513265	18	<p>Grazing, gently undulating plain, simple slope 3%/3%</p> <p>Nil microrelief, complete clearing</p> <p>Surface firm</p> <ul style="list-style-type: none"> <li>0.00-0.10m, Clay loam, sandy, 10YR3/1 very dark grey</li> <li>0.10-0.30m+, Light clay, sandy, 10YR3/2 very dark greyish brown</li> </ul>	  





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-78	641444 7513398	6	<p>Grazing, gently undulating plain, mid slope 2%</p> <p>Grasses</p> <p>Nil microrelief</p> <p>Complete clearing, not cultivated</p> <ul style="list-style-type: none"> <li>A1, 0.00-0.12m, Sandy clay loam, 7.5YR3/3 dark brown</li> <li>B21, 0.12-0.34+, medium clay, 10YR3/2 very dark greyish brown</li> </ul>	  


Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-79	641336 7513255	6	<p>Grazing, gently undulating plain, mid slope</p> <p>Grasses, nil microrelief, complete clearing, not cultivated</p> <p>Surface firm,</p> <ul style="list-style-type: none"> <li>• A1, 0.00-0.12m, sandy clay loam 7.5YR3/3 dark brown</li> <li>• B21, 0.12-0.34m+, medium clay, 10YR3/2 very dark greyish brown</li> </ul>	 





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-80	641391 7512856	6	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 55)	Map Unit	Comments	Pictures
NC-81	641512 7512735	6	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 55)	Map Unit	Comments	Pictures
NC-82	641616 7512602	6	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 55)	Map Unit	Comments	Pictures
NC-83	641670 7512506	20	Nil microrelief, extensive clearing Surface light clay with cracking and self mulching, 10YR3/2 very dark greyish brown	 
NC-84	641652 7512295	6	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	6	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 55)	Map Unit	Comments	Pictures
NC-86	642366 7510364	14	South of boundary, reddish brown surface colour begins towards to the south	





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-87	642365 7510309	14	<p>Grazing, gently undulating plain, lower slope &lt;2%</p> <p>Extensive disturbance, within existing power line easement</p> <p>Surface firm</p> <ul style="list-style-type: none"> <li>• 0.00-0.12m, sandy loam, weak, 10YR3/2 greyish brown</li> <li>• 0.12-0.40+m, Light clay, moderate 5YR4/3 reddish brown</li> </ul>	  





Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-88	641880 7510244	13	<p>Forage cropping, surface firm, mid slope &lt;2%</p> <ul style="list-style-type: none"> <li>0.00-0.10m, sandy clay loam, weak, 10YR3/2 greyish brown</li> <li>0.10-0.14m, light clay, weak, 10YR4/3 brown</li> <li>0.14-0.40+m, light clay, strong, 10YR4/3 brown, with 5% mottle 10YR4/4 dark yellowish brown</li> </ul> <p>As per site 9-SCL</p> <p>Aggregated with Map Unit 13 due to polygon size being less than 10 ha</p>	 




Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-89	642019 7510231	13	<p>Forage cropping, surface firm, flat</p> <p>Nil microrelief</p> <ul style="list-style-type: none"> <li>0.00-0.12m, sandy clay loam, weak, very firm 10YR3/2 greyish brown</li> <li>0.10-0.45m, light clay, moderate, firm, 10YR4/3 brown, nil mottles</li> </ul> <p>As per site 9-SCL</p> <p>Aggregated with Map Unit 13 due to polygon size being less than 10 ha</p>	  






Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-90	642122 7510236	14	<p>Grazing, gently undulating plain, flat</p> <p>Extensive disturbance, forage cropping</p> <p>Surface firm</p> <ul style="list-style-type: none"> <li>• 0.00-0.12m, sandy loam, weak, 10YR3/2 greyish brown</li> <li>• 0.12-0.40+m, Light clay, moderate 5YR4/3 reddish brown</li> </ul>	 



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-91	642063 7510332	14	<p>Grazing, gently undulating plain, mid slope &lt;1%</p> <p>Extensive disturbance, forage cropping</p> <p>Surface firm</p> <ul style="list-style-type: none"> <li>• 0.00-0.14m, sandy loam, weak, 10YR3/2 greyish brown</li> <li>• 0.14-0.40+m, Light clay, moderate 5YR4/3 reddish brown</li> </ul>	 

Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-92	641808 7510250	13	<p>Gently undulating plain, flat 1%/1%</p> <p>Nil microrelief, complete clearing, forage cropping</p> <p>Surface firm, nil coarse fragments</p> <ul style="list-style-type: none"> <li>A1, 0.00-0.11m, Light clay, moderate, firm, 10YR2/1 Black, nil mottles, nil inclusions, moderately moist, moderately well drained, roots fine/few</li> <li>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</li> </ul>	  



Site No.	Location - mE, mN (GDA94 Zone 55)	Map Unit	Comments	Pictures
NC-93	641880 7510362	13	<p>Gently undulating plain, mid slope 1%</p> <p>Nil microrelief, complete clearing, forage cropping</p> <p>Surface firm, nil coarse fragments</p> <ul style="list-style-type: none"> <li>• A1, 0.00-0.11m, Light clay, moderate, 10YR2/1 Black</li> <li>• B21, 0.11-0.40+m, Medium clay, moderate, 10YR2/1 Black</li> </ul>	  



Key	Acceptable SWS Result	
	Marginal SWS Result. PAWCER Required	
	Failed SWS Result	
	Physical / Chemical Barrier	

1	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N6-SCL-0.0-0.1	CL				N7-SCL-0.0-0.1	CL				N8-SCL-0.0-0.1	SL			
		N6-SCL-0.2-0.3	CL				N7-SCL-0.2-0.3	CL				N8-SCL-0.2-0.3	L			
		N6-SCL-0.5-0.6	MC			No assessment due to pH > 8.9	N7-SCL-0.5-0.6	LC			No assessment due to pH > 8.9	N8-SCL-0.5-0.6	LC			No assessment due to pH > 8.9
		N6-SCL-0.77-0.87	ZCL				N7-SCL-0.8-0.9	LC				N8-SCL-0.8-0.9	LC			
		N6-SCL-0.9-1.0	CL			N7-SCL-0.9-1.0	LC				N8-SCL-0.9-1.0	LMC				
					0	0				0	0				0	0
2	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N17-0.0-0.1	SL				N18-0.0-0.1	SL				N19-0.0-0.1	LS			
		N17-0.1-0.2	SCL			No assessment due to pH > 8.9	N18-0.2-0.3	SC			No assessment due to pH > 8.9	N19-0.2-0.3	CL			
		N17-0.2-0.3	SCL				N18-0.5-0.6	LC				N19-0.5-0.6	SCL			No assessment due to pH > 8.9
		N12-0.5-0.6	CL				N18-0.8-0.9	LC				N19-0.8-0.9	SCL			
		N12-0.8-0.88	CL			N18-0.9-1.0	LC				N19-0.9-0.95	CL				
					0	0				0	0				0	0
3	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N15-0.0-0.1	LC	10	10	10	N16-0.0-0.1	LC				60-SCL-0.0-0.1	LC			0
		N15-0.2-0.3	MC				N16-0.2-0.3	LC				60-SCL-0.2-0.3	LMC	10	30	30
		N15-0.55-0.6	MC	12	50	60	N16-0.5-0.6	LC				60-SCL-0.5-0.6	MC			0
		N15-0.8-0.9	LMC	10	30	30	N16-0.8-0.9	LMC	10	90	90	60-SCL-0.8-0.9	MC			0
		N15-0.9-1.0	MC	12	10	12	N16-0.9-1.0	MC	12	10	12	60-SCL-0.9-1.0	MC	12	70	84
					100	112				100	102				100	114
4	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N20-0.0-0.1	CL	8	10	8	N21-0.0-0.1	SCL				N22-0.0-0.1	SCL			
		N20-0.2-0.3	CL				N21-0.2-0.3	SC				N22-0.2-0.3	SC			
		N20-0.5-0.6	SCL	6	50	30	N21-0.5-0.58	LC			No assessment due to pH > 8.9	N22-0.5-0.6	SC			No assessment due to pH > 8.9
		N20-0.75-0.85	LC			No assessment due to pH > 8.9	N21-0.8-0.9	LMC				N22-0.8-0.9	LC			
		N20-0.9-1.0	MC			N21-0.9-1.0	MC				N22-0.9-1.0	LMC				
					60	38				0	0				0	0
5	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N4-SCL-0.0-0.1	S				N5-SCL-0.0-0.1	SL				N9-SCL-0.0-0.1	SL			
		N4-SCL-0.2-0.3	CL				N5-SCL-0.2-0.3	CL			No assessment due to pH > 8.9	N9-SCL-0.2-0.3	CL			No assessment due to pH > 8.9
		N4-SCL-0.5-0.6	CL			No assessment due to pH > 8.9	N5-SCL-0.5-0.6	CL			No assessment due to pH > 8.9	N9-SCL-0.55-0.65	CL			No assessment due to pH > 8.9
		N4-SCL-0.8-0.9	CL				N5-SCL-0.8-0.9	CL				N9-SCL-0.75-0.85	CL			
		N4-SCL-0.9-1.0	CL			N5-SCL-0.9-1.0	CL				N9-SCL-0.9-1.0	CL				
					0	0				0	0				0	0
6	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N27-0.0-0.1	SCL				91-0.0-0.1	SL	5	10	5	32-SCL-0.0-0.1	SCL			
		N27-0.2-0.3	SCL				91-0.2-0.3	L	6	20	12	32-SCL-0.2-0.3	LC			
		N27-0.5-0.6	LMC			No assessment due to pH > 8.9	91-0.5-0.6	LC				32-SCL-0.5-0.6	CL			No assessment due to pH > 8.9
		N27-0.8-0.9	LMC				91-0.8-0.9	LC	10	60	60	32-SCL-0.8-0.9	CL			
		N27-0.9-1.0	LMC			91-0.9-1.0	LC			Chloride Exceedance of 1026 mg/kg	32-SCL-0.9-1.0	CL				
					0	0				90	77				0	0
	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	
	80-SCL-0.0-0.1	SCL														
	80-SCL-0.22-0.3	CL														
	80-SCL-0.5-0.6	CL			No assessment due to pH > 8.9											
	80-SCL-0.8-0.9	CL														
		80-SCL-0.9-1.0	CL													
					0	0										
7	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N1-0.0-0.1	Heavy Clay	12	0	0	N2-0.0-0.1	Medium Clay		0	0	N3-0.0-0.1	Medium Clay		0	0
		N1-0.2-0.3	Heavy Clay	12	0	0	N2-0.2-0.3	Medium Clay		0	0	N3-0.2-0.3	Medium Clay		0	0
		N1-0.5-0.6	Heavy Clay	12	0	0	N2-0.5-0.6	Medium Clay		0	0	N3-0.5-0.6	Medium Clay		0	0
		N1-0.8-0.9	Heavy Clay	12	0	0	N2-0.8-0.9	Medium Clay		0	0	N3-0.8-0.9	Medium Clay		0	0
		N1-0.9-1.0	Heavy Clay	12	100	120	N2-0.9-1.0	Medium Clay	12	100	120	N3-0.9-1.0	Medium Clay	12	100	120
					100	120				100	120				100	120
8	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N12-0.0-0.1	CL	8	10	8	N13-0.0-0.1	SCL	6	10	6	N14-0.0-0.1	SL	5	10	5
		N12-0.2-0.3	LC	10	20	20	N13-0.2-0.3	LMC	10	20	20	N14-0.2-0.3	MC	12	20	24
		N12-0.5-0.6	MC	12	30	36	N13-0.5-0.6	MC	12	30	36	N14-0.5-0.6	LMC			
		N12-0.8-0.9	LMC				N13-0.8-0.9	LMC	10	30	30	N14-0.8-0.9	LMC	10	60	60
		N12-0.9-1.0	LMC	10	40	40	N13-0.9-1.0	MC	12	10	12	N14-0.9-1.0	MC	12	10	12
					100	104				100	104				100	101
9	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		65-0.0-0.1	LMC	10	10	10	N29-SCL-0.0-0.10	LMC				N30-SCL-0.0-0.1	LMC			
		65-0.2-0.3	LMC	10	20	20	N29-SCL-0.2-0.3	LC				N30-SCL-0.2-0.3	LC			
		65-0.5-0.6	MC	10	30	30	N29-SCL-0.5-0.6	LC	10	60	60	N30-SCL-0.5-0.6	LC			
		65-0.8-0.9	MC				N29-SCL-0.8-0.9	MC	12	30	36	N30-SCL-0.8-0.9	LMC			
		65-0.9-1.0	MC	12	40	48	N29-SCL-0.9-1.0	LMC	10	10	10	N30-SCL-0.9-1.0	LC	10	100	100
					100	108				100	106				100	100
	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	
	N31-SCL-0.0-0.1	LMC				N32-SCL-0.0-0.1	LC				N33-SCL-0.0-0.1	LMC				
	N31-SCL-0.2-0.3	LMC	10	30	30	N32-SCL-0.2-0.3	LMC				N33-SCL-0.2-0.3	LC	10	30	30	
	N31-SCL-0.5-0.6	MC				N32-SCL-0.5-0.6	LMC	10	60	60	N33-SCL-0.5-0.6	MC				
	N31-SCL-0.8-0.9	MC				N32-SCL-0.8-0.9	MC				N33-SCL-0.8-0.9	MC				
		N31-SCL-0.9-1.0	MC	12	70	84	N32-SCL-0.9-1.0	MC	12	40	48	N33-SCL-0.9-1.0	MC	12	70	84
					100	114				100	108				100	114
10	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N45-SCL-0.0-0.05	CI	8	5	4	N28-SCL-0.0-0.05	CL				N43-SCL-0.0-0.1	CL			
		N45-SCL-0.25-0.3	LC	10	25	25	N28-SCL-0.2-0.3	CL				N43-SCL-0.2-0.3	CL			
		N45-SCL-0.5-0.6	MC	12	30	36	N28-SCL-0.5-0.6	LC			No assessment due to pH > 8.9	N43-SCL-0.5-0.6	LC			No assessment due to pH > 8.9
		N45-SCL-0.8-0.9	LMC	10	30	30	N28-SCL-0.8-0.9	LC				N43-SCL-0.8-0.9	LC			
		N45-SCL-0.9-1.0	MC	12	10	12	N28-SCL-0.9-1.0	LC				N43-SCL-0.9-1.0	LC			
					100	107				0	0				0	0
11	Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
		N23-0.0-0.1	CL				N24-0.0-0.1	SC				N25-0.0-0.1	MC			
		N23-0.2-0.3	LMC				N24-0.2-0.3	LC			No assessment due to pH > 8.9	N25-0.22-0.3	MC			No assessment due to pH > 8.9
		N23-0.5-0.6	LMC			No assessment due to pH > 8.9	N24-0.5-0.6	LC				N25-0.5-0.6	LMC			
		N23-0.8-0.9	MC				N24-0.8-0.9	LC				N25-0.8-0.9	MC			

Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
15	N38-SCL-0.0-0.1	LMC				N39-SCL-0.0-0.1	LMC	10	10	10	N40-SCL-0.0-0.1	LMC			
	N38-SCL-0.2-0.3	LMC				N39-SCL-0.2-0.3	MC	12	20	24	N40-SCL-0.2-0.3	LC			
	N39-SCL-0.5-0.6	LC				N39-SCL-0.5-0.6	SC	10	30	30	N40-SCL-0.5-0.6	LMC	10	60	60
	N38-SCL-0.8-0.9	LC				N39-SCL-0.8-0.9	MC	12	30	36	N40-SCL-0.8-0.9	MC			
	N38-SCL-0.9-1.0	LMC	10	100	100	N39-SCL-0.9-1.0	LC	10	10	48	N40-SCL-0.9-1.0	MC	12	40	48
				100	100				100	110				100	108
Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
16	102-SCL-D-0.0-0.1	MC				102-SCL-M-0.0-0.1	SC	8	10	8	103-SCL-D-0.0-0.1	MC			
	102-SCL-D-0.2-0.3	MHC				102-SCL-M-0.2-0.3	LC			0	103-SCL-D-0.2-0.3	MC			
	102-SCL-D-0.5-0.6	MHC				102-SCL-M-0.5-0.6	LMC	10	50	50	103-SCL-D-0.5-0.6	MC			
	102-SCL-D-0.8-0.9	MHC				102-SCL-M-0.83-0.9	MC			0	103-SCL-D-0.8-0.9	MC			
	102-SCL-D-0.9-1.0	MHC	12	100	120	102-SCL-M-0.9-1.0	MC	12	40	48	103-SCL-D-0.9-1.0	MC	12	100	120
				100	120				100	106				100	120
	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
	103-SCL-M-0.0-0.1	LC				5-SCL-M-0.0-0.1	MC				5-SCL-D-0.0-0.1	MC			
	103-SCL-M-0.2-0.3	LC				5-SCL-M-0.2-0.3	MC				5-SCL-D-0.2-0.3	MHC			
	103-SCL-M-0.5-0.6	LC				5-SCL-M-0.5-0.6	MC				5-SCL-D-0.5-0.6	MHC			
	103-SCL-M-0.8-0.9	LC				5-SCL-M-0.8-0.9	MHC				5-SCL-D-0.8-0.9	HC			
	103-SCL-M-0.9-1.0	LC	10	100	100	5-SCL-M-0.9-1.0	MHC	12	100	120	5-SCL-D-0.9-1.0	HC	12	100	120
				100	100				100	120				100	120
Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
17	4-SCL-0.0-0.1	Medium Clay		0		110-SCL-0.0-0.1	Light Clay	10	10	10	115-SCL-0.0-0.1	Clay loam	8	10	8
	4-SCL-0.2-0.3	Medium Clay		0		110-SCL-0.2-0.3	Medium Clay				115-SCL-0.2-0.3	Light Clay	10	20	20
	4-SCL-0.5-0.6	Medium Clay		0		110-SCL-0.5-0.6	Medium Clay				115-SCL-0.5-0.6	Medium Clay	12	30	36
	4-SCL-0.7-0.8	Medium Clay	12	80	96	110-SCL-0.7-0.8	Medium Clay	12	70	84	115-SCL-0.8-0.9	Light Clay	10	30	30
	4-SCL-0.9-1.0	Silty clay loam	8	20	16	110-SCL-0.9-1.0	Loam	6	20	12	115-SCL-0.9-1.0	Medium Clay	12	10	12
				100	112				100	106				100	106
Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
18	N46-0.00-0.10	Sandy Clay Loam	6	12	7.2	N52-0.00-0.10	Sandy Clay Loam	8	12	9.6	N26-0.0-0.1	SCL			
	N46-0.20-030	Light clay	10	8	8	N52-0.20-030	Light clay	10	8	8	N26-0.2-0.3	SC			
	N46-0.50-0.60	Medium Clay	12	0		N52-0.50-0.60	Medium Clay	12	0		N26-0.5-0.6	LMC	No assessment due to pH >8.9		
	N46-0.70-0.80	Medium Clay	12	0		N52-0.70-0.80	Light medium clay	12	0		N26-0.83-0.9	LMC			
	N46-0.90-1.00	Medium Clay	12	0		N52-0.90-1.00	Medium Clay	12	0		N26-0.9-1.0	LC			
				20	15.2				20	17.6				0	0
	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
	77-SCL-0.0-0.1	CL	8	10	8										
	77-SCL-0.2-0.3	LMC													
	77-SCL-0.5-0.6	LC													
	77-SCL-0.8-0.9	LMC	10	80	80										
	77-SCL-0.9-1.0	MC	12	10	12										
				100	100				0	0				0	0
Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
19	N47-0.0-0.08	Medium Clay	12	8	9.6	N49-0.0-0.1	Medium Clay	12	13	15.6	N57-0.0-0.1	ght medium Cl	12	8	9.6
	N47-0.2-0.3	Medium Clay	12	32	38.4	N49-0.2-0.3	Medium Clay	12	0	0	N57-0.2-0.3	Medium Clay	12	42	50.4
	N47-0.5-0.6	Medium Clay	12	0	0	N49-0.5-0.6	Medium Clay	12	48	57.6	N57-0.5-0.6	Medium Clay	12	0	0
	N47-0.7-0.8	Medium Clay	12	40	48	N49-0.7-0.8	Medium Clay	12	0	0	N57-0.7-0.8	Medium Clay	12	40	48
	N47-0.9-1.0	Medium Clay	12	20	24	N49-0.9-1.0	Medium Heavy Cla	12	39	46.8	N57-0.9-1.0	Medium Clay		0	0
				100	120				100	120				90	108
Map Unit	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)	Sample	PSA Texture	Texture (mm)	Horizon depth (mm)	Total SWS (mm)
20	N54-0.0-0.1	Medium Clay	12	12	14.4	N56-0.0-0.1	Medium Clay	12	10	12	N58-0.00-0.10	Medium Clay	12	11	13.2
	N54-0.2-0.3	Medium Clay	12	22	26.4	N56-0.2-0.3	Medium Clay	12	0	0	N58-0.20-0.30	ght medium Cl	12	34	40.8
	N54-0.5-0.6	Medium Clay	12	36	43.2	N56-0.5-0.6	Medium Clay	12	55	66	N58-0.50-0.60	Medium Clay	12	0	0
	N54-0.7-0.8	Medium Clay	12		0	N56-0.7-0.8	Medium Clay	12	25	30	N58-0.66-0.76	Medium Clay	12	31	37.2
	N54-0.9-1.0	Medium Clay	12		0	N56-0.9-1.0	Medium Clay	12		0	N58-0.90-1.00	Medium Clay	12	24	28.8
				70	84				90	108				100	120

Acceptable SWS Result	
Marginal SWS Result	
Failed SWS Result	

Sample No.	Upper Depth (m)	Lower Depth (m)	Depth Factor	FS	CS	Cl	15 Bar	Field Capacity	Bulk Density	Wilting Point	delta AWC	PAWC
10-SCL	0	0.1	1.3	0	75.1	16.8	16	31.41	1.27	18.65	16.21	
	0.2	0.3	2.6	0	67.5	20.5	13	22.15	1.47	14.72	10.96	
	0.5	0.6	2.1	0	67.3	22.9	14	18.79	1.57	14.81	6.24	
	0.7	0.8	2.4	0	59.0	24.4	15	18.49	1.58	15.31	5.02	
	0.9	1	1.6	0	49.3	29.5	17	20.22	1.54	16.93	5.07	82.83

Sample No.	Upper Depth (m)	Lower Depth (m)	Depth Factor	FS	CS	Cl	15 Bar	Field Capacity	Bulk Density	Wilting Point	delta AWC	PAWC
91-SCL	0	0.1	1.2	0	82.0	13.9	12	27.07	1.35	14.92	16.40	
	0.2	0.3	3.8	0	74.5	17.4	14	23.12	1.44	15.96	10.35	
	0.5	0.6	1	0	59.6	34.0	19	25.13	1.43	19.42	8.16	
	0.8	0.9	3	0	58.7	36.9	21	25.73	1.42	21.11	6.56	
	0.9	1	1	0	47.3	37.5	22	26.57	1.40	22.06	6.34	93.19

Sample No.	Upper Depth (m)	Lower Depth (m)	Depth Factor	FS	CS	Cl	15 Bar	Field Capacity	Bulk Density	Wilting Point	delta AWC	PAWC
N42	0	0.1	1.4	0	77.0	19.0	12	27.25	1.36	14.41	17.40	
	0.2	0.3	1.6	0	59.0	35.0	15	25.15	1.43	15.65	13.61	
	0.5	0.6	4	0	61.0	37.0	16	21.89	1.51	16.29	8.47	
	0.8	0.9	2	0	57.0	37.0	18	22.26	1.50	18.10	6.26	
	0.9	1	1	0	56.0	38.0	19	23.14	1.48	19.05	6.08	98.64

Sample No.	Upper Depth (m)	Lower Depth (m)	Depth Factor	FS	CS	Cl	15 Bar	Field Capacity	Bulk Density	Wilting Point	delta AWC	PAWC
N54	0	0.1	1.2	0	41.5	47.0	13	29.31	1.36	12.63	22.76	
	0.2	0.3	2.2	0	40.8	52.7	17	28.54	1.39	16.34	16.96	
	0.5	0.6	2.6	0	17.1	71.1	21	30.46	1.38	20.05	14.41	
	Chemical Barrier											
												102.09

PAWC is determined using the above PAWCER Pedo-transfer Function (supplied by Ian Grant, Agricultural Chemistry Pty Ltd). Ian Grant was suggested by Dennis Baker (E.S.S.A / Nominated Laboratory Representative) and has worked previously in PAWCER development for soil science applications.

A summary of the function is as follows:

Steps	Function
1	Upper and lower depths relate to the soil samples collected
2	Depth factor is the height of the soil column based on the texture observed, within the upper and lower depths. These values may extend beyond the upper/lower depth, however this is to ensure accuracy of the texture and depth of texture observed. The depth factor must equal 10 for 1.0m
3	CS (Coarse Sand/Sand) and Cl (Clay) laboratory result percentages are inserted. FS (Silt) is not included, as per RPI 08/14 example calculation.
4	15 Bar laboratory result is inserted.
5	Field Capacity is determined by assessing upper depth, FS, CS, CL and 15 Bar. Example calculation below; $(0.995+0.0011*(FS+CS))*13.2*EXP(-2.845*Upper\ depth)+(1.0054+0.0041*Cl)*15\ Bar$
6	Bulk density is determined by the calculation using the field capacity and CL percentage. Example calculation below; $(85.82+0.12*Cl)/(37.74+Field\ Capacity)$
7	Wilting point is determined by the calculation using the upper depth, Cl and 15 Bar. Example calculation below; $100*(-2.41+0.0566*Cl)*(-0.0176+0.022*Upper\ Depth)+1.0054*15\ Bar$
8	delta AWC is calculated for the individual depth using the field capacity, bulk density and wilting point. Example calculation below; $(Bulk\ Density*Field\ Capacity)-(Bulk\ Density*Wilting\ point)$
9	PAWC is then calculated by the delta AWC multiplied against the depth factor, with all results added. Example calculation below; $delta\ AWC*Depth\ Factor+ delta\ AWC*Depth\ Factor + delta\ AWC*Depth\ Factor + delta\ AWC*Depth\ Factor + delta\ AWC*Depth\ Factor\ (Five\ Depths)$



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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

Soil Analysis Report  
Batch Numbers: H2096Date 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 of 2**

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

Referenc H2096

Page 3 of 4

## 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 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

Reference: H2096

Page: 4 of 4

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia*. CSIRO Publishing: Collingwood.

Test Method	Units		Acceptance Criteria	
			Actual Value	[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	Acceptance Criteria	
			Actual Value	[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](mailto:e.s.s.a@bigpond.net.au)**

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References: I2733

Sheet 1 of 4

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



Soil Analysis Report  
Batch Numbers: I2733Date Received: 13/06/2019  
Date Completed:14/07/2019

Client: GTE SARAJI- Results Page 1 of 2

ESSA Ref	field ref depth (m)	Soil pH	Soil EC dS/m	Soil Cl mg/kg	Exch.Ca meq/100g	Exch. Mg meq/100g	Exch.K meq/100g	Exch. Na meq/100g	CEC meq/100g	ESP %Na/CEC	Ca/Mg 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%	

## METHOD DESCRIPTIONS

## Soil

Reference: I2733

Page 3 of 4

## 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 NaHCO <sub>3</sub> @ pH 8.5, (AA) colorimetric
Exch.Ca	15B/C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.Mg	15B/C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.Na	15B/C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.K	15B/C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO <sub>3</sub> + Ca(NO <sub>3</sub> ) <sub>2</sub> 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(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub> @ 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&gt;0.3dS/m).

## QUALITY CONTROL DATA

Soil

Reference: I2733

Page: 4 of 4

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia*. CSIRO Publishing: Collingwood.

Test Method	Units		Acceptance Criteria	
			Actual Value	[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	Acceptance Criteria	
			Actual Value	[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**

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References: I3569

Sheet 1 of 4

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

Soil Analysis Report  
Batch Number: I3569Date 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)		dSm	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-0.0-0.1	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-0.0-0.1	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



## METHOD DESCRIPTIONS

## Soil

Reference: I3569

Page 3 of 4

## 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 NaHCO <sub>3</sub> @ pH 8.5, (AA) colorimetric
Exch.Ca	15B/C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.Mg	15B/C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.Na	15B/C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.K	15B/C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO <sub>3</sub> + Ca(NO <sub>3</sub> ) <sub>2</sub> 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(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub> @ 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&gt;0.3dS/m).

## QUALITY CONTROL DATA

Soil

Reference: I3569

Page: 4 of 4

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia*. CSIRO Publishing: Collingwood.

Test Method	Units		Acceptance Criteria	
			Actual Value	[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	Acceptance Criteria	
			Actual Value	[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](mailto:e.s.s.a@bigpond.net.au)**

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**References**K6315,6319,6329,6331 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 Ref	field ref	Soil pH	Soil EC	Soil Cl	Exch.Ca	Exch. Mg	Exch.K	CEC	ESP	Ca/Mg	
	depth (m)	H2O	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	N46-0.20-0.30	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	N46-0.20-0.30	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

## METHOD DESCRIPTIONS

## Soil

Reference:K7115

Page 3 of 4

## 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 /glycerol
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

\* Australian Laboratory Handbook of Soil and Water Chemical Methods (1992 /2011)

D E Baker BSc CPSS

Director and Principal Soil Scientist – ESSA Pty Ltd

Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia*.

Published : CSIRO Collingwood

Soluble Salts included in Exch. Cations - Except PRE-WASHED (if EC&gt;0.3dS/m).



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





## QUALITY CONTROL DATA

Soil

Reference: J7115

Page: 4 of 4

\* Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)

Test Method	Units		Acceptance Criteria	
			Actual Value	[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	Acceptance Criteria	
		Actual Value	[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**

**email: e.s.s.a@bigpond.net.au**

---

Reference: **21/21**

Page: 1 of 5

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	N46-0.20-0.30	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



## METHOD DESCRIPTIONS

## Soil

Reference: 21/21

Page 3 of 5

## 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, (H2SO4/K2Cr2O7), titr.
Ca (Neut)	15A1	10.3	0.10	meq/100g	Exchangeable calcium	1M NH4Cl @ pH 7.0 shake, AAS
Mg (Neut)	15A1	6.6	0.10	meq/100g	Exchangeable magnesium	1M NH4Cl @ pH 7.0 shake, AAS
Na (Neut)	15A1	7.3	0.03	meq/100g	Exchangeable sodium	1M NH4Cl @ pH 7.0 shake, AAS
K (Neut)	15A1	3.9	0.02	meq/100g	Exchangeable potassium	1M NH4Cl @ 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 &amp; Qld)

Trainer in Soil Science Soil Science Australia (National &amp; Qld)

Hon. Life Member Soil Science Australia (National &amp; Qld)

Certified Professional Practicing Soil Scientist CPSS



## METHOD DESCRIPTIONS

## Soil

Reference: 21/21

Page 4 of 5

## 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: \_\_\_\_\_

## QUALITY CONTROL DATA

Soil

Reference: 21/21

Page: 5 of 5

\* 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	
Sulfate-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*

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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

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M0403245560

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## **Appendix B**

### **GT Environmental (2020), Saraji East Coal Mine Project, Baseline Land Resources and Soil Suitability**



# Baseline Land Resources and Soil Suitability Assessment

Saraji East Project  
BHP Coal Pty Ltd

FINAL Rev4\_20200826  
26 August 2020



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---

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# TABLE OF CONTENTS

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<b>EXECUTIVE SUMMARY .....</b>	<b>I</b>
<b>1 INTRODUCTION .....</b>	<b>1</b>
<b>1.1 PROJECT DETAILS</b>	<b>1</b>
<b>1.2 PROJECT BACKGROUND</b>	<b>1</b>
<b>1.3 SCOPE OF ASSESSMENT</b>	<b>1</b>
<b>2 LEGISLATION AND POLICY.....</b>	<b>2</b>
<b>2.1 LEGISLATIVE AND STATUTORY REQUIREMENTS</b>	<b>2</b>
2.1.1 Commonwealth Legislation	2
2.1.2 State Legislation and Policies	2
2.1.3 Other Policies and Guidelines	3
<b>3 METHODOLOGY .....</b>	<b>4</b>
<b>3.1 DESKTOP REVIEW</b>	<b>4</b>
3.1.1 Regional Soils Reports and Available Documentation	4
3.1.2 Aerial Photography	6
3.1.3 Land Suitability Assessment	6
3.1.4 Areas of Regional Interest	6
3.1.5 Acid Sulfate Soils Assessment	6
3.1.6 Fieldwork	6
3.1.7 Nomenclature of Sites	7
<b>4 DESCRIPTION OF ENVIRONMENTAL VALUES.....</b>	<b>9</b>
<b>4.1 SOIL MAPPING UNITS</b>	<b>9</b>
4.1.1 SMU 2 / 20 (Variant)	11
4.1.2 SMU 3	15
4.1.3 SMU 4	18
4.1.4 SMU 5	21
4.1.5 SMU 8	24
4.1.6 SMU 12	27
4.1.7 SMU 13	30
4.1.8 SMU 16 / 23 (Overlain Variant)	35
4.1.9 SMU 17	39
4.1.10 SMU 18	42
4.1.11 SMU 19	45
4.1.12 SMU A1	48
4.1.13 SMU A2	51

4.1.14 SMU A2g	54
4.1.15 SMU A3	57
4.1.16 SMU A4	60
4.1.17 SMU A4c	63
4.1.18 SMU A5	66
4.1.19 SMU B1	69
4.1.20 SMU B2 & B2v	72
4.1.21 SMU B2g	75
4.1.22 SMU B2s	78
4.1.23 SMU B2bl	81
4.1.24 SMU B3	84
4.1.25 SMU B3bl	88
4.1.26 SMU B4	91
4.1.27 SMU B5	94
4.1.28 SMU E1	97
4.1.29 SMU E1r	100
4.1.30 SMU E2	103
4.1.31 SMU E3	106
4.1.32 SMU T1	109
4.1.33 SMU T2	112
<b>4.2 LAND SUITABILITY ASSESSMENT</b>	<b>115</b>
4.2.1 Soils and Land Suitability Survey	115
4.2.2 Land Suitability Summary	117
4.2.3 Soils and Land Suitability Survey Project Site Summary	121
<b>4.3 TOPSOIL AND SUBSOIL STRIPPING DEPTH ASSESSMENT</b>	<b>123</b>
4.3.1 Existing soil mapping unit stripping recommendations	123
4.3.2 Topsoil and Subsoil Stripping Methodology	128
4.3.3 New 2019 soil stripping assessment	128
4.3.4 Summary of Recommended Soil Stripping Depths and Volumes Available	130
<b>4.4 REGIONAL PLANNING INTERESTS ASSESSMENT</b>	<b>132</b>
4.4.1 Assessment of Strategic Cropping Areas	132
4.4.2 Assessment of Priority Agricultural Areas	132
4.4.3 Assessment of Strategic Environmental Areas	132
4.4.4 Assessment of Priority Living Areas	133
<b>4.5 ACID SULFATE SOILS ASSESSMENT</b>	<b>133</b>
4.5.1 Assessment of Actual and Potential Acid Sulfate Soils	133
<b>5 IMPACTS, MITIGATION AND RESIDUAL OUTCOMES.....</b>	<b>136</b>
<b>5.1 POTENTIAL IMPACTS</b>	<b>136</b>



5.1.1	Disturbance Types Requiring Rehabilitation	136
5.1.2	Topsoil and Subsoil Stripping Impacts	136
5.1.3	Strategic Cropping Area Impacts	136
5.1.4	Acid Sulfate Soils Impacts	137
<b>5.2</b>	<b>MITIGATION MEASURES AND RECOMMENDATIONS</b>	<b>137</b>
5.2.1	Land Use Recommendations	137
5.2.2	Mismanagement of Topsoil Stripping	138
5.2.3	Strategic Cropping Land Mitigation Measures	138
5.2.4	Acid Sulfate Soils Mitigation Measures	138
<b>5.3</b>	<b>RESIDUAL IMPACTS</b>	<b>139</b>
<b>6</b>	<b>CONCLUSION.....</b>	<b>140</b>
<b>7</b>	<b>GLOSSARY.....</b>	<b>141</b>
<b>8</b>	<b>REFERENCES.....</b>	<b>144</b>
<b>9</b>	<b>FIGURES.....</b>	<b>146</b>
	<b>FIGURE 1 SOIL MAPPING UNITS</b>	
	<b>FIGURE 2 PRE-MINE CROPPING (RAINFED &amp; REGIONAL FRAMEWORKS) SUITABILITY</b>	
	<b>FIGURE 3 PRE-MINE BEEF CATTLE GRAZING SUITABILITY</b>	
	<b>FIGURE 4 AGRICULTURAL LAND CLASSES</b>	
	<b>FIGURE 5 TOPSOIL STRIPPING DEPTH</b>	
	<b>FIGURE 6 STRATEGIC CROPPING LAND</b>	
<b>10</b>	<b>APPENDICES .....</b>	<b>147</b>
	<b>APPENDIX A EMMERTON, 2005 OBSERVATION SITE DESCRIPTIONS</b>	
	<b>APPENDIX B GTES, 2012 OBSERVATION SITE DESCRIPTIONS</b>	
	<b>APPENDIX C GTES, 2018 OBSERVATION SITE DESCRIPTIONS</b>	
	<b>APPENDIX D GTES, 2019 OBSERVATION SITE DESCRIPTIONS</b>	
	<b>APPENDIX E LABORATORY DATA SUMMARY</b>	
	<b>APPENDIX F LABORATORY CERTIFICATES</b>	
	<b>APPENDIX G REGIONAL FRAMEWORKS LAND SUITABILITY LIMITATIONS REVIEW</b>	

## EXECUTIVE SUMMARY

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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 twenty-six SMUs and eleven variants reported two SMUs and two variants suitable for cropping: B1, E2, B2s and B2g as Class A1. The remaining SMUs were assessed as suitable for grazing either as simple or complex units (consisting of two classes). In general, the topsoils for most SMUs were assessed as suitable for rehabilitation activities, including as a growth medium for natural vegetation on flat to gently undulating plains.

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 SCA. An assessment was undertaken to identify SCL in the Project Site. The Project Site does not encroach on any PLAs, SEAs or PAAs.

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 and Science (DES). 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, 2020), 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 DES.

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 compiled 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 strategic cropping land 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 (2020), 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.

### **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 (2020). 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 1 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 1: 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
E3	Poplar box on shallower loams	169
T1	Sandy hard duplex poplar box	51
T2	Deep sandy duplex plains with poplar box and ironbark	21

The SMUs 1 and 14 identified in Table 1 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.

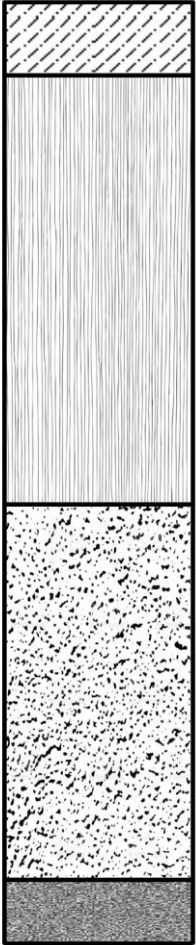
A land summary is presented in Table 2 and soil profile description summaries are presented in Tables 3 and 4. The soil chemistry results for the sites are presented in Appendix E.

**Table 2: Land Summary**

Item	Description
<b>SMU</b>	2 / 20 (Variant)
<b>Representative Site Number</b>	Site J4, S40 and 104 (Variant)
<b>Representative Site photograph</b>	No photo available.
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Dawson gum and Brigalow, with minor poplar box, wilga, yellowwood and belah, some sandalwood and currant bush with low relatively sparse grassland below
<b>Location</b>	n/a
<b>Disturbance</b>	The area has been cleared
<b>Landform element /pattern</b>	Very to gently undulating Plain
<b>Micro relief</b>	Minor gilgai
<b>Permeability</b>	Assessment unavailable <i>GTE Assessment – Slowly permeable</i>
<b>Slope (%)</b>	<1.5
<b>Drainage</b>	Assessment unavailable <i>GTE Assessment – Moderately well-drained</i>
<b>Surface coarse fragments</b>	No coarse fragments reported
<b>Surface condition</b>	Crust with slight cracking Variant has a softer (firm) cracking surface
<b>Substrate</b>	Unconsolidated Cainozoic sediments
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE Assessment – brown sodosol</i>
<b>Land suitability summary</b>	<b>Estimated effective rooting depth:</b> Site S40: 120cm. Site J4: 90cm. Site 104: 90cm <b>Estimated soil water storage:</b> Site S40: 96mm. Site J4: 84mm. Site 104: 86mm <b>Cropping suitability class:</b> 4 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> <i>GTE Assessment C1</i>
<b>Erosion potential</b>	This SMU is located on undulating sloping areas with a medium clay surface. Laboratory results indicated; <ul style="list-style-type: none"> <li>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;</li> <li>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.</li> </ul>

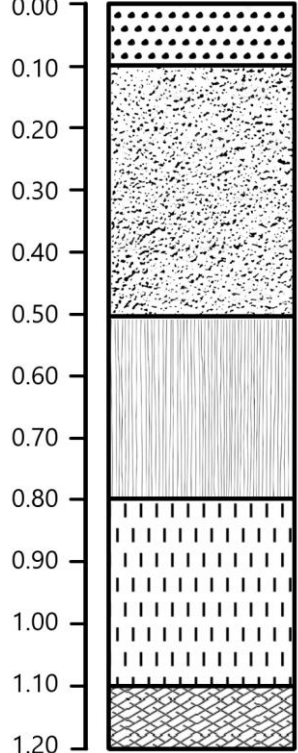
Item	Description
	<ul style="list-style-type: none"> <li>Calcium to magnesium ratios are at good levels in the surface layers and decline with depth.</li> </ul> <p><i>GTE Assessment - Erosion potential through dispersion is considered low however slightly increasing with subsoils, appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.</i></p>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.30 metres below ground level (mbgl)</p> <p><u>Recommended topsoil use:</u> 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</p> <p><u>Recommended subsoil strip depth:</u> 0.00 mbgl</p> <p><u>Recommended subsoil use:</u> Nil, do not strip the lighter coloured B horizon clays in duplex areas.</p> <p><i>GTE Recommendation – Reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS, Nil field indicators of AASS</i>
<b>Total area (ha)</b>	221

**Table 3 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 4: 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.	9.3	1090
		End of Borehole		

### 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.

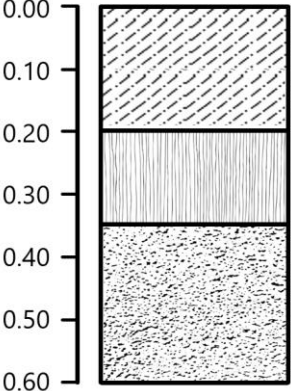
A land summary is presented in Table 5 and soil profile description summaries are presented in Tables 6 and 7. The soil chemistry results for the sites are presented in Appendix E.

**Table 5: Land Summary**

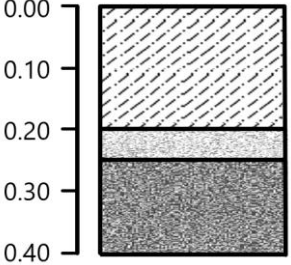
Item	Description
<b>SMU</b>	3
<b>Representative Site Number</b>	S12, J31, 33 and 96
<b>Representative Site photograph</b>	No photo available.
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Poplar box open woodland, with lesser ghost gum ironwood, bloodwood and bullock
<b>Location</b>	Site 33 0637674E / 7515738N, Site 96 0633481E / 7523458N
<b>Disturbance</b>	Much of the area is relatively natural (some area towards the south has been cleared) and the appearance of an area of natural vegetation
<b>Landform element /pattern</b>	Very gently to gently (eroded variant) undulating plain
<b>Micro relief</b>	No microrelief
<b>Permeability</b>	Assessment unavailable <i>GTE Assessment – Moderate to slowly permeable</i>
<b>Slope (%)</b>	<2.0. ≥4.0 Eroded variant
<b>Drainage</b>	Assessment unavailable <i>GTE Assessment – Imperfectly drained</i>
<b>Surface coarse fragments</b>	No coarse fragments reported
<b>Surface condition</b>	Firm to hard set and massive
<b>Substrate</b>	Unconsolidated Cainozoic sediments
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE Assessment – brown sodosol</i>
<b>Land suitability summary</b>	<b>Estimated effective rooting depth:</b> Site S12: 90cm. Site J31: 60cm. <b>Estimated soil water storage:</b> Site S40: 90mm. Site J4: 58mm <b>Cropping suitability class:</b> 5 <b>Grazing suitability class:</b> 4, minor Class 5 in eroded or drainage areas <b>Agricultural Land Class:</b> <i>GTE Assessment -C2/C3</i>
<b>Erosion potential</b>	This SMU is located on undulating sloping areas with a medium clay surface. Laboratory results indicated; <ul style="list-style-type: none"> <li>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;</li> <li>ESP may be non-sodic in the surface and A2 horizons and becomes highly sodic in the B horizon (extreme at depth);</li> <li>Calcium to magnesium ratios are at reasonable levels for the maintenance of structure in the surface horizon but decline rapidly in the B horizon.</li> </ul> <i>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.</i>
<b>Soil quality for mine rehabilitation</b>	<u>Recommended topsoil strip depth:</u> 0.00-0.30 mbgl <u>Recommended topsoil use:</u> 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. <u>Recommended subsoil strip depth:</u> 0.00 mbgl <u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided.

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

**Table 6: 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 7: 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 8 and a soil profile description summary is presented in Table 9. The soil chemistry results for the sites are presented in Appendix E.

**Table 8: Land Summary**

Item	Description
<b>SMU</b>	4
<b>Representative Site Number</b>	S41, J27, J32 and 119
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Brigalow with lesser Dawson Gum and yellowwood present
<b>Location</b>	Site 119 0633 832E 7524 606N
<b>Disturbance</b>	Natural woodlands
<b>Landform element /pattern</b>	Very gently undulating plain
<b>Micro relief</b>	Minor gilgai
<b>Permeability</b>	Assessment unavailable <i>GTE Assessment – Slowly permeable</i>
<b>Slope (%)</b>	<1.0
<b>Drainage</b>	Assessment unavailable <i>GTE Assessment – Moderate to imperfect</i>
<b>Surface coarse fragments</b>	No coarse fragments reported
<b>Surface condition</b>	Firm to hard set and massive
<b>Substrate</b>	n/a
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE Assessment – endohypersodic grey vertosol</i>
<b>Land suitability summary</b>	<b>Estimated effective rooting depth:</b> Site S41: 90 cm. Site J27: 60 cm. Site J32: 60 cm. Site 119: 60 cm. <b>Estimated soil water storage:</b> Site S41: 112 mm. Site J27: 84 mm. Site J32: 74 mm. Site 119: 82 mm <b>Cropping suitability class:</b> 4 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> <i>GTE Assessment – C1</i>
<b>Erosion potential</b>	Laboratory results indicated; <ul style="list-style-type: none"> <li>R1 dispersion ratio is only low to moderate;</li> <li>ESP slightly elevated (still low) in the surface and increases with depth becoming sodic by 20 cm and highly sodic by 50 cm);</li> <li>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.</li> </ul> <i>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.</i>
<b>Soil quality for mine rehabilitation</b>	<u>Recommended topsoil strip depth:</u> 0.00-0.30 mbgl <u>Recommended topsoil use:</u> 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. <i>GTE Assessment, to have a maximum of 0.30 mbgl of stripping depth</i> <u>Recommended subsoil strip depth:</u> 0.00 mbgl

Item	Description
	<i>Recommended subsoil use:</i> Nil, no stripping recommendations for subsoils provided. <i>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.</i>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	42

**Table 9: 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 10, and a soil profile description summary is presented in Table 11. The soil chemistry results for the sites are presented in Appendix E.

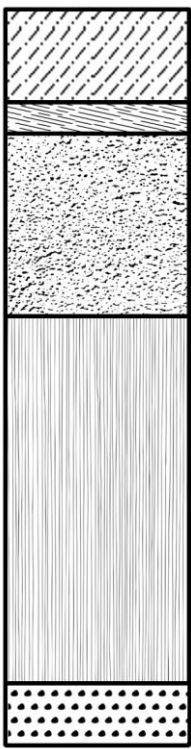


**Table 10: Land Summary**

Item	Description
<b>SMU</b>	5
<b>Representative Site Number</b>	S28 and 76.
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Dawson gum and Brigalow and a low height relatively sparse grass cover is present
<b>Location</b>	Site 76 0634028E 7521010N
<b>Disturbance</b>	Assessment unavailable
<b>Landform element /pattern</b>	Very gently undulating plain
<b>Micro relief</b>	Slight gilgai may or may not be present
<b>Permeability</b>	Assessment unavailable <i>GTE Assessment – Moderate to slowly</i>
<b>Slope (%)</b>	<2.0
<b>Drainage</b>	Assessment unavailable <i>GTE Assessment – Moderate to imperfect</i>
<b>Surface coarse fragments</b>	Some ironstone and silcrete may be present
<b>Surface condition</b>	Noncracking or slightly cracking friable which is non self-mulching and may be hard set or may have a weak firm surface flake
<b>Substrate</b>	Deep Tertiary clays
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE Assessment - Endohypersodic Brown Vertosol</i>
<b>Land suitability summary</b>	<b>Estimated effective rooting depth:</b> Site S28: 60 cm. Site 76: 60 cm. <b>Estimated soil water storage:</b> Site S40: 100 mm. Site J4: 93 mm <b>Cropping suitability class:</b> 4 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> <i>GTE Assessment - C1</i>
<b>Erosion potential</b>	Laboratory results indicated; <ul style="list-style-type: none"> <li>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;</li> <li>ESP is elevated (sodic) in the surface and increases with depth to highly sodic levels by 20 cm;</li> <li>Calcium to magnesium ratios low levels for the maintenance of structure in the surface horizon and decline further with depth.</li> </ul> <i>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.</i>
<b>Soil quality for mine rehabilitation</b>	<u>Recommended topsoil strip depth:</u> 0.00-0.20 mbgl <u>Recommended topsoil use:</u> 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). <u>Recommended subsoil strip depth:</u> Nil <u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided. <i>GTE Recommendation – Reuse as capping for waste rock due to saline and dispersive attributes to a</i>

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

**Table 11: 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	4.5	1004
	End of Borehole			

#### **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 12, and a soil profile description summary is presented in Table 13. The soil chemistry results for the sites are presented in Appendix E.

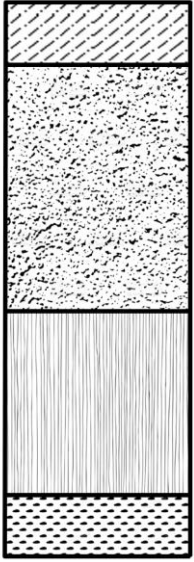
**Table 12: Land Summary**

Item	Description
<b>SMU</b>	8
<b>Representative Site Number</b>	S7 and 22 (scalded surface)
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Dawson gum with some Brigalow
<b>Location</b>	Site 22 0637791E 7513604N
<b>Disturbance</b>	Much of the area has been cleared
<b>Landform element /pattern</b>	Gently to moderately undulating plain
<b>Micro relief</b>	Slight gilgai may or may not be present
<b>Permeability</b>	Assessment unavailable <i>GTE assessment – moderate to slowly</i>
<b>Slope (%)</b>	3.0 – 10.0
<b>Drainage</b>	Assessment unavailable <i>GTE assessment – moderate to imperfect</i>
<b>Surface coarse fragments</b>	No coarse fragments reported
<b>Surface condition</b>	Hard-set with an algal crust present
<b>Substrate</b>	Sediments
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE assessment – brown sodosol</i>
<b>Land suitability summary</b>	<p><b>Estimated effective rooting depth:</b> Site S7: 30 cm. Site 22: 60 cm.</p> <p><b>Estimated soil water storage:</b> Site S7: 64 mm. Site 22: 70 mm.</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 5</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C3</i></p>
<b>Erosion potential</b>	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>R1 dispersion indices is high (0.74) in the scalded profile and only moderate (0.47) in the partially scalded profile;</li> <li>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;</li> <li>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.</li> </ul> <p><i>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.</i></p>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.15 mbgl</p> <p><u>Recommended topsoil use:</u> The surface 10 to 15 cm (A horizon) may be useful on very flat areas, (do not strip the scalded areas).</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – reuse as first layer capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i></p>



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

**Table 13: 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 is 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 14, and a soil profile description summary is presented in Table 15. The soil chemistry results for the sites are presented in Appendix E.

**Table 14: Land Summary**

Item	Description
<b>SMU</b>	12
<b>Representative Site Number</b>	J22 and 145
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Poplar box open woodland, with lesser ghost gum and occasional river gum and moreton bay ash on stream channels
<b>Location</b>	Site 145 0633147E 7528468N
<b>Disturbance</b>	Much of the area is relatively natural and the appearance of an area of natural vegetation
<b>Landform element /pattern</b>	Very gently undulating plain
<b>Micro relief</b>	Nil
<b>Permeability</b>	Assessment unavailable <i>GTE assessment – highly to moderate</i>
<b>Slope (%)</b>	<0.5
<b>Drainage</b>	Assessment unavailable <i>GTE assessment – Rapid to moderately well drained.</i>
<b>Surface coarse fragments</b>	Nil
<b>Surface condition</b>	Firm to hard set and massive
<b>Substrate</b>	Reworked Cainozoic sediments
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE assessment – brown sodosol</i>
<b>Land suitability summary</b>	<p><b>Estimated effective rooting depth:</b> Site J22: 60 cm. Site 145: 90 cm.</p> <p><b>Estimated soil water storage:</b> Site SJ22: 60 mm. Site 145: 67 mm.</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> Class 4 on levees, Class 5 on creek banks</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C2/C3</i></p>
<b>Erosion potential</b>	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>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;</li> <li>ESP is low in the surface and A2 horizons and becomes sodic in the upper B horizon of the profile with the heavier subsoil;</li> <li>Calcium to magnesium ratios is 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.</li> </ul> <p><i>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.</i></p>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.40 mbgl</p> <p><u>Recommended topsoil use:</u> 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.</p> <p><u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – Reuse as buried subsoils and capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i></p>

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

**Table 15: 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 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. Sodidity increases in the B horizon and becomes high at depth;
- calcium to magnesium ratios is 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.

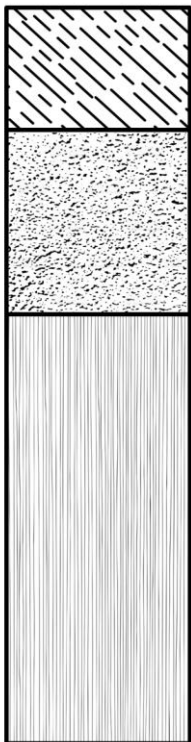
A land summary is presented in Table 16, and soil profile description summaries are presented in Tables 17, 18 and 19. The soil chemistry results for the sites are presented in Appendix E.

**Table 16: Land Summary**

Item	Description
<b>SMU</b>	13
<b>Representative Site Number</b>	J23, 48, 134 and 138
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Poplar box but with some Dawson Gum, bauhinia, belah, yellowwood and Brigalow also present
<b>Location</b>	Site 48 0637338E 7517603N, Site 134 0632239E 7528755N, Site 138 0633952E 7525593N
<b>Disturbance</b>	Much of the area is relatively natural and the appearance of an area of natural vegetation
<b>Landform element /pattern</b>	Very gently undulating plains
<b>Micro relief</b>	Nil
<b>Permeability</b>	Assessment unavailable <i>GTE assessment - moderate</i>
<b>Slope (%)</b>	<0.5
<b>Drainage</b>	Assessment unavailable <i>GTE assessment – well to imperfect</i>
<b>Surface coarse fragments</b>	Nil
<b>Surface condition</b>	Firm to hard set and massive
<b>Substrate</b>	Alluvium
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE assessment – sodic dermosol</i>
<b>Land suitability summary</b>	<p><b>Estimated effective rooting depth:</b> Site J23: 90 cm. Site 48: 60 cm. Site 134: 90 cm. Site 138: 60 cm.</p> <p><b>Estimated soil water storage:</b> Site J23: 83 mm. Site 48: 67 mm. Site 134: 82 mm. Site 138: 66 mm.</p> <p><b>Cropping suitability class:</b> Class 4 on levees, Class 5 on creek banks</p> <p><b>Grazing suitability class:</b> Class 3 on levees, Class 5 on creek banks</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C1/C3</i></p>
<b>Erosion potential</b>	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>R1 dispersion ratio in the surface horizon is high (0.67 to 0.77) indicating poor structure and a propensity to surface sealing;</li> <li>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</li> <li>Calcium to magnesium ratios is 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.</li> </ul> <p><i>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.</i></p>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.25 mbgl</p> <p><u>Recommended topsoil use:</u> Strip the A horizon (15 to 25 cm) avoiding B horizon clays which are generally dispersive. Only reuse the soil on almost flat areas (&lt;0.5%) as the soil has very poor physical characteristics with low infiltration rates and is prone to surface sealing.</p> <p>If sufficient volumes of other soils are available for rehabilitation, the SMU may be better discarded.</p> <p><u>Recommended subsoil strip depth:</u> 0.00 mbgl.</p>

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

**Table 17: 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 18: 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 19: 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.

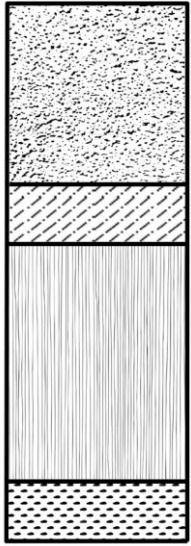
A land summary is presented in Table 20, and two soil profile description summaries are presented in Table 21 and 22. The soil chemistry results for the sites are presented in Appendix E.

**Table 20: Land Summary**

Item	Description
<b>SMU</b>	16 / 23 (overlain variant)
<b>Representative Site Number</b>	S17 (Variant), H32, 42 (Variant) and 60
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Poplar box with occasional blue gum, moreton bay ash, broad leafed ironbark and leichhardt bean
<b>Location</b>	Site 42 0636772E 7516760N Site 60 0635842E 7519633N
<b>Disturbance</b>	Much of the area has been cleared but the appearance of natural vegetation present
<b>Landform element /pattern</b>	Very gently undulating plains
<b>Micro relief</b>	Nil
<b>Permeability</b>	Assessment unavailable <i>GTE assessment – moderate</i>
<b>Slope (%)</b>	<0.5
<b>Drainage</b>	Assessment unavailable <i>GTE assessment – moderately well drained</i>
<b>Surface coarse fragments</b>	Nil
<b>Surface condition</b>	Hard-set
<b>Substrate</b>	Alluvium
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE assessment – sodic brown dermosol</i>
<b>Land suitability summary</b>	<b>Estimated effective rooting depth:</b> Site S17: 120 cm. Site H32: 90 cm. Site 42: 90 cm. Site 60: 90 cm. <b>Estimated soil water storage:</b> Site S17: 91 mm. Site H32: 80 mm. Site 42: 74 mm. Site 60: 74 mm <b>Cropping suitability class:</b> Class 4, minor Class 5 on stream banks <b>Grazing suitability class:</b> Class 3, some Class 4 and 5 on stream banks and the overlain variant <b>Agricultural Land Class:</b> <i>GTE assessment - C1/C3</i>
<b>Erosion potential</b>	Laboratory results indicated; <ul style="list-style-type: none"> <li>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);</li> <li>ESP is low in the surface, and usually increases only very slightly at depth;</li> <li>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.</li> </ul> <i>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.</i>
<b>Soil quality for mine rehabilitation</b>	<u>Recommended topsoil strip depth:</u> 0.00-0.25 mbgl <u>Recommended topsoil use:</u> 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. <u>Recommended subsoil strip depth:</u> 0.00 mbgl <u>Recommended subsoil use:</u> The material in the lower horizons is strongly slaking and some of this subsoil material is dispersive.

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

**Table 21: 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 22: 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 23, and soil profile description summaries are presented in Table 24. The soil chemistry results for the sites are presented in Appendix E.

**Table 23: Land Summary**

Item	Description
<b>SMU</b>	17
<b>Representative Site Number</b>	S32 and 57
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Poplar box with occasional blue gum, moreton bay ash, broad Leafed ironbark and leichhardt bean
<b>Location</b>	n/a
<b>Disturbance</b>	Much of the area has been cleared but the appearance of natural vegetation present
<b>Landform element /pattern</b>	Very gently undulating plains
<b>Micro relief</b>	Nil
<b>Permeability</b>	Assessment unavailable <i>GTE assessment – moderate to slowly</i>
<b>Slope (%)</b>	Extremely low
<b>Drainage</b>	Assessment unavailable <i>GTE assessment - moderate to imperfect</i>
<b>Surface coarse fragments</b>	No coarse fragments reported
<b>Surface condition</b>	Hard-set cracking
<b>Substrate</b>	Alluvium
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE assessment – epihypersodic vertosol</i>
<b>Land suitability summary</b>	<b>Estimated effective rooting depth:</b> Site S32: 60 cm. Site 57: 30 cm. <b>Estimated soil water storage:</b> Site S32: 70 mm. Site 57: 48 mm. <b>Cropping suitability class:</b> Class 5 <b>Grazing suitability class:</b> Class 4 <b>Agricultural Land Class:</b> <i>GTE assessment - C2</i>
<b>Erosion potential</b>	Laboratory results indicated; <ul style="list-style-type: none"> <li>R1 dispersion ratio which is high for a surface soil (0.80) and indicates poor surface physical conditions;</li> <li>ESP is elevated (sodic) in the surface and increases down the profile being extremely sodic by 20cm;</li> <li>Calcium to magnesium are at low levels for the maintenance of structure in the surface horizon and at depth.</li> </ul> <i>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.</i>
<b>Soil quality for mine rehabilitation</b>	<u>Recommended topsoil strip depth:</u> Nil <u>Recommended topsoil use:</u> Generally nil, minor SMU with little seed source <u>Recommended subsoil strip depth:</u> Nil <u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided. <i>GTE recommendation – Reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl</i>
<b>AASS/PASS</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>

Item	Description
Assessment	
Total area (ha)	4

**Table 24: 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.

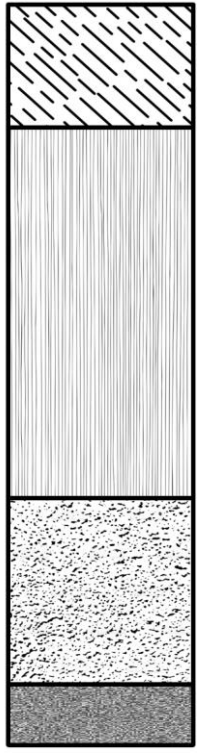
A land summary is presented in Table 25 and a soil profile description summary is presented in Table 26. The soil chemistry results for the sites are presented in Appendix E.

**Table 25: Land Summary**

Item	Description
<b>SMU</b>	18
<b>Representative Site Number</b>	S51, H32 and 109
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. hand auger.
<b>Vegetation</b>	Moreton bay ash with lesser blue gum, ghost gum and poplar box present
<b>Location</b>	Site 109 0631776E 7530533N
<b>Disturbance</b>	Area has been previously disturbed
<b>Landform element /pattern</b>	Very gently undulating plains to steep inclines
<b>Micro relief</b>	Nil
<b>Permeability</b>	Assessment unavailable <i>GTE assessment – highly too slowly</i>
<b>Slope (%)</b>	Generally low on the levees, however on stream banks can be high (up to 40%)
<b>Drainage</b>	Assessment unavailable <i>GTE assessment – rapid to moderately drained</i>
<b>Surface coarse fragments</b>	No coarse fragments reported
<b>Surface condition</b>	Soft to firm
<b>Substrate</b>	Alluvium
<b>ASC Order (s)</b>	Assessment unavailable <i>GTE assessment – brown kandosol</i>
<b>Land suitability summary</b>	<p><b>Estimated effective rooting depth:</b> Site S51: 150 cm. Site H32: 120 cm. Site 109: 65 mm</p> <p><b>Estimated soil water storage:</b> Site S51: 87 mm. Site H32: 100 mm. Site 109: 65 mm</p> <p><b>Cropping suitability class:</b> Class 4 on levees, Class 5 on creek banks</p> <p><b>Grazing suitability class:</b> Class 3 on levees, Class 4 on creek banks</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C1/C2</i></p>
<b>Erosion potential</b>	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>R1 dispersion ratio is elevated (0.68 to 0.84 in the surface);</li> <li>ESP is low;</li> <li>Calcium to magnesium ratios is at a good level for the maintenance of structure in all analysed horizons.</li> </ul> <p><i>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.</i></p>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.50 mbgl</p> <p><u>Recommended topsoil use:</u> 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.</p> <p>Avoid the inclusion of lower clay layers as some of these materials in the Hughes and Spring creek areas may be very dispersive.</p> <p>Overall structure is weak and the material should not be reused on steep slopes.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> 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</p>

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

**Table 26: 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	6.6	57
		End of Borehole		

#### **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 27 and soil profile description summary is presented in Table 28. The soil chemistry results for the sites are presented in Appendix E.

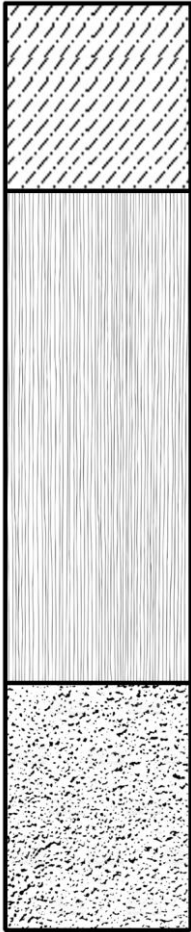


**Table 27: Land Summary**

Item	Description
<b>SMU</b>	19
<b>Representative Site Number</b>	S49 and 142
<b>Representative Site photograph</b>	No photo available
<b>Site survey type</b>	Detailed. Hand auger.
<b>Vegetation</b>	Moreton bay ash with lesser poplar box, bloodwood and leichhardt bean
<b>Location</b>	Site 142 0633668E 7527125N
<b>Disturbance</b>	Assessment unavailable
<b>Landform element /pattern</b>	Very gently undulating plains to steep inclines
<b>Micro relief</b>	Nil
<b>Permeability</b>	Assessment unavailable <i>GTE assessment – highly</i>
<b>Slope (%)</b>	Generally low on the levees, however on-stream banks can be high (up to 40%)
<b>Drainage</b>	Assessment unavailable <i>GTE assessment – rapid</i>
<b>Surface coarse fragments</b>	Nil
<b>Surface condition</b>	Loose and weak
<b>Substrate</b>	Alluvium
<b>ASC Order (s)</b>	Assessment unavailable GTE assessment – brown tenosol
<b>Land suitability summary</b>	<p><b>Estimated effective rooting depth:</b> Site S49: 90 cm. Site 142: 120/150 cm.</p> <p><b>Estimated soil water storage:</b> Site S51: 61 mm. Site H32: 77/93 mm.</p> <p><b>Cropping suitability class:</b> Class 4</p> <p><b>Grazing suitability class:</b> Class 3</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C1</i></p>
<b>Erosion potential</b>	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>R1 dispersion ratio is very high (0.81 and 0.96) and this is likely due to the low clay content (only 5%) present;</li> <li>ESP is low in the surface and down the profile, sometimes rising to sodic levels in the deep subsoil where texture becomes heavier;</li> <li>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.</li> </ul> <p><i>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.</i></p>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.50 mbgl</p> <p><u>Recommended topsoil use:</u> Strip the surface 50cm as better quality soil.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> The subsoil should not be incorporated due to hard setting tendency.</p> <p>Nil, no stripping recommendations for subsoils provided.</p>

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

**Table 28: 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 29, and a soil profile description summary is presented in Table 30. The soil chemistry results for the sites are presented in Appendix E.


**Table 29: 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	<p><b>Estimated effective rooting depth:</b> 0.60-0.70 m</p> <p><b>Estimated soil water storage:</b> 50 mm</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 3</p> <p>Preferred Use: Light Grazing</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C2</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP (is low in the surface and upper subsoil layers and increases slowly down the profile becoming sodic below 50cm.</li> </ul> <p><i>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</i></p>



Item	Description
	<i>considered when stockpiling and for reuse of this SMU for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.40 mbgl</p> <p><u>Recommended topsoil use:</u> 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.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> The subsoil should not be incorporated due to hard setting tendency. Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE Recommendation – Reuse as capping for waste rock due to dispersive attributes to a depth of 0.60 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	463

**Table 30: 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 31, and a soil profile description summary is presented in Table 32. The soil chemistry results for the sites are presented in Appendix E.

**Table 31: 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	<p><b>Estimated effective rooting depth:</b> 0.40-0.50 m</p> <p><b>Estimated soil water storage:</b> 50 mm</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 3</p> <p>Preferred Use: Grazing</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C2</i></p>
Erosion potential	<p>Laboratory results indicated.</p> <ul style="list-style-type: none"> <li>ESP is low in the surface and upper subsoil layers and increases slowly down the profile becoming sodic below 0.4mbgl.</li> </ul> <p><i>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.</i></p>

Item	Description
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.30 mbgl</p> <p><u>Recommended topsoil use:</u> 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.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> The subsoil should not be considered due to increased salinity levels. Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	442

**Table 32: 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 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	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	Firm <10mm peds, cracking 2-6mm, crust
ASC Order (s)	Crusting Grey Vertosol (minor sub-dominant black vertosol)
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 m <b>Estimated soil water storage:</b> 120 mm <b>Regional Frameworks class:</b> 3 <b>Grazing suitability class:</b> 2 <b>Agricultural Land Class:</b> A1
Erosion potential	Low to moderate based on surface crusting attributes
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> 0.00-0.10 mbgl <u>Recommended topsoil use:</u> Suitable - Recommended for slope and level plain application. <u>Recommended subsoil strip depth:</u> 0.10-0.30 mbgl <u>Recommended subsoil use:</u> 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,
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	7

**Table 33: Soil Profile Description for Site N1-SCL**

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 <10m 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, firm 10-30mm 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, firm 10-30mm 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, firm 10-30mm 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 34, and a soil profile description summary is presented in Table 35.




**Table 34: 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 rudisol / tenosol
Land suitability summary	<p><b>Estimated effective rooting depth:</b> 0.70 m</p> <p><b>Estimated soil water storage:</b> 70 mm</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 3</p> <p>Preferred Use: Natural Areas – Light grazing</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C3</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>Calcium and magnesium ratio (as calculated using Burgess. (2003) SMU exchangeable cations, calcium and magnesium results of 2.3;</li> <li>ESP is low throughout.</li> </ul> <p><i>GTE assessment - Erosion potential through reviewing sodicity, soil texture and structure are considered</i></p>

Item	Description
	<i>low. Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.50 mbgl</p> <p><u>Recommended topsoil use:</u> 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.</p> <p>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.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	454

**Table 35: 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 36, and a soil profile description summary is presented in Table 37. The soil chemistry results for the sites are presented in Appendix E.


**Table 36: 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 Dermosol
Land suitability summary	<b>Estimated effective rooting depth:</b> 0.60 m <b>Estimated soil water storage:</b> 49 mm <b>Regional Frameworks class:</b> 5 <b>Grazing suitability class:</b> 5 <b>Agricultural Land Class:</b> C3
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>ESP is low throughout</li> </ul> Erosion potential is assessed as low to moderate due to surface texture.
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> 0.00-0.00 mbgl <u>Recommended topsoil use:</u> Topsoil is not recommended due to the texture grade. <u>Recommended subsoil strip depth:</u> Nil <u>Recommended subsoil use:</u> Subsoils below 0.10 is suitable for capping waste rock due to increase in



Item	Description
	alkaline pH levels. Additional soil amelioration using powdered sulphur may reduce pH levels.
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	10

**Table 37: 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)
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- 0.88EOB H	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 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	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	Firm, minor cracking
ASC Order (s)	Black Dermosol
Land suitability summary	<b>Estimated effective rooting depth:</b> 0.85 m <b>Estimated soil water storage:</b> 73 mm <b>Regional Frameworks class:</b> 5 <b>Grazing suitability class:</b> 4 <b>Agricultural Land Class:</b> C3
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>• ESP is low throughout</li> </ul> Erosion potential is assessed as low.
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> 0.00-0.10 mbgl <u>Recommended topsoil use:</u> Highly suitable - Recommended for slope and level plain application. <u>Recommended subsoil strip depth:</u> 0.10–0.50 mbgl <u>Recommended subsoil use:</u> 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.
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	101

**Table 39: 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)
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.

##### **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 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	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	Minor cracking
ASC Order (s)	Grey Dermosol
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 m <b>Estimated soil water storage:</b> 90-100 mm <b>Regional Frameworks class:</b> 4 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> B
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>ESP is low throughout</li> </ul> Erosion potential is assessed as low.
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> 0.00-0.10 mbgl <u>Recommended topsoil use:</u> Suitable - Recommended for slope and level plain application. <u>Recommended subsoil strip depth:</u> 0.10-0.45 mbgl

Item	Description
	<u>Recommended subsoil use:</u> 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.
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	8

**Table 41: 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)
A1 0.00- 0.12 Abrupt	Clay loam	Weak, soft sub- rounded <10mm	Nil inclusions / segregation s	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well	Prese nt	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	Prese nt	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	Prese nt	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 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	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	Cracking, strong fine self-mulching
Substrate	Mixed sediments
ASC Order (s)	Black vertosol
Land suitability summary	<p><b>Estimated effective rooting depth:</b> 1.00 m</p> <p><b>Estimated soil water storage:</b> 100 mm</p> <p><b>Cropping suitability class:</b> 2</p> <p><b>Grazing suitability class:</b> 1</p> <p>Preferred Use: Grazing with opportunistic cropping</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - A1</i></p> <p><i>Regional Frameworks: 3</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP is low in the upper subsoil layers and increases slowly down the profile becoming sodic below 0.5 mbgl.</li> </ul> <p><i>GTE assessment - Erosion potential for dispersion is assessed as low, increasing very slightly with depth.</i></p> <p><i>Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU</i></p>

Item	Description
	<i>for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.50 mbgl</p> <p><u>Recommended topsoil use:</u> 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.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> 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.</p> <p><i>GTE recommendation – subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	637

**Table 43: 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 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	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	<p><b>Estimated effective rooting depth:</b> 0.70 m</p> <p><b>Estimated soil water storage:</b> 070 mm</p> <p><b>Cropping suitability class:</b> 4</p> <p><b>Grazing suitability class:</b> 2</p> <p>Preferred Use: Grazing with opportunistic forage</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C1</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP is low in the topsoil layers and increases slowly down the profile becoming sodic below 0.8 mbgl.</li> </ul> <p><i>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.</i></p>



Item	Description
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.30 mbgl</p> <p><u>Recommended topsoil use:</u> 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.</p> <p>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</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> Subsoils are not saline or sodic but are still not very good quality for reuse on rehabilitation.</p> <p><i>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</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	377

**Table 45: 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 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	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	2-6mm coarse fragments
Surface condition	Soft
ASC Order (s)	Black chromosol (with minor grey chromosol variant, site N4)
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 mbgl <b>Estimated soil water storage:</b> 90 mm <b>Regional Frameworks class:</b> 3 <b>Grazing suitability class:</b> 2 <b>Agricultural Land Class:</b> A1
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>ESP is low in the surface and upper subsoil layers and increases down the profile becoming sodic below 0.5mbgl.</li> </ul> Erosion potential is assessed as low to moderate due to sodic attributes increasing in subsoils.
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> 0.00-0.00 mbgl <u>Recommended topsoil use:</u> Not suitable due to texture grade of the surface. <u>Recommended subsoil strip depth:</u> Nil

Item	Description
	<p><u>Recommended subsoil use:</u> 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.</p> <p>Therefore, soils for the profile are recommended for capping waste rock unless soil amelioration to reduce salt levels is applied.</p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	18.3

**Table 47: 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 segregation s	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.

##### **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 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	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 Chromosol
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 m <b>Estimated soil water storage:</b> 1.00-1.10 mm <b>Regional Frameworks class:</b> 3 <b>Grazing suitability class:</b> 2 <b>Agricultural Land Class:</b> A1
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>ESP is low throughout</li> </ul> Erosion potential is assessed as low.
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> 0.00-0.15 mbgl <u>Recommended topsoil use:</u> Highly suitable - Recommended for slope and level plain application. <u>Recommended subsoil strip depth:</u> 0.15-0.60 mbgl <u>Recommended subsoil use:</u> Suitable for support topsoil placement, slopes or level plains.

Item	Description
	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.
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	108

**Table 49: 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)
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	Presen t	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	Presen t	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	Presen t	0.90 / 7.5		

#### **4.1.23 SMU B2bI**

##### **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 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.


##### **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 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	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	Minor cracking, firm
ASC Order (s)	Black Dermosol
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 mbgl <b>Estimated soil water storage:</b> 70-90 mm <b>Regional Frameworks class:</b> 4 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> B
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>ESP is low throughout with other SMU sites</li> </ul>

Item	Description
	Erosion potential is assessed as low.
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.10 mbgl</p> <p><u>Recommended topsoil use:</u> Suitable - Recommended for slope and level plain application.</p> <p><u>Recommended subsoil strip depth:</u> 0.10-0.80 mbgl</p> <p><u>Recommended subsoil use:</u> 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.</p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	470.4

**Table 51: 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)
A1 0.00- 0.12 Abrupt	Sandy Clay	Moderate, weak <20mm sub- angular	Nil inclusions and segregation s	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 segregation s	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
- calcium 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 52, and a soil profile description summary for the mound and depression are presented in Tables 53 and 54. The soil chemistry results for the sites are presented in Appendix E.


**Table 52: 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	<b>Estimated effective rooting depth:</b> 0.70 m (mound) 0.40 m (depression) <b>Estimated soil water storage:</b> 85 mm (mound), 50 mm (depression) <b>Cropping suitability class:</b> 4 <b>Grazing suitability class:</b> 2 Preferred Use: Grazing with opportunistic forage <b>Agricultural Land Class:</b> <i>GTE assessment - C1</i>
Erosion potential	Laboratory results indicated; <ul style="list-style-type: none"> <li>ESP is low in the topsoil layers and increases significantly down the profile becoming sodic below 0.1 mbgl.</li> </ul> <i>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</i>




Item	Description
	<i>for reuse of this SMU for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.30 mbgl</p> <p><u>Recommended topsoil use:</u> 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</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	1,616

**Table 53: 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 54: 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 55, and a soil profile description summary is presented in Table 56. The soil chemistry results for the sites are presented in Appendix E.


**Table 55: 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, minor crust, cracking 2-6+mm
ASC Order (s)	Black Vertosol
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 m <b>Estimated soil water storage:</b> 100 – 120 mm <b>Regional Frameworks class:</b> 4 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> B
Erosion potential	Low to moderate based on surface crusting attributes



Item	Description
<b>Soil quality for mine rehabilitation</b>	<u>Recommended topsoil strip depth:</u> 0.00-0.10 mbgl <u>Recommended topsoil use:</u> Highly suitable - Recommended for slope and level plain application. <u>Recommended subsoil strip depth:</u> 0.10-1.00 mbgl <u>Recommended subsoil use:</u> 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.
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	466

**Table 56: Soil Profile Description for Site 5-SCL(Mound)**

Site 5-SCL- M									
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	Light clay	Moderate, soft <20mm sub- angular	Nil inclusions and segregation	10YR2/1 Black Nil mottles / bleaching	Humid, Well drained	Com mon, medi- um	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, medi- um	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 57, and a soil profile description summary for the mound and depression are presented in Table 58 and 59. The soil chemistry results for the sites are presented in Appendix E.

**Table 57: 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	<p><b>Estimated effective rooting depth:</b> 0.20 m (mound) 0.40 m (depression)</p> <p><b>Estimated soil water storage:</b> 20 mm (mound), 40mm (depression)</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 3/4</p> <p>Preferred Use: Grazing</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C2</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>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.</li> </ul> <p><i>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.</i></p>

Item	Description
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended topsoil strip depth:</u> 0.00-0.20 mbgl (mound) and 0.00 mbgl (depression)</p> <p><u>Recommended topsoil use:</u> 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.</p> <p>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.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	841

**Table 58: 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 59: 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 60, and a soil profile description summary is presented in Table 61. The soil chemistry results for the sites are presented in Appendix E.

**Table 60 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, minor cracking
ASC Order (s)	Black Dermosol
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 m <b>Estimated soil water storage:</b> 90 - 110 mm <b>Regional Frameworks class:</b> 5 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> C1
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>ESP is low throughout</li> </ul> Erosion potential is assessed as low.
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> Nil <u>Recommended topsoil use:</u> Not suitable due to structure grade (Massive). Soil amelioration and mixing of other suitable topsoils may improve soils to 0.00-0.20 mbgl <u>Recommended subsoil strip depth:</u> 0.20-0.60 mbgl

Item	Description
	<b>Recommended subsoil use:</b> 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.
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	32.9

**Table 61: 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 segregation s	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Presen t	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 0.9-1.00	Nil
A12 0.06 – 0.20 Gradual	Sandy clay loam	Weak, sub- rounded peds <10 mm	Nil inclusions or segregation s	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Presen t	0.20 / 7.5		
B21 0.20 – 0.46 Gradual	Sandy clay loam	Subangula r blocky, moderate, peds <20 mm, firm	Nil inclusions or segregation s	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Presen t	0.30 / 7.5		
B22 0.46 – 1.00 EOBH	Medium clay, sandy	Subangula r blocky, moderate, peds <20 mm, firm	<20% calcium carbonate	10YR3/3 Dark reddish brown Nil mottles / bleaching	Dry, well – moderate drained	Presen t	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 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	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	<p><b>Estimated effective rooting depth:</b> 1.20+ m</p> <p><b>Estimated soil water storage:</b> 60 mm</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 3</p> <p>Preferred use: opportunistic cropping and grazing</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - C2</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP is sodic in the topsoil and decreases with depth profile becoming non-sodic below 0.40 mbgl.</li> <li>Calcium and magnesium ratio are high to very high.</li> </ul> <p><i>GTE assessment - Erosion potential for dispersion is assessed as low decreasing with depth. Appropriate</i></p>

Item	Description
	<i>management of bare topsoil earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended soil strip depth:</u> 0.00-0.50 mbgl</p> <p><u>Recommended soil use:</u> 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</p> <p><u>Recommended subsoil strip depth:</u> 0.50 – 1.00 mbgl</p> <p><u>Recommended subsoil use:</u> Possibly strip further to 1.00 mbgl.</p> <p><i>GTE recommendation – subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	1,271

**Table 63: 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;
- very low levels of chloride; and
- non-sodic.

##### **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 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	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	Minor cracking, loose
ASC Order (s)	Red Chromosol (Brown Chromosol sub-dominant)
Land suitability summary	<b>Estimated effective rooting depth:</b> 1.00 m <b>Estimated soil water storage:</b> 70-100 mm <b>Regional Frameworks class:</b> 4 <b>Grazing suitability class:</b> 3 <b>Agricultural Land Class:</b> B
Erosion potential	Laboratory results indicated. <ul style="list-style-type: none"> <li>ESP is low throughout</li> </ul> Erosion potential is assessed as low.
Soil quality for mine rehabilitation	<u>Recommended topsoil strip depth:</u> Nil <u>Recommended topsoil use:</u> 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 <u>Recommended subsoil strip depth:</u> 0.15-1.00 mbgl



Item	Description
	<b>Recommended subsoil use:</b> 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.
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	33.2

**Table 65: Soil Profile Description for Site 10-SCL**

Site 10-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)
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 segregation s	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 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	E2
Representative Site Number	Site 110
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	Fine, self-mulching and cracking.
Substrate	Weathered calcareous material and basalt
ASC Order (s)	Black Vertosol
Land suitability summary	<p><b>Estimated effective rooting depth:</b> 0.90-1.00 m</p> <p><b>Estimated soil water storage:</b> 100+ mm</p> <p><b>Cropping suitability class:</b> 2</p> <p><b>Grazing suitability class:</b> 2</p> <p><b>Regional Frameworks class:</b> 3</p> <p>Preferred Use: Opportunistic Cropping and grazing</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment - A1</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP is non-sodic in the topsoil and increases with depth profile becoming sodic below 0.30 mbgl.</li> <li>Calcium and magnesium ratio are high throughout.</li> </ul>

Item	Description
	<i>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.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended soil strip depth:</u> 0.00-0 40 mbgl</p> <p><u>Recommended soil use:</u> 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.</p> <p>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.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> The soils are often saline below 50 cm depth</p> <p>Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.25 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	919

**Table 67: 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 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	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	<p><b>Estimated effective rooting depth:</b> 0.40 m</p> <p><b>Estimated soil water storage:</b> 30 mm</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 4</p> <p>Preferred Use: Light grazing</p> <p><b>Agricultural Land Class:</b> <i>GTE assessment – C3</i></p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP is non-sodic in the topsoil and increases with depth profile becoming sodic below 0.40 mbgl.</li> <li>Calcium and magnesium ratio is high and decreases to moderate in subsoils</li> </ul> <p><i>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</i></p>

Item	Description
	<i>for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended soil strip depth:</u> 0.00-0.20 mbgl</p> <p><u>Recommended soil use:</u> 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.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> As per topsoil recommendation, the clayey subsoil as the material is hard, impervious and generally dispersive</p> <p>Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	381

**Table 69: 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 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	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	<i>GTE assessment – moderate</i>
Slope (%)	0.0
Drainage	<i>GTE assessment – well to moderate</i>
Surface coarse fragments	No coarse fragments reported
Surface condition	Sandy loam, firm
Substrate	n/a
ASC Order (s)	Brown sodosol
Land suitability summary	<p><b>Estimated effective rooting depth:</b> 0.15-0.25 m</p> <p><b>Estimated soil water storage:</b> 25-50 mm</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 4</p> <p>Preferred Use: n/a</p> <p><b>Agricultural Land Class:</b> C3</p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP is non-sodic in the topsoil and increases with depth profile becoming sodic to highly sodic below 0.10 mbgl.</li> <li>Calcium and magnesium ratio are high and decreases to moderate in subsoils.</li> </ul> <p><i>GTE assessment – Erosion potential for dispersion is assessed as low in topsoils increasing with depth.</i></p>

Item	Description
	<i>Appropriate management of bare earths must be considered when stockpiling and for reuse of this SMU for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended soil strip depth:</u> 0.00-0.20 mbgl</p> <p><u>Recommended soil use:</u> 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.</p> <p>The preferred rehabilitation application is Flat sites only due to high erosion potential.</p> <p><u>Recommended subsoil strip depth:</u> Nil</p> <p><u>Recommended subsoil use:</u> Nil, no stripping recommendations for subsoils provided.</p> <p><i>GTE recommendation – reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	7

**Table 71: 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 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	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	<i>GTE assessment – moderate</i>
Slope (%)	0.0
Drainage	<i>GTE assessment – moderate to well drained</i>
Surface coarse fragments	No coarse fragments reported
Surface condition	Firm/hard setting sandy
Substrate	n/a
ASC Order (s)	Brown sodosol
Land suitability summary	<p><b>Estimated effective rooting depth:</b> 0.20-0.30 m</p> <p><b>Estimated soil water storage:</b> 40-80 mm</p> <p><b>Cropping suitability class:</b> 5</p> <p><b>Grazing suitability class:</b> 3</p> <p>Preferred Use: n/a</p> <p><b>Agricultural Land Class:</b> C2</p>
Erosion potential	<p>Laboratory results indicated;</p> <ul style="list-style-type: none"> <li>ESP is marginally sodic in the topsoil and decreasing with depth profile becoming non-sodic below 0.60 mbgl.</li> <li>Calcium and magnesium ratio are high to very high.</li> </ul> <p><i>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</i></p>



Item	Description
	<i>for rehabilitation activities.</i>
<b>Soil quality for mine rehabilitation</b>	<p><u>Recommended soil strip depth:</u> 0.00-0.20 mbgl</p> <p><u>Recommended soil use:</u> 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.</p> <p>The preferred rehabilitation application is Flat sites only due to high erosion potential.</p> <p><u>Recommended subsoil strip depth:</u> 0.20 – 0.60 mbgl</p> <p><u>Recommended subsoil use:</u> 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.</p> <p><i>GTE recommendation – subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.</i></p>
<b>AASS/PASS Assessment</b>	<i>GTE Assessment - Very low field indication of PASS. Nil field indicators of AASS</i>
<b>Total area (ha)</b>	22

**Table 73: 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 broadacre 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 broadacre grain 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), and Shields and Williams (1991). These classes are described in Table 74.

**Table 74: Land Suitability Classes**

Class	Definition
1	Suitable land with negligible limitations which is highly productive requiring only simple management practices to maintain economic production.
2	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 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	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 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 dryland broadacre grain 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);

- 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 (2019) Strategic Cropping Land 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).

Water erosion was assessed using ESP.

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 D.

## 4.2.2 Land Suitability Summary

The suitability and major limiting factors of existing SMUs for dryland broadacre grain cropping and grazing of improved pastures is shown in Table 75; this is based on the land suitability classes detailed in Table 55 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 76 and 77. These are presented in Figure 2 and Figure 3.

**Table 75: Land Suitability Limitations and Classes**

SMU	Dryland Broadacre Grain 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
E1	m5, n5, n4	5	m3, n3, n3	3
E2	m2, n2, p2	2	m1, n1, p2	2



SMU	Dryland Broadacre Grain Cropping		Grazing of Improved Pastures	
	Limitations	Suitability Class	Limitations	Suitability Class
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 suitable for beef cattle grazing activities and therefore not considered for review. These assessments are presented in Appendix D and summarised in Table 76.

**Table 76: 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
B2s	4	4	3	3	4	3	4	3	3	3	3	4	4	3
B2g	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	4	4	4	4	4	4	4	4	4	4	4	4
B5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
E1r	5	5	3	4	5	4	5	4	4	4	4	5	5	4
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, B2s, B2g, B1 and E2 are assessed as suitable to marginally suitable for land uses outlined in the regional frameworks for the Project Site. Land management options for SMUs and variants A4, A4c, A5, B2bl, B3bl, B5, E1r are assessed as marginally or unsuitable for land uses outlined in the regional frameworks for the Project Site

### 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 77. 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 77: 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 78.

**Table 78: Agricultural Land Classes**

<b>Agricultural Land Class</b>	<b>Land Suitability (Cropping)<sup>2</sup></b>	<b>Land Suitability (Grazing)<sup>2</sup></b>	<b>Description<sup>1</sup></b>
<b>A</b>	-	-	Crop land - Land that is suitable for a wide range <sup>3</sup> of current and potential crops with nil to moderate limitations to production.
<b>A1</b>	1-3	1-3	Suitable for a wide range of current and potential broadacre and horticultural <sup>4</sup> crops.
<b>A2</b>	1-3	1-3	Suitable for a wide range of current and potential horticultural crops only.
<b>B</b>	3-4	1-3	Limited crop land - Land that is suitable for a narrow range <sup>5</sup> of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops
<b>C</b>	-	-	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.
<b>C1</b>	4-5	1-2	Suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils.
<b>C2</b>	4-5	3	Suitable for grazing native pastures, with or without the introduction of pasture species, and with lower fertility soils than C1.
<b>C3</b>	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.
<b>D</b>	5	5	Non-agricultural land <sup>6</sup> - Land not suitable for agricultural use, including land alienated from agricultural use.
<b>A/C</b> <b>A/D</b> <b>B/C</b> <b>C/D</b>	-	-	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% <sup>7</sup> .

<sup>1</sup> Sourced from Guidelines for agricultural land evaluation in Queensland (2nd edn). DNRM (2015).

<sup>2</sup> 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.

<sup>3</sup> A wide range of crops is four or more crop types of local commercial significance.

<sup>4</sup> 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.

<sup>5</sup> 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.

<sup>6</sup> 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.

<sup>7</sup> 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 75, 76 and 77 against the ALCs in Table 78 and provided the following assessment below for ALCs. The summary assessment and results for each SMU and variant is presented in Table 79 and Figure 4.

**Table 79: Agricultural Land Assessment**

Agricultural Land Assessment		
Agricultural Land Class	Soil Mapping Unit (SMU)	Area (ha)
A1	A2g, B1, B2g, B2s and E2	1,486
A2	-	-
B	A5, B2bl, B3bl and E1r	1,075
C1	2 (20), 4, 5, 19, B2 (B2v), B3 and B5	2,483
C2	17, A1, A1v, A2, B4, E1 and T2	3,043
C3	8, A3, A4, A4c, E3 and T1	1,134
D	-	-
<b>Complex Units</b>		
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 are assessed as suitable to marginally suitable for land uses outlined in the regional frameworks for the Project Site with soil water availability being the greatest limitation. This limitation was based on the plant available water capacity (PAWC) attributes of 100 mm or more.

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.

#### 4.2.3 Soils and Land Suitability Survey Project Site Summary

Table 80 summarises the Project Site SMUs cropping, grazing, ALCs and where relevant regional framework suitable subgroups.



**Table 80: Land Suitability Summary for Project Site**

Soil	Concept	Dryland 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	-	2	A1	3
A3	Alluvial loamy creek channels	5	3	C3	-
A4	Dark brown sands with sandy loam subsoils near drainage lines	-	5	C3	5
A4c	Variant of SMU A4, texture includes higher clay percentage	-	4	C3	5
A5	Dark grey clay loams to grey brown clays in forested drainage line areas	-	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	-
B2s	Variant of SMU B2, increase of salt content in subsoils	-	2	A1	3

Soil	Concept	Dryland Cropping Class	Beef Cattle Grazing Class	ALC	Regional Frameworks
B2g	Variant of SMU B2, colour of soil profile is black, with minor sub-dominant grey	-	2	A1	3
B2bl	Variant of SMU B2, colour of soil profile is black	-	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	B	4
B4	Melan holed Brigalow clay plains	5	3/4	C2	-
B5	Deep sandy clay loams with clay subsoils on gently undulating plains of tall woodlands	-	3	C1	5
E1	Eucalypt woodlands on deep sandy loams	5	3	C2	-
E1r	Variant of SMU E1 over red clay subsoils on gently undulating plains	-	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 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 81.

**Table 81: 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. <i>Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl</i>	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. <i>Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl</i>	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. <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i>	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. <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i>	0.00
8	The surface 10 to 15 cm (A horizon) may be useful on very flat areas, (do not strip the scalded areas).	0.00-0.15	Nil, no stripping recommendations for subsoils provided. <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i>	0.00
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. <i>Recommendation – potential reuse as buried subsoils and capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i>	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	0.00-0.25	Nil, no stripping recommendations for subsoils provided. <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i>	0.00

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
	available for rehabilitation, the SMU may be better discarded.			
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. <i>Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 1.20 mbgl</i>	0.00
17	Generally nil, minor SMU with little seed source	0.00	Nil, no stripping recommendations for subsoils provided. <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl</i>	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. <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.50 mbgl</i>	0.00
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. <i>Recommendation – potential reuse as capping for waste rock due to dispersive attributes to a depth of 0.60 mbgl</i>	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. <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i>	0.00
A3	Topsoil strip depth may extend well	0.00-0.50	Nil, no stripping recommendations	0.00



SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
	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 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.		for subsoils provided.  <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.20 mbgl</i>	
B1	Excellent quality topsoil which could be taken deeper than the 50 cm nominated depth (up to 90 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.	0.00-0.50	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.  <i>Recommendation – Subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.</i>	0.50-0.90
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.  <i>Recommendation – Subsoils may be used as supporting buried subsoils for topsoil placement or capping for waste rock to a depth of 1.00 mbgl</i>	0.00
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.  <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i>	0.00
B4	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.	0.00-0.20 (Mound) 0.00 (Depression)	Nil, no stripping recommendations for subsoils provided.  <i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i>	0.00

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
E1	<p>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.</p> <p>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.</p>	0.00-0.50	<p>Possibly strip further to 1.00 mbgl.</p> <p><i>Recommendation – Subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.</i></p>	0.50-1.00
E2	<p>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.</p> <p>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.</p>	0.00-0.40	<p>The soils are often saline below 50 cm depth</p> <p>Nil, no stripping recommendations for subsoils provided.</p> <p><i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 1.25 mbgl</i></p>	0.00
E3	<p>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.</p>	0.00-0.20	<p>As per topsoil recommendation, the clayey subsoil as the material is hard, impervious and generally dispersive</p> <p>Nil, no stripping recommendations for subsoils provided.</p> <p><i>Recommendation – potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.90 mbgl</i></p>	0.00
T1	<p>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.</p> <p>The preferred rehabilitation application is flat sites only due to high erosion potential.</p>	0.00-0.20	<p>Nil, no stripping recommendations for subsoils provided.</p> <p><i>Recommendation –potential reuse as capping for waste rock due to saline and dispersive attributes to a depth of 0.60 mbgl</i></p>	0.00
T2	<p>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.</p> <p>The preferred rehabilitation application is flat sites only due to high erosion potential.</p>	0.00-0.20	<p>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.</p>	0.20-0.60

SMU	Topsoil Recommended Rehabilitation Use	Recommended Topsoil Stripping Depth (mbgl)	Subsoil Recommended Rehabilitation Use	Recommended Subsoil Stripping Depth (mbgl)
			<i>Recommendation – Subsoils may be used as either additional topsoil reserves or as supporting buried subsoils for topsoil placement.</i>	

### 4.3.2 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 62.

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 82.

**Table 82: 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

### 4.3.3 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 83. 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 83 summarises the topsoil stripping assessment and recommended depths. Table 84 summarises the subsoil stripping assessment and recommended depths.

**Table 83: Topsoil Stripping Assessment, Elliot and Veness (1981)**

SMU	Criteria									Suitability, Stripping Depth (mbgl)
	Structure grade	Coherence	Mottling	Macro-structure	Force to disrupt peds <sup>1</sup>	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 <sup>2</sup> 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 <sup>2</sup> 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 82 has been used to assess the suitability of subsoils, as presented in Table 84.

**Table 84: 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	0.10-0.50



SMU	Subsoil Stripping Recommendation and Limitation Assessment	Subsoil Depth (mbgl)
	than 3, suitable for capping waste rock.	
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.

#### 4.3.4 Summary of Recommended Soil Stripping Depths and Volumes Available

Table 85 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.

**Table 85: Recommended Stripping Depths and Approximate Volumes Available**

SMU	Recommended Topsoil Stripping Depth (mbgl)	Recommended Subsoil Stripping Depth (mbgl)	Soil Mapping Unit Area (ha)	Approximate Topsoil Volume (m³)	Approximate Subsoil Volume (m³)
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	7	7,000	14,000
A3	0.00-0.50	0.00	454	2,270,000	-
A4	0.00	0.00	10	-	-
A4c	0.00-0.10	0.10-0.50	101	101,000	404,000
A5	0.00-0.10	0.10-0.45	8	8,000	28,000
B1	0.00-0.50	0.50-0.90	637	3,185,000	2,548,000
B2 & B2V	0.00-0.30	0.00	377	1,131,000	-
B2bl	0.00-0.10	0.10-0.80	555	555,000	3,885,000
B2g	0.00	0.00	24	-	-
B2s	0.00-0.15	0.15-0.60	108	162,000	486,000
B3	0.00-0.30	0.00	1,616	4,848,000	-
B3bl	0.00-0.10	0.10-1.00	466	466,000	4,194,000
B4	0.00-0.20	0.00	841	1,682,000	-
B5	0.00	0.20-0.60	31	-	124,000

SMU	Recommended Topsoil Stripping Depth (mbgl)	Recommended Subsoil Stripping Depth (mbgl)	Soil Mapping Unit Area (ha)	Approximate Topsoil Volume (m <sup>3</sup> )	Approximate Subsoil Volume (m <sup>3</sup> )
E1	0.00-0.50	0.50-1.00	1,271	6,355,000	6,355,000
E1r	0.00	0.15-1.00	46	-	391,000
E2	0.00-0.40	0.00	710	2,840,000	-
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
<b>TOTAL FOR PROJECT SITE</b>			<b>9,503</b>	<b>32,999,500</b>	<b>18,753,000</b>

## 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

Strategic Cropping Areas (SCAs) (as determined by the Queensland Government) are shown on the Strategic Cropping Land (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, 2020).

### 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 from 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  $pH_F \leq 4$ , when field  $pH_F > 4$  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 86.

**Table 86: 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.



SMU	AASS / PASS Assessment	Overall Assessment
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.
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.

SMU	AASS / PASS Assessment	Overall Assessment
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 indicators 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, MITIGATION AND RESIDUAL OUTCOMES**

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### **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 65.

#### **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 62. 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 66 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 ( $\text{pH}_{\text{FOX}}$ ) 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

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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 two variants suitable for cropping: B1,E2, B2s and B2g as Class A1. The remaining SMUs were assessed as suitable for grazing 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.

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

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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.

**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.

**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 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.  $ESP = (\text{Exchangeable sodium (meq/100g)} / \text{Cation exchange capacity (meq/100g)}) \times 100$

**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 is 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 anaerobic 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 A1 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

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<b>Figure 1</b>	<b>Soil Mapping Units</b>
<b>Figure 2</b>	<b>Pre-Mine Cropping (Rainfed &amp; Regional Frameworks) Suitability</b>
<b>Figure 3</b>	<b>Pre-Mine Beef Cattle Grazing Suitability</b>
<b>Figure 4</b>	<b>Agricultural Land Classes</b>
<b>Figure 5</b>	<b>Topsoil Stripping Depth</b>
<b>Figure 6</b>	<b>Strategic Cropping Land</b>







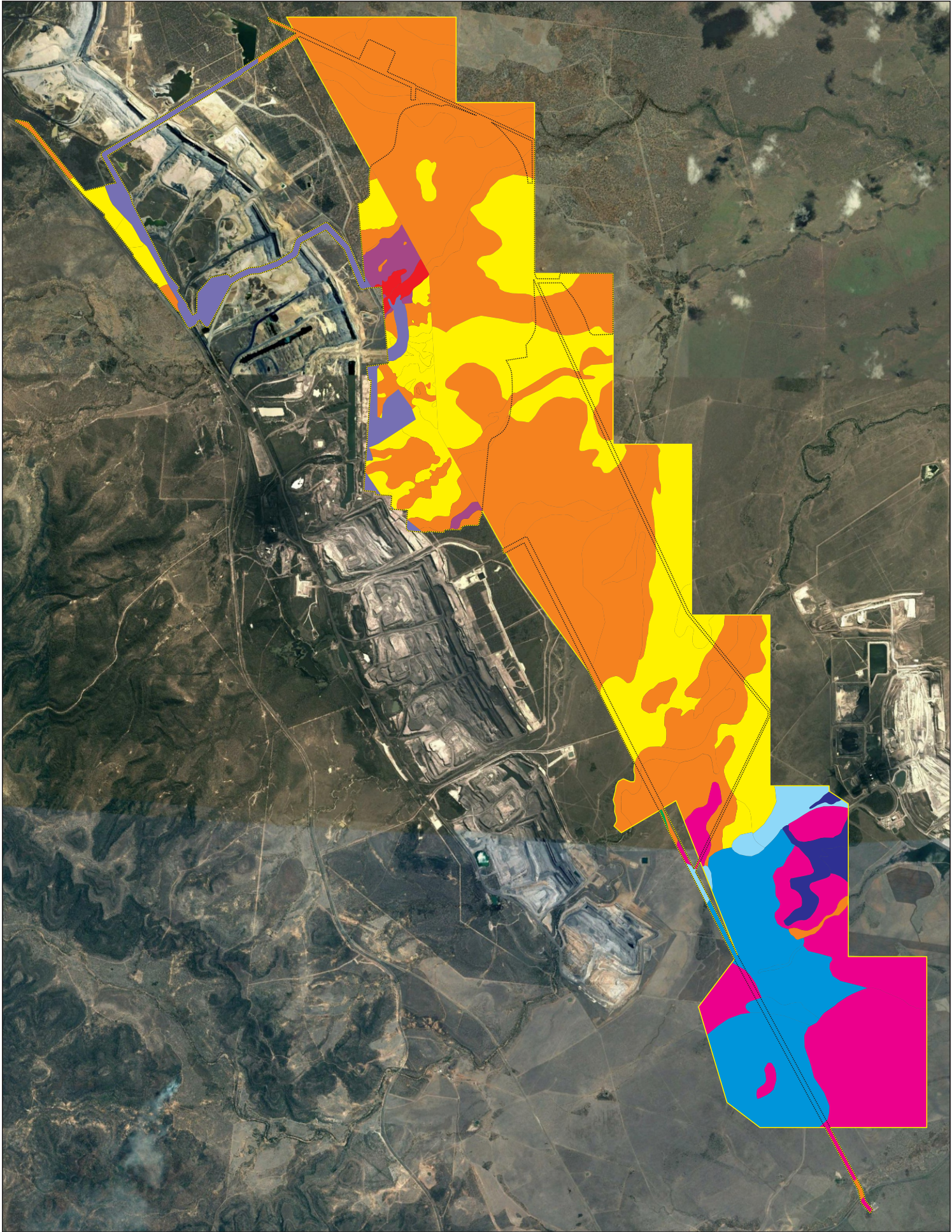


Figure 2: Pre-Mine Cropping (Rainfed and Regional Frameworks) Suitability

Version 6  
30/01/2020

0 2000  
Metres

Soils and Land Suitability Assessment  
SARAJI EAST PROJECT

- Legend
- Project site
  - Project footprint
  - Regional Frameworks Class 3
  - Regional Frameworks Class 4
  - Regional Frameworks Class 5
  - Cropping Class 2 / Regional Frameworks Class 3
  - Cropping Class 4
  - Cropping Class 5
  - Class 4 on levees, Class 5 on creek banks
  - Class 4, minor Class 5 on stream banks
  - Disturbed



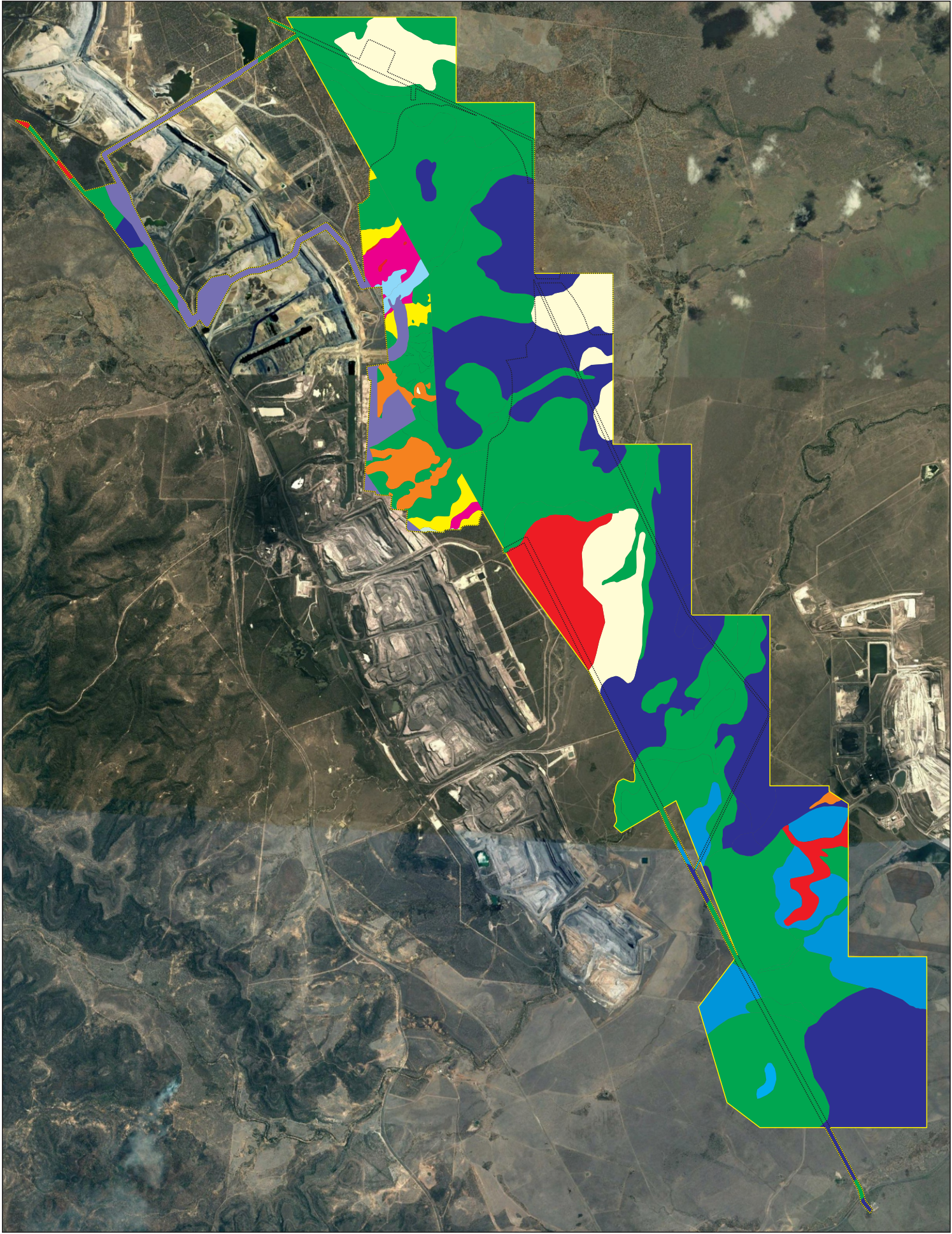


Figure 3: Pre-Mine Beef Cattle Grazing Suitability

Version 6  
30/01/2020

0 2000  
Metres

Soils and Land Suitability Assessment  
SARAJI EAST PROJECT

- Legend
- Project site
  - Project footprint
  - Class 1
  - Class 2
  - Class 3
  - Class 4
  - Class 5
  - Class 3/4
  - Class 4 on levees, Class 5 on creek banks
  - Class 3 on levees, Class 5 on creek banks
  - Class 3, some Class 4 and 5 on stream banks
  - Class 4, minor Class 5 in eroded or drainage areas
  - Disturbed



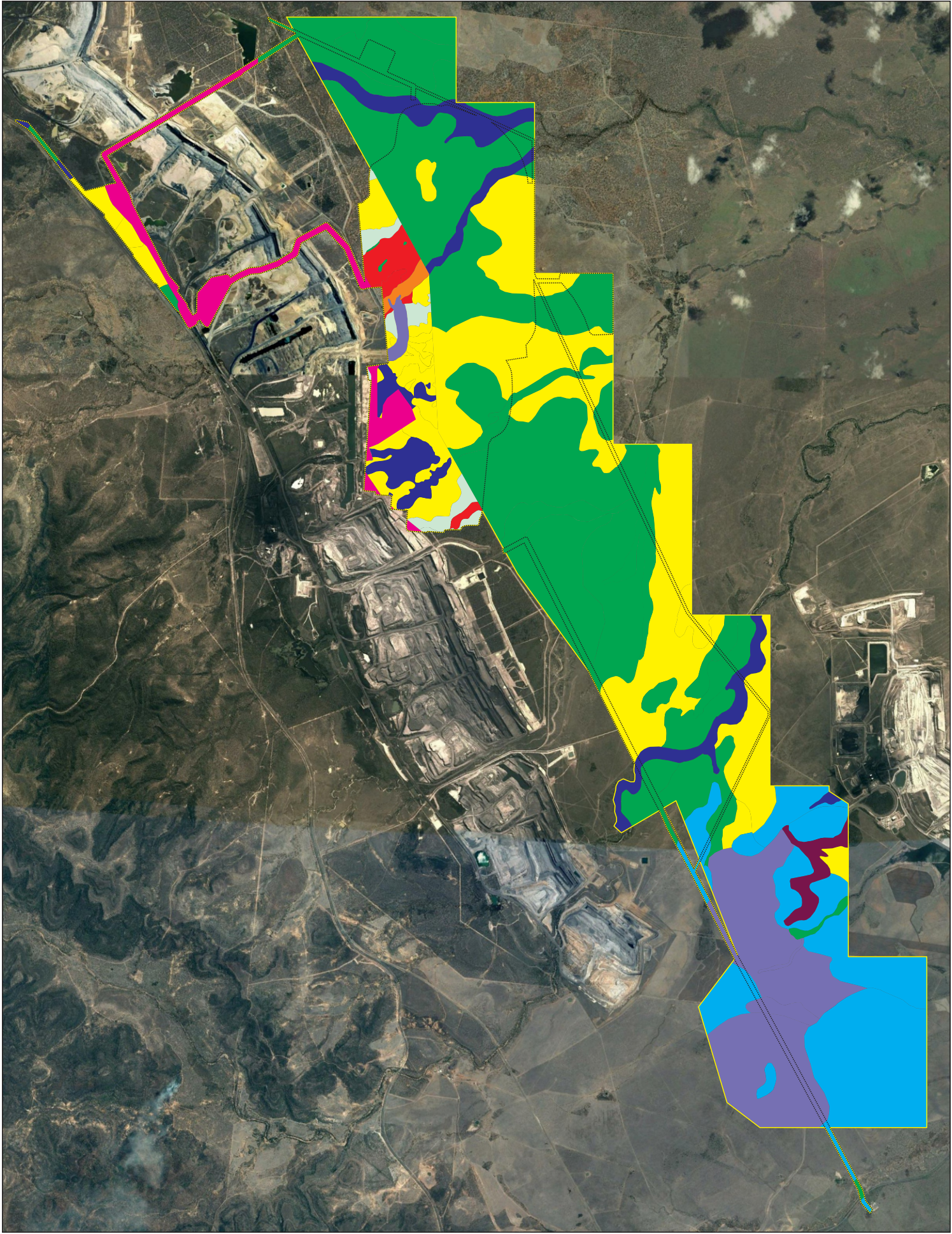


Figure 4: Agricultural Land Classes

Version 6  
10/02/2020

0 2000  
Metres

Soils and Land Suitability Assessment  
SARAJI EAST PROJECT

- Legend
- Project site
  - Project footprint
  - Class A1
  - Class B
  - Class C1
  - Class C1 / C2
  - Class C1 / C3
  - Class C2
  - Class C2 / C3
  - Class C3
  - Disturbed



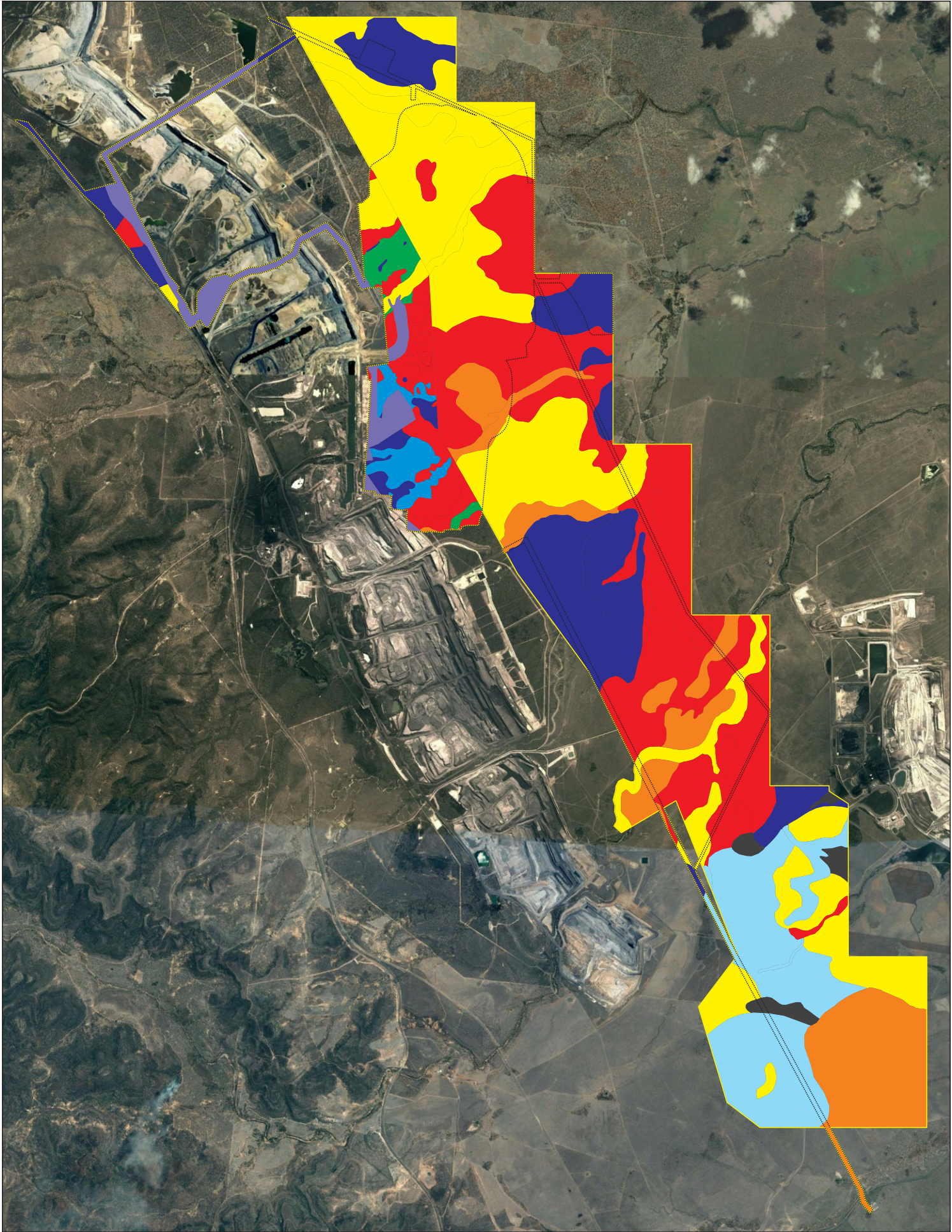


Figure 5: Topsoil Stripping Depth

Version 6  
30/01/2020



Soils and Land Suitability Assessment  
SARAJI EAST PROJECT

- Legend
- Project site
  - Project footprint
  - 0.00m
  - 0.10m
  - 0.15m
  - 0.20m
  - 0.25m
  - 0.30m
  - 0.40m
  - 0.50m
  - Disturbed





Figure 6: Strategic Cropping Land

Version 6  
30/01/2020



- Legend
- Project site
  - Strategic Cropping Land Trigger Map
  - Project footprint

Soils and Land Suitability Assessment  
SARAJI EAST PROJECT



## 10 APPENDICES

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<b>Appendix A</b>	<b>Emmerton, 2005 Observation site descriptions</b>
<b>Appendix B</b>	<b>GTEs, 2012 Observation site descriptions</b>
<b>Appendix C</b>	<b>GTE, 2018 Observation Site Descriptions</b>
<b>Appendix D</b>	<b>GTE, 2019 Observation Site Descriptions</b>
<b>Appendix E</b>	<b>Laboratory Data Summary</b>
<b>Appendix F</b>	<b>Laboratory Certificates</b>
<b>Appendix G</b>	<b>Regional Frameworks Land Suitability Limitations Review</b>



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

<b>22</b>	■ <u>0 637 791E 7 513 604N</u> (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 <sup>3</sup> present	8.4	190	1-2	0 (0)
<b>33</b>	■ <u>0 637 674E 7 515 738N</u> (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)
<b>42</b>	<u>0 636 772E 7 516 760N</u> (hardset, slightly flaking surface, an overlain variant)				
0-10	Hardset brown platy/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 <sup>3</sup> )	6.5	73	2-3	0 (2)
<b>48</b>	<u>0 637 338E 7 517 603N</u> (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	-	-	-	-

<b>57</b>	1.1 <u>0 635 281E 7 519 412N</u> (hardset cracking surface)				
0-10	Dark grey platy/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)
<b>60</b>	1.2 <u>0 635 842E 7 519 633N</u> (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 <sup>3</sup> )	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 <sup>3</sup> present)	8.5	160	3	0 (2)
110-120	As above	8.6	123	3	0 (1-2)
<b>61</b>	■ <u>0 636 217E 7 520 539N</u> (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 <sup>3</sup> )	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)
<b>68</b>	■ <u>0 634 233E 7 520 713N</u> (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 <sup>3</sup> and some high laterite present	5.7	99	3	3 (3)
50-60	Whole coloured yellowish brown MC (sandy) B22, no laterite or CO <sup>3</sup>	7.1	443	3	3 (3)
80-90	As above	7.0	397	3	3 (3)
<b>70</b>	■ <u>0 634 998E 7 520 878N</u> (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 <sup>3</sup>	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 <sup>3</sup> present	9.2	657	3	2 (2-3)
<b>71</b>	■ <u>0 634 950E 7 520 372N</u> (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)
<b>73</b>	■ <u>0 635 934E 7 520 944N</u> (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 <sup>3</sup> )	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 <sup>3</sup> )	4.9	248	3	2 (2-3)
<b>74</b>	■ <u>0 635 775E 7 520 501N</u> (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)
<b>75</b>	■ <u>0 635 385E 7 520 379N</u> (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 B21 under	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)
<b>76</b>	■ <u>0 634 028E 7 521 010N</u> (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 <sup>3</sup>	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 <sup>3</sup>	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)
<b>77</b>	■ <u>0 633 898E 7 521 568N</u> (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 <sup>3</sup> , 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)
<b>78</b>	■ <u>0 634 157E 7 522 090N</u> (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 <sup>3</sup> 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 <sup>3</sup> present	9.2	678	3	2 (2)
80-90	Yellowish brown LC (sandy) B3, no CO <sup>3</sup>	8.8	909	3	2 (2)
<b>79</b>	■ <u>0 633 706E 7 522 541N</u> (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)
<b>83</b>	■ <u>0 634 802E 7 521 593N</u> (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 <sup>3</sup>	8.8	752	3	2-3 (2)
80-90	Strong brown MC B3, no CO <sup>3</sup> present, some tertiary influences	9.3	354	3	2-3 (2)
<b>84</b>	■ <u>0 635 621E 7 521 518N</u> (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)
<b>85</b>	■ <u>0 635 250E 7 522 300N</u> (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 <sup>3</sup> present	-	-	-	-
<b>87</b>	■ <u>0 633 492E 7 520 900N</u> (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 <sup>3</sup>	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)
<b>88</b>	■ <u>0 633 588E 7 521 768N</u> (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 <sup>3</sup>	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)
<b>89</b>	■ <u>0 633 495E 7 522 234N</u> (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 <sup>3</sup>	9.3	300	2-3	0 (1-2)
30-40	Mottled dark brown/dark yellowish brown MC B22, no CO <sup>3</sup>	9.4	701	3	2 (2)
50-60	Yellowish brown LMC (sandy) LMC (sandy) B23, no CO <sup>3</sup>	8.4	1130	3	2 (2)
80-90	As above	7.8	1110	3	2-3 (2-3)
<b>90</b>	■ <u>0 633 499E 7 522 836N</u> (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 <sup>3</sup> present	9.4	687	3	2-3 (2)
<b>91</b>	■ <u>0 634 431E 7 523 277N</u> (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 <sup>3</sup>	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 <sup>3</sup> , some coarse sand	4.9	1326	3	2 (2)
<b>92</b>	■ <u>0 634 806E 7 523 499N</u> (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 <sup>3</sup>	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 <sup>3</sup>	-	-	-	-
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)
<b>93</b>	■ <u>0 634 892E 7 523 885N</u> (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 <sup>3</sup> present	7.3	132	3	1 (2)
50-60	As above	9.2	341	3	1 (2)
<b>94</b>	■ <u>0 634 967E 7 523 218N</u> (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 <sup>3</sup>	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 <sup>3</sup>	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 <sup>3</sup> , possible sediment inclusion?	8.1	972	3	2 (2)
110-120	As above	7.4	979	3	2-3 (2)
<b>95</b>	■ <u>0 634 953E 7 522 907N</u> (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 <sup>3</sup>	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)	-	-	-	-
<b>96</b>	■ <u>0 633 481E 7 523 458N</u> (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)
<b>98</b>	■ <u>0 633 783E 7 523 731N</u> (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)
<b>99</b>	■ <u>0 633 927E 7 523 352N</u> (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 <sup>3</sup>	9.4	727	3	2 (2-3)
80-90	Mottled dark greyish brown/yellowish brown LMC (sandy) B23, no CO <sup>3</sup>	8.6	1028	3	3 (2)
<b>100</b>	■ <u>0 634 483E 7 523 599N</u> (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 <sup>3</sup> present	9.2	406	3	0 (0)
50-60	As above	9.2	554	3	1 (0)
<b>102</b>	■ <u>0 634 611E 7 525 401N</u> (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 <sup>3</sup> below	8.4	401	3	2 (2-3)
80-90	Dark yellowish brown MC B3, soft CO <sup>3</sup> present	9.5	648	3	2 (2-3)
110-120	Mottled greyish brown/yellowish brown parent cainozoic	9.6	777	3	2-3 (2)
<b>103</b>	■ <u>0 634 686E 7 525 075N</u> (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 <sup>3</sup>	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)
<b>104</b>	■ <u>0 634 714E 7 524 711N</u> (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 <sup>3</sup> present (colour lightening)	9.6	475	3	2 (3)
80-90	Brown to strong brown MC (sandy) B3, high soft CO <sup>3</sup> present	9.2	1296	3	0 (1)
110-120	Brown to strong brown MHC cainozoic, high soft CO <sup>3</sup> present	9.3	1090	3	1-2 (2)
<b>105</b>	■ <u>0 634 986E 7 524 348N</u> (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 <sup>3</sup> present	9.3	996	3	1-2 (1)
80-90	Mottled brown/strong brown parent cainozoic, soft CO <sup>3</sup> present	9.4	939	3	1-2 (1-2)
110-120	As above	-	-	-	-
<b>106</b>	■ <u>0 634 613E 7 524 473N</u> (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 <sup>3</sup> present	9.4	893	3	2 (2)
80-90	Mottled grey/brown sandy clay cainozoic, some hard and soft CO <sup>3</sup> present	9.5	929	3	1-2 (2)
110-120	As above	-	-	-	-
<b>107</b>	■ <u>0 634 392E 7 524 205N</u> (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 <sup>3</sup> present	7.9	384	1	0 (2-3)
30-40	Very dark grey MHC B21 with soft CO <sup>3</sup> 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 <sup>3</sup>	9.2	922	3	1 (2)
<b>109</b>	■ <u>0 631 776E 7 530 533N</u> (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)
<b>117</b>	■ <u>0 634 080E 7 524 980N</u> (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)
<b>118</b>	■ <u>0 633 710E 7 524 893N</u> (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)
<b>119</b>	■ <u>0 633 832E 7 524 606N</u> (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 <sup>3</sup> 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 <sup>3</sup> and coarser quartz present	8.8	1391	3	0 (2)
110-120	As above	8.9	1259	3	1 (2)
<b>120</b>	■ <u>0 633 287E 7 525 615N</u> (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)
<b>122</b>	■ <u>0 633 456E 7 525 940N</u> (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)
<b>124</b>	■ <u>0 632 347E 7 526 952N</u> (cracking clay, gilgai to 20cm, shelf profile, weak surface flake, some algal crust and hard CO <sup>3</sup> 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 <sup>3</sup>	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 <sup>3</sup> 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 <sup>3</sup> present	8.0	2503	3	2 (1)
140-150	Slightly mottled light olive brown HC PM, slight hard CO <sup>3</sup> present	8.1	2491	3	2 (1)
<b>125</b>	■ <u>0 631 825E 7 527 410N</u> (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)
<b>126</b>	■ <u>0 632 108E 7 527 125N</u> (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	-	-	-	-
<b>127</b>	■ <u>0 632 594E 7 527 175N</u> (cracking clay, gilgai to 20cm, shelf profile, hardset granular surface, some hard CO <sup>3</sup> 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 <sup>3</sup>	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 <sup>3</sup> present	8.2	2119	3	2-3 (1)
<b>128</b>	■ <u>0 633 014E 7 527 063N</u> (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 <sup>3</sup> )	7.1	61	3	1 (2-3)
110-120	As above	8.0	95	3	0 (2-3)
<b>129</b>	■ <u>0 632 696E 7 527 347N</u> (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 <sup>3</sup> present	8.1	1465	3	0 (0)
80-90	As above, slight hard CO <sup>3</sup> present	8.6	1673	3	2 (0)
110-120	Mottled dark yellowish brown/dark grey MHC parent clays	8.1	1623	3	2 (2)
<b>134</b>	■ <u>0 632 696E 7 527 347N</u> (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 <sup>3</sup> present	8.1	1465	3	0 (0)
80-90	As above, slight hard CO <sup>3</sup> present	8.6	1673	3	2 (0)
110-120	Mottled dark yellowish brown/dark grey MHC parent clays	8.1	1623	3	2 (2)
<b>138</b>	■ <u>0 633 952E 7 525 593N</u> (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 <sup>3</sup>	8.9	1061	3	2-3 (3)
110-120	Brown weakly mottled HC alluvium, with hard CO <sup>3</sup> present	9.1	973	3	2-3 (3)
<b>142</b>	■ <u>0 633 668E 7 527 125N</u> (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)
<b>143</b>	■ <u>0 633 493E 7 527 610N</u> (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)
<b>144</b>	■ <u>0 633 285E 7 528 032N</u> (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 <sup>3</sup>	6.6	91	3	0 (2)
<b>145</b>	■ <u>0 633 147E 7 528 468N</u> (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)
<b>146</b>	■ <u>0 632 940E 7 528 754N</u> (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 <sup>3</sup> below	7.5	304	3	1 (2-3)
50-60	Yellowish brown HC B22, slight hard CO <sup>3</sup>	8.9	683	3	1 (2)

80-90	Yellowish brown parent clays, high hard CO <sup>3</sup>	9.0	1025	3	1 (1)
<b>148</b>	■ <u>0 634 213E 7 527 327N</u> (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 A: SITE DESCRIPTION SUMMARY (GTES, 2012)**

SITE NO	EAST	NORTH	SOIL	DESCRIPTION
1	642377	7508687	B1	<p>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.</p> <p>A1 0-0.05cm Brown (7.5YR4/2), light medium clay, strong granular, no inclusions, field pH 7.5. clear change to;</p> <p>B21 0.05-40cm Dark brown (10YR3/2), medium clay, angular blocky, field pH 7.5, no carbonate nodules, dry, clear change to,</p> <p>B22 40-100cm Dark brown (10YR3/2), medium heavy clay, strong lenticular structure, field pH 8.0, some carbonate nodules, moist, gradual change to,</p> <p>B23 100-120+cm Greyish brown (10YR4/3), medium heavy clay, coarse angular blocky, field pH 8.5, increasing carbonate nodules. Moist.</p>
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 Bullock.
14	643537	7510038	E2	<p>Upper mid slope 2-3% grade. Mt Coolibah soil with occasional Emu Apple. Buffel cover &gt;70%.</p> <p>A1 0-5cm grey black medium clay, 10YR2/1 pH 8.5, strong granular, cracking</p> <p>B21 5-90+cm grey black medium heavy clay 10YR4/1, carbonate nodules. pH 8.5, lenticular.</p>
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	<p>Level plain. Cultivation immediately to east. Dark scrub soil like site 4. Heavy Parthenium infestation in cultivation.</p> <p>0-5cm brown black organic layer 10YR2/1, pH 7.5</p> <p>5-75cm grey black medium clay, 10YR2/1 pH 8.5</p> <p>75-90cm grey black medium heavy clay 10YR4/4, carbonate nodules.</p> <p>90-120cm heavy black clay pH. 8.5</p>
18				Site replaced
19				Site replaced
20				Site replaced
21	640296	7515046	A2	<p>Level plain. Dark brown cracking clay with light surface crust. Probable strip depth 0-40cm. Buffel &gt;50% cover</p> <p>A11 0 – 0.02 Weak sandy crust. Field pH 7.0</p> <p>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;</p> <p>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,</p> <p>B22 50 – 90+ Greyish brown (10YR4/4), medium heavy clay, coarse angular blocky, field pH 8.0, few mottles, dry.</p>
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 nodules, 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, 7.5YR5/4, 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 coarse 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
				<p>A1 0 – 3 Dark 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,</p> <p>B21 3 – 40 Dark (10YR3/1), medium clay, 5mm strong angular blocky, field pH 6.5, no inclusions, moist, clear change to,</p> <p>B22 40 -100+ Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, field pH 5.5, 5% orange mottles.,</p>
118	638593	7516484	B4	<p>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 &lt;0.5%. Surface non cracking with minor gravels. Buffel 50%. This is representative of a very large area.</p> <p>A1 0 – 20cm Brown (10YR5/3), fine sandy clay, weak blocky, field pH 5.5, no inclusions, dry, clear change to,</p> <p>B21 20 – 50cm Dark brown (10YR3/2), medium clay- sandy, strong blocky, field pH 6.5, trace soft carbonate, moist, clear change to,</p> <p>B22 50 -100cm Yellowish brown (10YR5/4), medium heavy clay, very coarse angular blocky, field pH 6.5, no concretions, moist,</p>
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	<p>Grey brown Brigalow clay with melon holes. Level plain.</p> <p>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,</p> <p>B22 55 -80cm. Yellowish brown (10YR5/4), medium heavy clay, hard.</p>
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	<p>Sandy loam under Poplar Box on gentle rise near Phillips Ck.</p> <p>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,</p>
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	<p>Sandy loam with Poplar Box on small rise. Near level.</p> <p>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,</p>
132	641254	7517243	A2	<p>Deep uniform Brigalow clays on level plain. Weak crust &amp; cracking. Cleared Brigalow area. Buffel &gt;70%. Close to exploration drill sump.</p> <p>0-40cm dark chocolate brown clay. 7.5YR3/2, sub ang blocky</p> <p>40-100cm reddish brown medium clay. 8.5, carb, hard angular</p>
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	<p>Poplar Box sandy loam duplex – Poplar box trees. Buffel &gt;70%. Current bush.</p> <p>0-50cm sandy loam, firm surface, 55% cover, 7.5YR5/2, pH 5.0,</p> <p>50 – 90cm Sandy clay, whole coloured reddish brown (5YR4/4), no mottles, well drained. pH 6.0</p>
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	<p>Brown sandy surface with small clumps of Poplar Box nearby.</p> <p>A1 0 – 45cm Reddish Brown (5YR4/3), sandy loam, massive, field pH 5.5, no inclusions, dry,</p> <p>B21 45 -100+cm Yellowish brown (10YR5/4) sandy clay, moderate angular blocky, field pH 8.0, no inclusions,</p>
140	641019	7518696	B3	<p>Cracking Clay. Some Gilgai.</p> <p>0 – 20cm Brown (10YR5/3), fine sandy clay, weak blocky, field pH 7.5, no inclusions, dry, clear change to,</p> <p>20 – 50cm Dark brown (10YR3/2), medium clay- sandy, strong blocky, field pH 7.5, trace soft carbonate, moist, clear change to,</p>



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 nodules, 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 -90cm 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 -90cm 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 110-SCL**

<b>Soil Mapping Unit</b> E2	<b>Location (GDA94 ZONE 56):</b> 644310mE 7508052mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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 No 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/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 0.13-0.38 Abrupt	Medium clay	Moderate, firm <40% 20- 60mm, <20% 60- 100 sub- angular blocky peds	<1% black nodules <1% calcium carbonate nodules	10YR4/2 Dark greyish brown  Nil mottles/bleach	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-	<5% calcium carbonate nodules	10YR4/2 Dark greyish brown  Nil mottles/bleach	Dry, moderate	Very fine, very few	0.60 / 8.0		

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
						angular blocky peds							
				0.82 – 1.00	Light clay	Moderate, firm <20mm, sub- angular blocky peds	<2% calcium carbonate nodules	10YR4/4  Nil mottles	Dry, Imperfect	Very fine, very few	0.90 / 8.0		

**SITE 4 - SCL**

<b>Soil Mapping Unit</b> E2	<b>Location (GDA94 ZONE 56):</b> 643527mE 7507664mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**Landscape****Surface****Soil Profile**

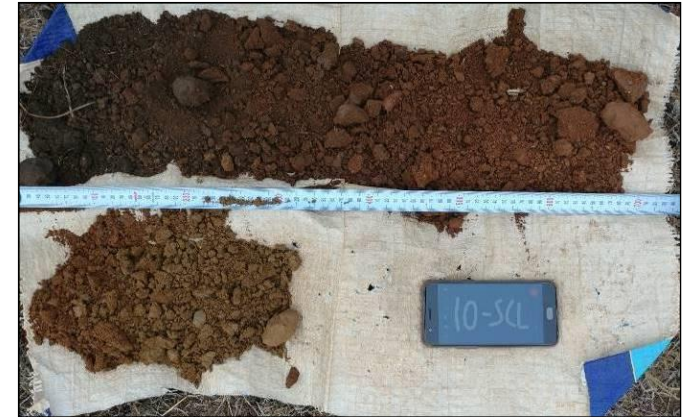
Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m)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



						angular blocky peds							
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**SITE 10-SCL**

<b>Soil Mapping Unit</b> B1	<b>Location (GDA94 ZONE 56):</b> 642525mE 7510097mN	<b>Aust. Soil Class.:</b> Dark Vertisol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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 grayish brown Nil mottles/bleach	Dry, moderate	Few, fine	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 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/bleach	Dry, moderate	Few, fine	0.30 / 7.0		

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
				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	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 91-SCL**

<b>Soil Mapping Unit</b> B1	<b>Location (GDA94 ZONE 56):</b> 643899mE 7510777mN	<b>Aust. Soil Class.:</b> Dark Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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	Cleared, nearby remnant Belah	Nil microrelief Nil 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/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 0.12-0.50 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	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 115-SCL**

<b>Soil Mapping Unit</b> E2	<b>Location (GDA94 ZONE 56):</b> 645410mE 7509123mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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	0.00-0.16 Abrupt	Light clay	Moderate, weak <10mm sub- angular blocky	<2% calcium carbonate nodules	10YR3/2 Very dark grayish brown 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
				0.16-1.00	Medium clay	Strong, firm <10mm sub- angular blocky	Nil inclusions and segregations	10YR3/2 Very dark grayish brown Nil mottles/bleach	Dry, omoderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0 0.90 / 7.5		



**SITE 65-SCL**

<b>Soil Mapping Unit</b> B1	<b>Location (GDA94 ZONE 56):</b> 643019mE 7513552mN	<b>Aust. Soil Class.:</b> Dark Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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 dary 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 0.11-0.80 Abrupt	Medium clay	Moderate, weak <10mm sub- angular	Nil inclusions and segregations	10YR2/2 Very dark brown Nil mottles/bleach	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/bleach	Dry, moderate	Very fine, very few	0.90 / 7.5		

**SITE N1-SCL**

<b>Soil Mapping Unit</b> A2	<b>Location (GDA94 ZONE 56):</b> 641005 mE 7512573 mN	<b>Aust. Soil Class.:</b> Crusting Brown Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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 gentle 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 gray Dark gray brown Nil mottles Nil bleaching	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, firm 10- 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, firm 10- 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	Medium clay	Moderate, firm 10- 30mm sub- angular	2% calcium carbonate nodules	10YR4/2 Dark grayish brown Nil mottles Nil bleaching	Dry, moderate	Very fine, very few	0.90 / 7.5		



**SITE N2-SCL**

<b>Soil Mapping Unit</b> A2	<b>Location (GDA94 ZONE 56):</b> 641096mE 7512914mN	<b>Aust. Soil Class.:</b> Crusting Brown Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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 gray  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 grayish brown  Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0 0.90 / 7.5		

**SITE N3-SCL**

<b>Soil Mapping Unit</b> A2	<b>Location (GDA94 ZONE 56):</b> 641074mE 7513152mN	<b>Aust. Soil Class.:</b> Crusting Brown Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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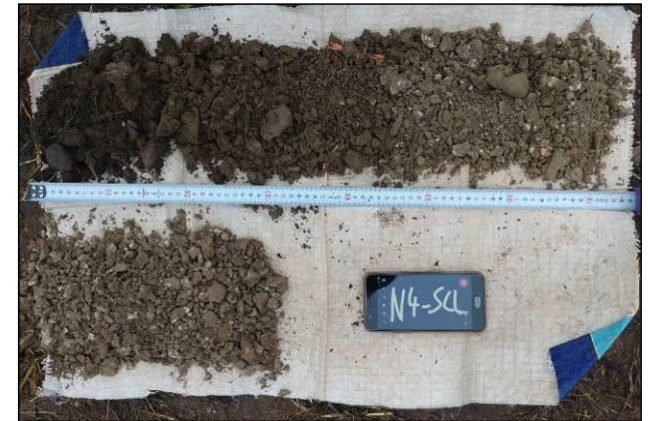
**Landscape****Surface****Soil Profile**

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 0.00-0.16 Abrupt	Light clay	Moderate, soft <10mm sub- angular	Nil inclusions and segregations	10YR3/1 Very dark gray  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 grayish brown  Nil mottles/bleach	Dry, moderate	Very fine, very few	0.30 / 6.5 0.60 / 7.0 0.90 / 7.5		



**SITE N4-SCL**

<b>Soil Mapping Unit</b> B2V	<b>Location (GDA94 ZONE 56):</b> 641871mE 7513601mN	<b>Aust. Soil Class.:</b> Brown Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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 grayish brown Very dark grayish 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 grayish brown Dark grayish brown Nil mottles/bleach	Moderately moist, moderate	Very fine, very few	0.30 / 7.5		
				B22 0.44-1.00	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-SCL**

<b>Soil Mapping Unit</b> B2V	<b>Location (GDA94 ZONE 56):</b> 641792mE 7513825mN	<b>Aust. Soil Class.:</b> Brown Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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	0.00-0.12 Abrupt	Sandy loam	Weak, soft <10mm sub- rounded	Nil inclusions and segregations	10YR3/1 Very dark gray 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
				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		
				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		
				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-SCL**

<b>Soil Mapping Unit</b> B2	<b>Location (GDA94 ZONE 56):</b> 643271mE 7514881mN	<b>Aust. Soil Class.:</b> Brown dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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 grayish 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 gray Very dark gray 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 grayish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 8.5		



**SITE N7-SCL**

<b>Soil Mapping Unit</b> B2	<b>Location (GDA94 ZONE 56):</b> 643071mE 7514453mN	<b>Aust. Soil Class.:</b> Brown dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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 gray 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 gray Very dark gray 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 grayish 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 grayish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 8.0		



**SITE N8-SCL**

<b>Soil Mapping Unit</b> B2	<b>Location (GDA94 ZONE 56):</b> 642368mE 7513895mN	<b>Aust. Soil Class.:</b> Brown dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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 gray 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 gray 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 gray 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 grayish brown Nil mottles/bleach	Dry, moderate	Very fine, very few	0.90 / 7.0		



**SITE N9-SCL**

<b>Soil Mapping Unit</b> B2V	<b>Location (GDA94 ZONE 56):</b> 642032mE 7513619mN	<b>Aust. Soil Class.:</b> Brown Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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, Brigalow, and belah on fenceline, 100 m nearby	Nil microrelief Nil disturbed Nil erosion	Soft, moist, nil coarse fragments	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
				0.09-0.35 Clear	Sandy Loam	Weak, loose	Nil inclusions and segregations	10YR2/1 Black Nil mottles	Dry, moderate	Very fine, very few	0.30 / 7.5		
				0.35-0.55 Abrupt	Medium clay	Moderate, strong, sub- angular <20 mm	Nil inclusions and segregations	10YR2/1 Black Nil mottles	Dry, moderate	Very fine, very few	-		
				0.55-0.85 Abrupt	Medium clay	Moderate, strong, sub- angular <20 mm	<2% calcium carbonate nodules	10YR2/1 Black Nil mottles	Dry, moderate	-	0.60 / 8.5		
				0.85-1.00	Medium clay	Moderate, strong, sub-	Nil inclusions and segregations	10YR3/3 Nil mottles	Dry, moderate	-	0.90 / 7.5		



						angular <20 mm							
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**SITE 18-1**

Site removed due to change in project site layout

**SITE 18-2**

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

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

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

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

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

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

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

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

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

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

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

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

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

<b>Map Unit</b> A2g	<b>Location (GDA94 ZONE 55):</b> 641005 mE 7512573 mN	<b>Aust. Soil Class.:</b> Crusting Grey (minor black) Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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, firm 10- 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, firm 10- 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, firm 10- 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**

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

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

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

<b>Map Unit</b> B2g	<b>Location (GDA94 ZONE 55):</b> 641792mE 7513825mN	<b>Aust. Soil Class.:</b> Black chromosol (with minor grey chromosol variant)	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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	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	0.20-0.30	
				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	0.50-0.60	
				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	0.80-0.90 0.90-1.00	



**SITE N6**

<b>Map Unit</b> B2g	<b>Location (GDA94 ZONE 55):</b> 643271mE 7514881mN	<b>Aust. Soil Class.:</b> Black chromosol (with minor grey chromosol variant)	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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**

<b>Map Unit</b> B2s	<b>Location (GDA94 ZONE 55):</b> 643071mE 7514453mN	<b>Aust. Soil Class.:</b> Black chromosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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**

<b>Map Unit</b> B2s	<b>Location (GDA94 ZONE 55):</b> 642368mE 7513895mN	<b>Aust. Soil Class.:</b> Black chromosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 1/07/2018
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**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

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

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

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

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

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

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

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

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

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

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

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

<b>Map Unit</b> A4c	<b>Location (GDA94 ZONE 55):</b> 642847mE 7513907mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 07/06/2019
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**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	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	0.20-0.30	
				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	0.50-0.60	
				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	-	0.80-0.90	
				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			0.90-1.00	



**SITE N22**

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

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

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

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

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

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

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

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

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

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

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

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

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

<b><u>Land use</u> <u>Landform</u> <u>Pattern,</u> <u>Element,</u> <u>Slope</u></b>	<b><u>Vegetation</u></b>	<b><u>Microrelief</u> <u>Disturbance</u> <u>Erosion</u></b>	<b><u>Surface</u> <u>condition,</u> <u>surface rock</u></b>	<b><u>Soil Profile Description</u></b>									
				<b><u>Horizon</u> <u>Depth (m),</u> <u>Boundary</u></b>	<b><u>Field</u> <u>Texture</u></b>	<b><u>Structure,</u> <u>Strength</u></b>	<b><u>Inclusions</u> <u>Segregations</u></b>	<b><u>Colour, Mottle,</u> <u>Bleaching</u></b>	<b><u>Moisture,</u> <u>Drainage</u></b>	<b><u>Roots</u></b>	<b><u>Depth (m) /</u> <u>Field pH</u></b>	<b><u>Sample (m)</u></b>	<b><u>Observations</u></b>
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**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

<b>Map Unit</b> E1r	<b>Location (GDA94 ZONE 55):</b> 642525mE 7510097mN	<b>Aust. Soil Class.:</b> Red Chromosol (Brown Chromosol sub-dominant)	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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	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	0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	
				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

<b>Map Unit</b> B2bl	<b>Location (GDA94 ZONE 55):</b> 641452mE 7512060mN	<b>Aust. Soil Class.:</b> Black Dermosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 05/06/2019
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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, moderate y 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, moderate y well drained	Nil roots	0.60 / 7.0 0.90 / 6.5		





**SITE 60-SCL**

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

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

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

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

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

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

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

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

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

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

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

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

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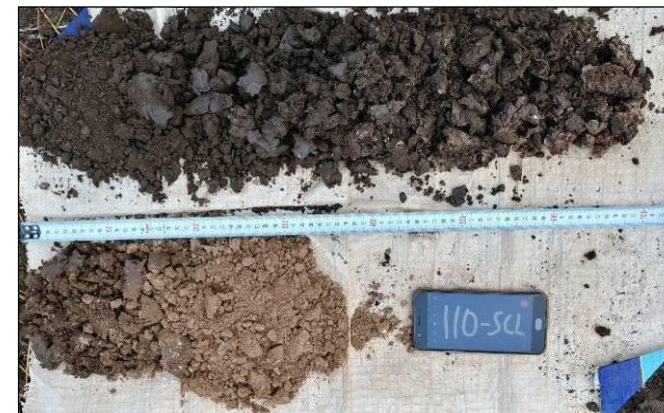
**Landscape****Surface****Soil Profile**

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**

<b>Map Unit</b> E2	<b>Location (GDA94 ZONE 55):</b> 644310mE 7508052mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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	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	0.20-0.30 0.50-0.60	
				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	0.70-0.80	
				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	0.90-1.00	

**SITE 115-SCL**



<b>Map Unit</b> E2	<b>Location (GDA94 ZONE 55):</b> 645410mE 7509123mN	<b>Aust. Soil Class.:</b> Black Vertosol	<b>Site Survey Type:</b> Detailed - 50mm hand auger	<b>Survey Date:</b> 30/06/2018
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**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	B2bl	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	B2bl	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	B2bl	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	B2s	<p>Gently undulating plain, lower slope &lt;2%</p> <p>Limited disturbance, Brigalow</p> <p>Surface – cracking 2-6 mm, light clay, no coarse fragments</p> <p>0.00 – 0.11 m</p> <p>Clay loam</p> <p>Moderate, firm, peds &lt;20 mm</p> <p>10YR3/1</p> <p>0.11 – 0.30+ m</p> <p>Medium clay</p> <p>Moderate, very firm, peds 20-40 mm</p> <p>10YR2/1</p>	 






Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-16	642934 7514283	B2S	<p>Gently undulating plain, mid slope &lt;2%</p> <p>Limited disturbance</p> <p>Surface – cracking 2-6 mm, light clay, no coarse fragments</p> <p>0.00 – 0.11 m</p> <p>Clay loam</p> <p>Moderate, firm, peds &lt;20 mm</p> <p>10YR3/2</p> <p>0.11 – 0.45+ m</p> <p>Medium clay</p> <p>Moderate, very firm, peds 20-40 mm</p> <p>10YR2/1</p>	



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	B2s	<p>Gently undulating plain, upper slope 1%, 2%</p> <p>Limited disturbance, Surface – cracking &lt;2 mm, and self mulching, light clay, no coarse fragments</p> <p>0.00 – 0.11 m Clay loam Moderate, firm, peds &lt;10 mm 10YR3/2</p> <p>0.11 – 0.30 m Medium clay Moderate, subangular blocky, peds &lt;20 mm 10YR2/1</p> <p>0.30 – 0.40+ m Medium clay with &lt;2% calcium carbonate Moderate, subangular blocky, peds &lt;20 mm 10YR2/1</p>	  
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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	<p>Gently undulating plain, upper slope 1%, 1%</p> <p>Surface, soft, minor cracking 2 mm, no coarse fragments</p> <p>Forage cropping disturbance</p> <p>0.00 – 0.09 m</p> <p>Sandy loam, massive, weak, peds &lt;100mm</p> <p>10YR3/2</p> <p>0.09 – 0.30+ m</p> <p>Sandy clay loam, peds &lt;200mm</p> <p>10YR3/2</p>	



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	B2bl	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	<p>Gently undulating plain, upper slope 1%, 1%</p> <p>Surface light clay 10YR3/2, cracking &lt;2 mm, self mulching, no coarse fragments.</p> <p>Gilgai located in area, map boundary</p> <p>Limited disturbance</p> <p>0.00 – 0.20 m</p> <p>Light clay, moderate, 10YR3/2</p> <p>0.20 – 0.40+ m</p> <p>Medium clay, subangular blocky, 10YR3/1</p>	 





Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-41	642161 7510152	E1r	<p>Brown surface colour to the north, change to grey surface colour nearby towards the south</p> <p>Surface - firm, sandy loam, 10YR3/3</p> <p>No coarse fragments, mid slope 1%</p>	 



Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-42	643510 7508834	E2	<p>Gently undulating plain, upper slope 1%, 1%</p> <p>Surface cracking &lt;2 mm, self mulching, no coarse fragments</p> <p>Cropping disturbance</p> <p>0.00 – 0.10 m Light clay, 10YR3/2</p> <p>0.10 – 0.35 m Medium clay, 10YR3/2</p> <p>0.35 – 0.50+ m Medium clay, 10YR4/2</p>	 









Site No.	Location - mE, mN (GDA94 Zone 56)	Map Unit	Comments	Pictures
NC-43	644026 7507963	E2	<p>Gently undulating plain, lower slope 2%, 2%</p> <p>Surface cracking 2-6 mm, no coarse fragments</p> <p>Cropping disturbance</p> <p>0.00 – 0.07 m</p> <p>Light clay, 10YR3/2</p> <p>Weak, peds &lt;10 mm</p> <p>0.07 – 0.50 + m</p> <p>Medium clay, 10YR3/2</p> <p>Moderate, subangular blocky, peds &lt;30 mm</p> <p>very firm</p>	 





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	<p>Gently undulating plain, mid slope 1%</p> <p>Surface - firm, sandy loam, 10YR3/3, no coarse fragments</p> <p>0.00 – 0.10 m Sandy loam 10YR3/3</p> <p>0.10 – 0.42 m Sandy clay loam 5YR4/3</p> <p>0.42 – 0.65 + m Sandy clay loam 7.5Y4/4 &lt;5% calcium carbonate</p>	 




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.	
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.	

## Appendix B – 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
SO <sub>4</sub> (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	---	---	---	---
Ext P (microgram/gram [ug/g])	5	---	---	---	---
Total P (%)	0.012	---	---	---	---
NO <sub>3</sub> (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	--- <sup>1</sup>	---	---
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	--- <sup>1</sup>	---	---
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
SO <sub>4</sub> (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	---	---	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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
SO <sub>4</sub> (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	---	---	---	---
Ext P (ug/g)	15	---	---	---	---
Total P (%)	0.035	---	---	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	--- <sup>1</sup>	---
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	--- <sup>1</sup>	---
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	--- <sup>1</sup>	---
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.

**SMU 5**

**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
SO <sub>4</sub> (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	---	---	---	---
Ext P (ug/g)	12	---	---	---	---
Total P (%)	0.035	---	---	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	--- <sup>1</sup>	---	---
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	---	---	---

<sup>1</sup>---'indicates laboratory analysis was not conducted for this sample.



**SMU 8**

**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
SO <sub>4</sub> (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	--- <sup>1</sup>	---
Ext P (ug/g)	15	---	---
Total P (%)	0.034	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	--- <sup>1</sup>	---
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	---	---

<sup>1</sup>---'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
SO <sub>4</sub> (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	--- <sup>1</sup>	---
Ext P (ug/g)	2	---	---
Total P (%)	0.013	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	--- <sup>1</sup>	---	---
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	---	---	---

<sup>1</sup>---'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
SO <sub>4</sub> (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	---	---	---
Ext P (ug/g)	11	---	---	---
Total P (%)	0.02	---	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	--- <sup>1</sup>	---
Ext P (ug/g)	6	---	---
Total P (%)	0.034	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	---	---	---
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	--- <sup>1</sup>	---
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	---	---

<sup>1</sup>---'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
SO <sub>4</sub> (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	---	---	---	---
Ext P (ug/g)	17	---	---	---	---
Total P (%)	0.009	---	---	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	--- <sup>1</sup>	---	---	---
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	--- <sup>1</sup>	---	---
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	--- <sup>1</sup>	---	---
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	--- <sup>1</sup>	---
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	--- <sup>1</sup>
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	---

<sup>1</sup>---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	--- <sup>1</sup>	---	---	---	---
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	--- <sup>1</sup>
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	--- <sup>1</sup>	---	---
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	---	---	---

<sup>1</sup>---'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
SO <sub>4</sub> (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	--- <sup>1</sup>	---	---	---
Ext P (ug/g)	7	---	---	---	---
Total P (%)	0.016	---	---	---	---
NO <sub>3</sub> (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
SO <sub>4</sub> (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	---	---	---	---
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	--- <sup>1</sup>	---
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

<sup>1</sup>---'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 <i>8.3</i>	7.65 <i>8.4</i>	8.50 <i>8.9</i>	- <i>8.2</i>
Soil EC (dS/m)	0.06 <i>0.2</i>	0.42 <i>2.35</i>	0.95 <i>1.47</i>	- <i>1.39</i>
Chloride (mg/mg)	26 <i>34</i>	598 <i>1744</i>	1239 <i>1716</i>	- <i>1758</i>
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 <i>3.7</i>	0.9 <i>1.0</i>	1.1 <i>0.76</i>	--- <i>0.70</i>
Exchangeable Potassium (meq/100g)	0.58	0.62	0.70	---
Exchangeable Magnesium (meq/100g)	8.48	21.07	24.23	---
Exchangeable Sodium (%)	2.8 <i>1.5</i>	9.3 <i>30.7</i>	10.6 <i>35.7</i>	---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
Ca/Mg (ratio)	2.5	10.4	14.2	20.5	23.2
ESP (%NaCEC)	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
Ca/Mg (ratio)	0.7	1.7	7.4	13.2	17.0
ESP (%NaCEC)	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
Ca/Mg (ratio)	0.2	0.7	7.9	16.0	20.3
ESP (%NaCEC)	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	9.14	9.11	---
	8.5	8.3	8.3	8.3
Soil EC (dS/m)	0.08	0.22	0.33	---
	0.12	0.10	0.22	0.55
Chloride (mg/mg)	18.0	134	312	---
	15	10	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	51.77	56.64	-
	48	48	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	5.0	6.9	---
	1	1	4.0	4.0
Ca:Mg	2.2	1.2	1.0	---
	2.2	1.5	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 <i>8.5</i>	9.3 <i>8.7</i>	9.44 <i>9.0</i>
Soil EC (dS/m)	0.07 <i>0.12</i>	0.11 <i>0.14</i>	0.34 <i>0.34</i>
Chloride (mg/mg)	5.0 <i>&lt; 10</i>	11 <i>&lt; 10</i>	224 <i>150</i>
Nitrate Nitrogen (mg/kg)	2.0	---	---
Phosphorus - Colwell extr (mg/kg)	1.0	---	---
Organic Matter (%)	2.8	---	---
Cation Exchange Capacity (meq/100g)	41.21 <i>20</i>	44.15 <i>18</i>	48.4 <i>19</i>
Exchangeable Potassium (meq/100g)	0.25 <i>0.21</i>	0.25 <i>0.07</i>	0.29 <i>0.06</i>
Exchangeable Magnesium (meq/100g)	7.04 <i>5.3</i>	13.54 <i>10</i>	22.61 <i>14</i>
Exchangeable Sodium (%)	0.5 <i>1.0</i>	2.5 <i>3.0</i>	7.9 <i>8.0</i>
Ca:Mg	4.8 <i>3.6</i>	2.2 <i>1.1</i>	1.0 <i>0.5</i>

'---' 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
Ca/Mg (ratio)	1.8	6.8	7.3	8.3	8.6
ESP (%NaCEC)	1.7	1.1	1.0	0.8	0.7



**SMU B2g**

**Table 40: Soil Chemistry Results for Detailed Site N4 (GTE, 2019)**

	<b>Sample Depth (m)</b>				
<b>Analysis (Unit)</b>	<b>0.00-0.10</b>	<b>0.20-0.30</b>	<b>0.50-0.60</b>	<b>0.80-0.90</b>	<b>0.90-1.00</b>
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	3	5	8	9

**SMU B2b1**

**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 <i>8.7</i>	8.74 <i>9.3</i>	8.81 <i>9.5</i>	--- <i>8.3</i>
Soil EC (dS/m)	0.06 <i>0.11</i>	0.22 <i>0.53</i>	0.36 <i>0.71</i>	--- <i>0.95</i>
Chloride (mg/mg)	16 <i>6</i>	114 <i>316</i>	321 <i>594</i>	--- <i>1104</i>
Nitrate Nitrogen (mg/kg)	9	---	---	---
Phosphorus - Colwell extr (mg/kg)	10	---	---	---
Organic Matter (%)	2.0	---	---	---
Exchangeable Potassium (meq/100g)	0.62 <i>0.4</i>	0.40 <i>0.11</i>	0.39 <i>0.15</i>	--- <i>0.13</i>
Exchangeable Magnesium (meq/100g)	7.38 <i>8.8</i>	11.35 <i>17</i>	12.98 <i>19</i>	--- <i>21</i>
Cation Exchange (meq/100g)	27.41 <i>32</i>	37.03 <i>36</i>	35.08 <i>34</i>	--- <i>33</i>
Ca:Mg	2.6 <i>3.6</i>	2.0 <i>0.8</i>	1.3 <i>0.4</i>	--- <i>0.4</i>
Exchangeable Sodium (%)	1.6 <i>3</i>	7.5 <i>9.7</i>	12.1 <i>19.4</i>	--- <i>22.7</i>

'---' 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 <i>8.0</i>	8.9 <i>8.7</i>	8.12 <i>8.5</i>	--- <i>8.3</i>
Soil EC (dS/m)	0.07 <i>0.14</i>	0.22 <i>0.26</i>	0.41 <i>0.57</i>	--- <i>1.18</i>
Chloride (mg/mg)	46 <i>20</i>	279 <i>120</i>	476 <i>560</i>	--- <i>1475</i>
Nitrate Nitrogen (mg/kg)	11	---	---	---
Phosphorus - Colwell extr (mg/kg)	21	---	---	---
Organic Matter (%)	1.2	---	---	---
Exchangeable Sodium (%)	5.1 <i>3</i>	9.1 <i>9</i>	12.2 <i>14</i>	--- <i>16</i>
Exchangeable Potassium (meq/100g)	0.76 <i>0.7</i>	0.50 <i>0.2</i>	0.47 <i>0.2</i>	--- <i>0.2</i>
Exchangeable Magnesium (meq/100g)	14.62 <i>11</i>	13.46 <i>15</i>	14.21 <i>16</i>	--- <i>17</i>
Cation Exchange (meq/100g)	35.01 <i>32</i>	34.39 <i>36</i>	33.91 <i>34</i>	--- <i>33</i>

	Sample Depth (cm)			
Analysis (Unit)	0-10	20-30	40-50	75-100
Ca:Mg	1.1	1.3	1.1	---
	1.9	1.2	0.9	0.7

'---' indicates laboratory analysis was not conducted for this sample.



**SMU B3bI**

**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
Ca/Mg (ratio)	0.3	0.9	5.5	8.3	12.7
ESP (%NaCEC)	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 <i>6.0</i>	8.15 <i>6.8</i>	6.90 <i>6.9</i>
Soil EC (dS/m)	0.01 <i>0.02</i>	0.01 <i>0.02</i>	0.01 <i>0.01</i>
Chloride (mg/mg)	2.0 <i>10</i>	1.0 <i>10</i>	1.0 <i>10</i>
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 <i>5.5</i>	3.9 <i>0.5</i>	2.3 <i>1.0</i>

'---' 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 <i>8.3</i>	9.0 <i>8.6</i>	8.8 <i>8.6</i>	--- <i>8.6</i>
Soil EC (dS/m)	0.04 <i>0.12</i>	0.16 <i>0.11</i>	0.42 <i>0.6</i>	--- <i>0.6</i>
Chloride (mg/mg)	6.0 <i>&lt; 10</i>	33.0 <i>30</i>	564 <i>600</i>	--- <i>570</i>
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 <i>42</i>	55.38 <i>45</i>	64.96 <i>46</i>	--- <i>60</i>
Ca:Mg	1.7 <i>1.7</i>	1.4 <i>1.2</i>	1.2 <i>0.96</i>	--- <i>0.88</i>

'---' 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 <i>6.4</i>	6.4 <i>6.6</i>	7.8 <i>7.9</i>
Soil EC (dS/m)	0.02 <i>0.02</i>	0.07 <i>0.07</i>	--- <i>0.16</i>
Nitrate Nitrogen (mg/kg)	<1.0	---	---
Chloride (mg/mg)	13 <i>10</i>	15 <i>30</i>	- <i>165</i>
Organic Matter (%)	2.4	---	---
Phosphorus - Colwell extr (mg/kg)	9.0	---	---
Potassium (mg/kg)	130	---	---
Exchangeable Calcium (meq/100)	3 <i>1.6</i>	10.77 <i>5.2</i>	--- <i>3.8</i>
Exchangeable Sodium (%)	0.9 <i>1.0</i>	3.8 <i>6.0</i>	--- <i>10</i>
Exchangeable Potassium (meq/100g)	0.35 <i>0.34</i>	0.58 <i>0.83</i>	--- <i>0.45</i>
Exchangeable Magnesium (meq/100g)	1.04 <i>0.8</i>	1.52 <i>6.4</i>	--- <i>7.2</i>
Cation Exchange Capacity (meq/100g)	4.4 <i>3</i>	23 <i>13</i>	--- <i>14</i>
Ca:Mg ratio	2.9 <i>2.0</i>	1.0 <i>0.8</i>	--- <i>0.5</i>

'---'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**

**Phone: 0403245560**

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References: I2733

Sheet 1 of 4

Date Received: 13/06/2019

Date Completed: 14/07/2019

**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

Soil Analysis Report  
Batch Numbers: I2733Date 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-	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-	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-	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-	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-	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	N25-0.22-0.3	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
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	N26-0.83-0.9	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	N25-0.22-0.3	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%	
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	N26-0.83-0.9	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%	

## METHOD DESCRIPTIONS

## Soil

Reference: I2733

Page 3 of 4

## 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&gt;0.3dS/m).



QUALITY CONTROL DATA

Soil

Reference: I2733  
Page: 4 of 4

\* Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)

			Actual Value	Acceptance Criteria
Test Method	Units			[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

			Actual Value	Acceptance Criteria
Test Method	Units	Test Soil		[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](mailto:e.s.s.a@bigpond.net.au)**

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References: I3569

Sheet 1 of 4

Date Received: 09/07/2019

Date Completed: 31/07/2019

**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

Soil Analysis Report  
Batch Number: I3569Date 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	N45-0.0-0.05	8.36	0.115	14	22.54	3.74	0.27	0.08	26.63	0.3	6.0
I3569/2	N45-0.25-0.3	8.80	0.164	40	15.73	10.28	0.13	1.41	27.55	5.1	1.5
I3569/3	N45-0.5-0.6	8.92	0.445	333	12.80	15.36	0.24	3.47	31.88	10.9	0.8
I3569/4	N45-0.8-0.9	8.93	0.824	803	10.26	14.78	0.27	3.83	29.14	13.1	0.7
I3569/5	N45-0.9-1.0	8.94	0.827	840	10.67	15.68	0.28	3.96	30.59	12.9	0.7
I3569/6	N28-0.0-0.05	8.10	0.107	13	18.46	2.54	0.41	0.06	21.46	0.3	7.3
I3569/7	N28-0.2-0.3	8.46	0.089	23	15.14	5.85	0.23	0.42	21.65	2.0	2.6
I3569/8	N28-0.5-0.6	8.99	0.346	227	12.50	15.12	0.33	2.88	30.84	9.4	0.8
I3569/9	N28-0.8-0.9	9.09	0.588	522	8.67	13.10	0.28	2.79	24.84	11.2	0.7
I3569/10	N28-0.9-1.0	9.04	0.701	686	9.03	14.19	0.32	3.24	26.78	12.1	0.6
I3569/11	N43-0.0-0.1	8.26	0.122	16	17.36	3.28	0.49	0.06	21.19	0.3	5.3
I3569/12	N43-0.2-0.3	8.27	0.090	17	15.98	5.30	0.37	0.19	21.84	0.9	3.0
I3569/13	N43-0.5-0.6	8.79	0.258	157	13.55	11.83	0.24	1.48	27.10	5.5	1.1
I3569/14	N43-0.8-0.9	9.04	0.376	270	10.08	12.97	0.39	2.12	25.56	8.3	0.8
I3569/15	N43-0.9-1.0	8.93	0.827	910	9.14	15.09	0.49	3.59	28.30	12.7	0.6
I3569/16	N29-0.0-0.10	8.69	0.097	8	..	..	..	..	..	..	..
I3569/17	N29-0.2-0.3	8.87	0.123	13	..	..	..	..	..	..	..
I3569/18	N29-0.5-0.6	9.18	0.178	30	..	..	..	..	..	..	..
I3569/19	N29-0.8-0.9	9.39	0.256	18	..	..	..	..	..	..	..
I3569/20	N29-0.9-1.0	9.42	0.344	14	..	..	..	..	..	..	..
I3569/21	N30-0.0-0.1	8.35	0.113	24	..	..	..	..	..	..	..
I3569/22	N30-0.2-0.3	8.80	0.117	11	..	..	..	..	..	..	..
I3569/23	N30-0.5-0.6	9.21	0.183	14	..	..	..	..	..	..	..
I3569/24	N30-0.8-0.9	9.41	0.223	17	..	..	..	..	..	..	..
I3569/25	N30-0.9-1.0	9.07	0.172	11	..	..	..	..	..	..	..
I3569/26	N34-0.0-0.1	9.06	0.170	24	..	..	..	..	..	..	..
I3569/27	N34-0.2-0.3	8.88	0.099	14	..	..	..	..	..	..	..
I3569/28	N34-0.5-0.6	9.19	0.182	11	..	..	..	..	..	..	..
I3569/29	N34-0.8-0.9	9.41	0.233	22	..	..	..	..	..	..	..
I3569/30	N34-0.9-1.0	9.48	0.285	25	..	..	..	..	..	..	..
I3569/31	N31-0.0-0.1	8.54	0.084	12	..	..	..	..	..	..	..
I3569/32	N31-0.2-0.3	8.34	0.082	21	..	..	..	..	..	..	..
I3569/33	N31-0.5-0.6	8.44	0.167	18	..	..	..	..	..	..	..
I3569/34	N31-0.8-0.9	8.88	0.112	21	..	..	..	..	..	..	..
I3569/35	N31-0.9-1.0	9.02	0.178	12	..	..	..	..	..	..	..
I3569/36	N32-0.0-0.1	8.32	0.138	16	..	..	..	..	..	..	..
I3569/37	N32-0.2-0.3	8.51	0.146	15	..	..	..	..	..	..	..
I3569/38	N32-0.5-0.6	8.90	0.190	16	..	..	..	..	..	..	..
I3569/39	N32-0.8-0.9	9.12	0.226	14	..	..	..	..	..	..	..
I3569/40	N32-0.9-1.0	9.11	0.246	14	..	..	..	..	..	..	..
I3569/41	N33-0.0-0.1	8.22	0.079	24	..	..	..	..	..	..	..
I3569/42	N33-0.2-0.3	8.92	0.196	15	..	..	..	..	..	..	..
I3569/43	N33-0.5-0.6	9.23	0.248	11	..	..	..	..	..	..	..
I3569/44	N33-0.8-0.9	8.71	0.091	14	..	..	..	..	..	..	..
I3569/45	N33-0.9-1.0	9.27	0.300	12	..	..	..	..	..	..	..
I3569/46	N35-0.0-0.04	8.70	0.091	7	..	..	..	..	..	..	..
I3569/47	N35-0.2-0.3	8.68	0.140	24	..	..	..	..	..	..	..
I3569/48	N35-0.5-0.6	8.99	0.214	33	..	..	..	..	..	..	..
I3569/49	N35-0.8-0.9	9.10	0.261	75	..	..	..	..	..	..	..
I3569/50	N35-0.9-1.0	9.12	0.353	149	..	..	..	..	..	..	..
I3569/51	N36-0.0-0.05	8.69	0.090	11	..	..	..	..	..	..	..
I3569/52	N36-0.2-0.3	8.46	0.133	32	..	..	..	..	..	..	..
I3569/53	N36-0.5-0.6	8.50	0.117	25	..	..	..	..	..	..	..
I3569/54	N36-0.8-0.9	8.80	0.190	39	..	..	..	..	..	..	..
I3569/55	N36-0.9-1.0	8.90	0.248	66	..	..	..	..	..	..	..
I3569/56	N37-0.0-0.05	8.70	0.089	8	..	..	..	..	..	..	..
I3569/57	N37-0.2-0.3	8.67	0.120	17	..	..	..	..	..	..	..
I3569/58	N37-0.5-0.6	8.86	0.118	24	..	..	..	..	..	..	..
I3569/59	N37-0.8-0.9	8.99	0.233	49	..	..	..	..	..	..	..
I3569/60	N37-0.9-1.0	9.04	0.288	99	..	..	..	..	..	..	..
I3569/61	N38-0.0-0.1	8.03	0.091	37	..	..	..	..	..	..	..
I3569/62	N38-0.2-0.3	7.72	0.068	68	..	..	..	..	..	..	..
I3569/63	N38-0.5-0.6	8.04	0.168	221	..	..	..	..	..	..	..
I3569/64	N38-0.8-0.9	8.59	0.543	640	..	..	..	..	..	..	..
I3569/65	N38-0.9-1.0	8.59	0.615	802	..	..	..	..	..	..	..
I3569/66	N39-0.0-0.1	7.69	0.058	18	..	..	..	..	..	..	..
I3569/67	N39-0.2-0.3	7.90	0.051	33	..	..	..	..	..	..	..
I3569/68	N39-0.5-0.6	8.49	0.173	220	..	..	..	..	..	..	..
I3569/69	N39-0.8-0.9	8.75	0.443	534	..	..	..	..	..	..	..
I3569/70	N39-0.9-1.0	8.74	0.561	562	..	..	..	..	..	..	..
I3569/71	N40-0.0-0.1	7.92	0.056	8	..	..	..	..	..	..	..
I3569/72	N40-0.2-0.3	8.76	0.133	11	..	..	..	..	..	..	..
I3569/73	N40-0.5-0.6	9.04	0.235	107	..	..	..	..	..	..	..
I3569/74	N40-0.8-0.9	8.98	0.426	384	..	..	..	..	..	..	..
I3569/75	N40-0.9-1.0	8.80	0.628	669	..	..	..	..	..	..	..
I3569/76	N41-0.0-0.1	7.27	0.036	9	9.77	4.81	0.16	0.16	14.90	1.1	2.0
I3569/77	N41-0.2-0.3	7.70	0.049	9	6.73	4.20	0.41	0.09	11.44	0.8	1.6
I3569/78	N41-0.5-0.6	7.95	0.036	9	5.86	5.00	0.55	0.22	11.63	1.9	1.2
I3569/79	N41-0.8-0.9	8.28	0.060	12	6.10	6.29	0.50	0.41	13.31	3.1	1.0
I3569/80	N41-0.9-1.0	8.51	0.170	17	8.21	7.32	0.45	0.37	16.35	2.3	1.1
I3569/81	N42-0.0-0.1	7.02	0.035	8	9.03	3.99	0.16	<0.065	13.23	0.4	2.3
I3569/82	N42-0.2-0.3	7.79	0.025	9	8.00	4.51	0.37	0.05	12.92	0.4	1.8
I3569/83	N42-0.5-0.6	7.97	0.027	7	5.84	4.45	0.37	0.15	10.81	1.4	1.3
I3569/84	N42-0.8-0.9	8.32	0.066	12	6.26	5.93	0.40	0.36	12.95	2.7	1.1
I3569/85	N42-0.9-1.0	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 Saraji Part 2 Results Page 2 of 2

Lab No	Sample No	ADMC	Gravel	CS>50µm	CS>20µm	2-50µm-Silt	2-20µm-Silt	Clay <2µm	15 Bar
	Depth (m)	%	%	%	%	%	%	%	%
I3569/1	N45-0.0-0.05	10	0	56	61	19	13	25	
I3569/2	N45-0.25-0.3	14	0	51	57	12	6	37	
I3569/3	N45-0.5-0.6	17	1	42	44	7	5	51	
I3569/4	N45-0.8-0.9	16	3	48	52	9	5	42	
I3569/5	N45-0.9-1.0	17	1	40	44	8	5	51	
I3569/6	N28-0.0-0.05	9	0	67	72	14	9	20	17
I3569/7	N28-0.2-0.3	11	1	60	66	11	6	29	17
I3569/8	N28-0.5-0.6	16	2	38	48	16	6	46	25
I3569/9	N28-0.8-0.9	14	3	51	55	11	7	38	22
I3569/10	N28-0.9-1.0	14	4	42	49	14	7	44	22
I3569/11	N43-0.0-0.1	8	0	62	67	11	6	27	15
I3569/12	N43-0.2-0.3	10	1	61	64	9	6	30	15
I3569/13	N43-0.5-0.6	14	1	48	52	10	6	42	23
I3569/14	N43-0.8-0.9	13	3	49	51	9	7	42	21
I3569/15	N43-0.9-1.0	13	2	47	51	10	6	43	21
I3569/16	N29-0.0-0.10	15	1	45	50	14	8	41	
I3569/17	N29-0.2-0.3	16	2	51	57	12	6	37	
I3569/18	N29-0.5-0.6	15	5	50	53	11	7	40	
I3569/19	N29-0.8-0.9	18	2	40	44	14	10	46	
I3569/20	N29-0.9-1.0	19	2	41	45	15	11	44	
I3569/21	N30-0.0-0.1	19	1	42	47	12	6	46	
I3569/22	N30-0.2-0.3	17	1	50	61	18	7	32	
I3569/23	N30-0.5-0.6	16	6	48	57	13	4	40	
I3569/24	N30-0.8-0.9	16	6	41	54	18	5	41	
I3569/25	N30-0.9-1.0	18	4	47	58	13	3	39	
I3569/26	N34-0.0-0.1	11	1	51	55	11	7	38	
I3569/27	N34-0.2-0.3	14	1	48	59	16	5	36	
I3569/28	N34-0.5-0.6	15	2	52	64	14	1	35	
I3569/29	N34-0.8-0.9	17	4	39	52	19	6	42	
I3569/30	N34-0.9-1.0	17	3	41	49	19	10	41	
I3569/31	N31-0.0-0.1	15	0	38	57	20	0	43	
I3569/32	N31-0.2-0.3	22	0	35	49	22	8	43	
I3569/33	N31-0.5-0.6	21	0	29	39	21	11	50	
I3569/34	N31-0.8-0.9	21	0	34	40	12	6	53	
I3569/35	N31-0.9-1.0	21	0	35	41	12	6	53	
I3569/36	N32-0.0-0.1	19	0	51	54	11	8	38	
I3569/37	N32-0.2-0.3	21	1	35	50	21	6	44	
I3569/38	N32-0.5-0.6	21	1	44	51	13	7	42	
I3569/39	N32-0.8-0.9	21	2	33	41	18	10	49	
I3569/40	N32-0.9-1.0	22	2	33	40	16	10	51	
I3569/41	N33-0.0-0.1	17	0	47	51	11	8	42	
I3569/42	N33-0.2-0.3	21	1	46	52	14	8	40	
I3569/43	N33-0.5-0.6	20	4	29	45	16	0	55	
I3569/44	N33-0.8-0.9	18	5	29	39	20	11	51	
I3569/45	N33-0.9-1.0	19	3	27	38	19	8	54	
I3569/46	N35-0.0-0.04	17	1	40	47	13	5	47	
I3569/47	N35-0.2-0.3	20	0	42	45	11	7	47	
I3569/48	N35-0.5-0.6	24	0	39	39	6	5	55	
I3569/49	N35-0.8-0.9	25	6	37	41	11	7	52	
I3569/50	N35-0.9-1.0	24	9	33	36	14	11	53	
I3569/51	N36-0.0-0.05	17	1	44	49	12	8	44	
I3569/52	N36-0.2-0.3	20	0	42	41	12	12	47	
I3569/53	N36-0.5-0.6	26	0	40	42	11	9	49	
I3569/54	N36-0.8-0.9	26	0	25	24	14	15	61	
I3569/55	N36-0.9-1.0	25	1	31	35	16	12	54	
I3569/56	N37-0.0-0.05	13	1	50	49	5	6	45	23
I3569/57	N37-0.2-0.3	20	0	46	50	11	7	44	28
I3569/58	N37-0.5-0.6	23	0	40	53	16	2	44	31
I3569/59	N37-0.8-0.9	24	0	51	56	7	2	42	35
I3569/60	N37-0.9-1.0	26	4	31	36	6	1	63	35
I3569/61	N38-0.0-0.1	16	2	59	60	4	4	36	
I3569/62	N38-0.2-0.3	15	1	55	57	4	2	41	
I3569/63	N38-0.5-0.6	14	2	58	58	5	5	37	
I3569/64	N38-0.8-0.9	14	2	49	53	11	8	40	
I3569/65	N38-0.9-1.0	14	1	50	54	8	4	43	
I3569/66	N39-0.0-0.1	15	1	47	52	12	7	41	
I3569/67	N39-0.2-0.3	15	1	43	45	11	9	46	
I3569/68	N39-0.5-0.6	12	5	55	60	12	8	32	
I3569/69	N39-0.8-0.9	13	2	49	51	5	3	46	
I3569/70	N39-0.9-1.0	13	1	56	57	7	6	37	
I3569/71	N40-0.0-0.1	15	2	46	49	12	8	43	
I3569/72	N40-0.2-0.3	15	2	45	50	15	9	40	
I3569/73	N40-0.5-0.6	15	3	38	46	17	9	45	
I3569/74	N40-0.8-0.9	15	3	42	46	11	7	47	
I3569/75	N40-0.9-1.0	15	3	33	41	19	11	48	
I3569/76	N41-0.0-0.1	9	1	71	71	7	6	23	
I3569/77	N41-0.2-0.3	11	3	57	63	10	4	33	
I3569/78	N41-0.5-0.6	10	5	53	53	12	13	34	
I3569/79	N41-0.8-0.9	12	1	76	81	8	3	15	
I3569/80	N41-0.9-1.0	10	2	51	55	14	10	35	
I3569/81	N42-0.0-0.1	9	1	73	77	8	5	19	12
I3569/82	N42-0.2-0.3	11	3	55	59	9	6	35	15
I3569/83	N42-0.5-0.6	11	4	55	61	8	2	37	16
I3569/84	N42-0.8-0.9	11	2	52	57	11	6	37	18
I3569/85	N42-0.9-1.0	12	2	53	56	10	6	38	18



## METHOD DESCRIPTIONS

## Soil

Reference: I3569

Page 3 of 4

## 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&gt;0.3dS/m).

QUALITY CONTROL DATA

Soil

Reference: I3569  
Page: 4 of 4

\* Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)

			Actual Value	Acceptance Criteria
Test Method	Units			[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

			Actual Value	Acceptance Criteria
Test Method	Units	Test Soil		[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](mailto:e.s.s.a@bigpond.net.au)**

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References: H2096

Sheet 1 of 4

Date Received: 06/07/2018

Date Completed: 25/07/2018

**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

Soil Analysis Report  
Batch Numbers: H2096Date 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	Ca/Mg	ESP
	depth (m)		dS/m	mg/kg		meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	Ratio	%Na/CEC
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	N1-0.0-0.1	7.96	0.16	23								
H2096/32	N1-0.2-0.3	8.23	0.14	82								
H2096/33	N1-0.5-0.6	8.29	0.47	384								
H2096/34	N1-0.8-0.9	8.25	0.52	582								
H2096/35	N1-0.9-1.0	8.22	0.58	669								
H2096/36	N2-0.0-0.1	7.67	0.13	39								
H2096/37	N2-0.2-0.3	8.23	0.12	59								
H2096/38	N2-0.5-0.6	8.52	0.10	50								
H2096/39	N2-0.8-0.9	8.47	0.15	73								
H2096/40	N2-0.9-1.0	8.48	0.18	114								
H2096/41	N3-0.0-0.1	7.78	0.12	35								
H2096/42	N3-0.2-0.3	8.34	0.08	15								
H2096/43	N3-0.5-0.6	8.52	0.10	14								
H2096/44	N3-0.8-0.9	8.61	0.15	14								
H2096/45	N3-0.9-1.0	8.66	0.17	21		11.09	7.08	0.22	0.86	19.2	1.6	4
H2096/46	N4-0.0-0.1	7.57	0.25	28		9.04	4.50	0.91	0.18	14.6	2.0	1
H2096/47	N4-0.2-0.3	8.06	0.11	30		13.00	8.04	0.19	0.65	21.9	1.6	3
H2096/48	N4-0.5-0.6	9.23	0.27	140		9.34	10.33	0.06	1.14	20.9	0.9	5
H2096/49	N4-0.8-0.9	9.24	0.43	280		7.70	11.55	0.08	1.63	21.0	0.7	8
H2096/50	N4-0.9-1.0	9.18	0.54	514		7.79	12.78	0.07	1.92	22.6	0.6	9
H2096/51	N5-0.0-0.1	6.82	0.09	63		11.53	5.73	1.23	0.10	18.6	2.0	1
H2096/52	N5-0.2-0.3	8.05	0.09	15		16.60	10.13	0.24	0.87	27.8	1.6	3
H2096/53	N5-0.5-0.6	9.03	0.34	201		15.55	17.77	0.09	3.19	36.6	0.9	9
H2096/54	N5-0.8-0.9	9.04	0.71	649		12.21	17.99	0.03	3.56	33.8	0.7	11
H2096/55	N5-0.9-1.0	9.03	0.78	918		11.19	17.41	0.04	3.34	32.0	0.6	10
H2096/56	N6-0.0-0.1	7.15	0.11	9		24.76	12.10	0.74	0.37	38.0	2.0	1
H2096/57	N6-0.2-0.3	8.27	0.22	7		22.26	12.16	0.11	1.66	36.2	1.8	5
H2096/58	N6-0.5-0.6	8.94	0.46	320		20.31	16.39	0.02	5.19	41.9	1.2	12
H2096/59	N6-0.77-0.87	8.66	1.06	1429		18.88	18.62	0.09	6.13	43.7	1.0	14
H2096/60	N6-0.9-1.0	8.68	1.08	1213		17.42	17.46	0.05	5.09	40.0	1.0	13
H2096/61	N7-0.0-0.1	7.61	0.11	21		17.28	6.41	0.17	0.28	24.1	2.7	1
H2096/62	N7-0.2-0.3	8.52	0.10	50		17.58	8.15	0.08	0.57	26.4	2.2	2
H2096/63	N7-0.5-0.6	9.15	0.43	306		12.73	15.60	0.03	2.70	31.1	0.8	9
H2096/64	N7-0.8-0.9	8.90	1.02	980		12.12	19.17	0.02	4.63	35.9	0.6	13
H2096/65	N7-0.9-1.0	8.80	1.16	1014		13.39	21.72	0.05	5.38	40.5	0.6	13
H2096/66	N8-0.0-0.1	7.29	0.06	15		15.30	9.66	0.41	0.12	25.5	1.6	0
H2096/67	N8-0.2-0.3	8.87	0.16	82		15.69	14.97	0.07	1.33	32.1	1.0	4
H2096/68	N8-0.5-0.6	9.37	0.35	166		13.74	22.47	0.09	4.52	40.8	0.6	11
H2096/69	N8-0.8-0.9	9.16	0.81	643		11.56	23.51	0.09	5.45	40.6	0.5	13
H2096/70	N8-0.9-1.0	8.98	1.02	949		13.44	28.20	0.10	6.36	48.1	0.5	13
H2096/71	N9-0.0-0.1	7.77	0.23	12		10.73	5.32	0.66	0.26	17.0	2.0	2
H2096/72	N9-0.2-0.3	7.90	0.09	6		10.99	6.93	0.08	0.84	18.8	1.6	4
H2096/73	N9-0.55-0.65	9.20	0.40	235		12.80	16.78	0.03	3.26	32.9	0.8	10
H2096/74	N9-0.75-0.85	9.14	0.62	543		8.86	13.84	0.04	2.68	25.4	0.6	11
H2096/75	N9-0.9-1.0	9.01	0.90	929		9.62	16.95	0.02	3.25	29.8	0.6	11



**Soil Analysis Report**  
**Batch Numbers: H2096**

**Date Received: 06/07/2018**  
**Date Completed: 25/07/2018**

**Client: GTE Saraji Results Page 2 of 2**

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	N1-0.0-0.1	23.4	0.0	20.7	23.4	20.8	18.1	58.5	31
H2096/32	N1-0.2-0.3	16.1	0.0	16.5	24.0	19.3	11.8	64.2	33
H2096/33	N1-0.5-0.6	17.6	0.0	9.5	12.5	27.4	24.3	63.1	34
H2096/34	N1-0.8-0.9	17.8	0.4	14.2	13.6	18.6	19.2	67.2	34
H2096/35	N1-0.9-1.0	17.7	0.4	6.1	13.1	31.2	24.2	62.7	34
H2096/36	N2-0.0-0.1	16.1	0.0	33.1	42.2	20.8	11.6	46.1	30
H2096/37	N2-0.2-0.3	13.6	0.3	27.0	32.2	23.3	18.1	49.7	30
H2096/38	N2-0.5-0.6	13.8	0.1	21.3	27.7	25.0	18.7	53.7	31
H2096/39	N2-0.8-0.9	15.3	0.7	25.8	36.0	22.8	12.6	51.4	31
H2096/40	N2-0.9-1.0	15.5	0.3	25.0	32.1	24.0	16.9	51.0	31
H2096/41	N3-0.0-0.1	22.4	0.0	9.9	38.0	37.8	9.7	52.3	30
H2096/42	N3-0.2-0.3	14.4	0.4	25.2	32.4	24.0	16.9	50.8	29
H2096/43	N3-0.5-0.6	14.5	0.7	33.1	40.5	18.7	11.3	48.2	29
H2096/44	N3-0.8-0.9	14.8	0.3	20.7	37.8	26.8	9.7	52.6	29
H2096/45	N3-0.9-1.0	14.9	0.5	21.3	33.2	28.6	16.8	50.0	29
H2096/46	N4-0.0-0.1	12.2	0.7	76.4	93.2	17.9	1.1	5.7	11
H2096/47	N4-0.2-0.3	9.1	0.2	56.3	66.2	17.3	7.5	26.3	16
H2096/48	N4-0.5-0.6	8.1	0.4	56.0	65.6	21.5	12.0	22.5	14
H2096/49	N4-0.8-0.9	7.8	0.3	58.5	60.7	18.2	16.0	23.3	15
H2096/50	N4-0.9-1.0	8.3	0.5	50.1	59.3	26.8	17.6	23.1	14
H2096/51	N5-0.0-0.1	16.9	0.3	78.3	78.6	7.6	7.3	14.1	14
H2096/52	N5-0.2-0.3	11.0	1.2	62.8	67.0	14.6	10.3	22.6	18
H2096/53	N5-0.5-0.6	9.3	1.3	65.5	65.0	7.0	7.5	27.5	20
H2096/54	N5-0.8-0.9	10.9	2.1	63.1	62.2	4.0	5.0	32.9	20
H2096/55	N5-0.9-1.0	11.2	1.6	55.7	61.6	15.2	9.3	29.1	21
H2096/56	N6-0.0-0.1	22.8	0.1	51.2	54.4	22.5	19.3	26.2	22
H2096/57	N6-0.2-0.3	13.9	0.0	48.3	56.7	21.5	13.1	30.2	23
H2096/58	N6-0.5-0.6	16.5	0.1	21.8	29.0	27.2	20.1	51.0	31
H2096/59	N6-0.77-0.87	15.9	1.6	32.0	36.9	30.8	25.9	37.2	26
H2096/60	N6-0.9-1.0	14.7	4.3	40.5	47.5	23.2	16.3	36.3	22
H2096/61	N7-0.0-0.1	25.9	1.1	64.1	64.1	12.4	12.4	23.5	14
H2096/62	N7-0.2-0.3	9.8	1.4	52.5	66.7	24.2	9.9	23.3	17
H2096/63	N7-0.5-0.6	10.6	0.6	50.1	59.9	14.1	4.3	35.8	20
H2096/64	N7-0.8-0.9	13.8	2.4	42.0	53.7	22.9	11.3	35.1	23
H2096/65	N7-0.9-1.0	14.6	1.5	42.9	49.6	17.9	11.3	39.1	22
H2096/66	N8-0.0-0.1	15.8	1.3	74.1	77.3	9.2	6.0	16.7	13
H2096/67	N8-0.2-0.3	9.8	1.2	62.2	69.9	18.4	10.7	19.4	17
H2096/68	N8-0.5-0.6	12.1	3.4	44.6	58.5	21.3	7.4	34.1	24
H2096/69	N8-0.8-0.9	14.0	1.2	35.1	53.2	25.3	7.3	39.6	26
H2096/70	N8-0.9-1.0	15.9	2.8	34.4	47.2	22.8	9.9	42.9	26
H2096/71	N9-0.0-0.1	16.1	1.7	71.5	81.8	17.3	7.0	11.2	12
H2096/72	N9-0.2-0.3	7.0	1.2	62.2	76.4	18.3	4.1	19.5	13
H2096/73	N9-0.55-0.65	10.4	1.6	55.6	65.1	15.9	6.4	28.5	19
H2096/74	N9-0.75-0.85	9.5	2.3	60.8	59.9	15.0	15.9	24.2	17
H2096/75	N9-0.9-1.0	10.4	0.7	59.1	55.5	13.5	17.1	27.4	18

## METHOD DESCRIPTIONS

## Soil

Reference: H2096

Page 3 of 4

## 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 NaHCO <sub>3</sub> @ pH 8.5, (AA) colorimetric
Exch.Ca	15B/C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.Mg	15B/C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.Na	15B/C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
Exch.K	15B/C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH <sub>4</sub> OAc @ pH 7.0/8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO <sub>3</sub> + Ca(NO <sub>3</sub> ) <sub>2</sub> 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(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub> @ 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&gt;0.3dS/m).

QUALITY CONTROL DATA

Soil

Reference: H20965  
Page: 4 of 4

\* Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)

			Actual Value	Acceptance Criteria
Test Method	Units			[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

			Actual Value	Acceptance Criteria
Test Method	Units	Test Soil		[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

**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) <sup>1</sup>	21	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) <sup>1</sup>	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-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) <sup>2</sup>	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) <sup>2</sup>	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)	3	4	4	3	3	4	3	4	3	3	3	3	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	3	4	3	4	3	3	3	3	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) <sup>1</sup>	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) <sup>1</sup>	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es) <sup>1</sup>	33	4	4	4	4	4	4	4	4	4	4	4	4	4
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm) <sup>1</sup>	7	4	4	4	4	4	4	4	4	4	4	4	4	4
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	4	4	4	4	4	4	4	4	4	4	4

1. Reference to SMU B3 erosion potential review by GTE

**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) <sup>1</sup>	33	5	5	5	5	5	5	5	5	5	5	5	5	5
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)	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-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) <sup>1</sup>	32	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

1. Water erosion assessed on k-factor of 0.075 Very high (Foster et al. 1981),



**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) <sup>1</sup>	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-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) <sup>1</sup>	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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## **Appendix C**

### **Land Suitability Assessment, LSAT, 1995 and DRNM, 2013**

# ATTACHMENT 2

## LAND SUITABILITY CLASSIFICATION FOR CROPPING AND GRAZING IN THE SEMI-ARID SUB-TROPICS OF QUEENSLAND

The following ratings tables present criteria for determining land suitability for rainfed broadacre cropping and for beef cattle grazing in the semi-arid sub-tropics (see Note 1). These tables are based upon Queensland Department of Primary Industries guidelines for agricultural land evaluation (Land Resources Branch 1990). The criteria used in these tables are necessarily general to be applicable over a wide area. The Department of Primary Industries is developing land suitability classifications for several specific locations within the semi-arid sub-tropics (Shields and Williams 1991) as part of detailed land resource surveys and the Department's detailed land suitability criteria may be more appropriate for each of these locations.

**TABLE 2.1**  
**SUITABILITY FOR RAINFED BROADACRE CROPPING**

Limitation	Land suitability class				
	1	2	3	4	5
Water availability (See Table 1.3)	PAWC >150 mm	PAWC 125-150 mm	PAWC 100-125 mm	PAWC 75-100 mm	PAWC <75 mm
Nutrient deficiency	Bicarbonate P >10 ppm	Bicarbonate P 5-10 ppm and Exchangeable K >0.3 meq. %	Bicarbonate P 5-10 ppm and Exchangeable K ≤0.3 meq. % or pH <5 60-90 cm below surface or pH >9 60-90 cm below surface	Bicarbonate P <10 ppm and Exchangeable K ≤0.3 meq. %, and Exchangeable Ca <3 meq. %, or pH <5 30-60 cm below surface, or pH >9 30-60 cm below surface	pH <5 within 30 cm of surface or pH >9 within 30 cm of surface
Soil physical factors	Cracking clays with very fine self-mulch (peds <2 mm), or Rigid soils with a loose, soft or firm surface when dry	Cracking clays with fine self-mulch (peds 2-10 mm)	Cracking clays with coarse self-mulch (peds 10-20 mm) or Rigid soils with a hard setting surface when dry	Cracking clays with coarse peds at the surface (≥20 mm)	
Soil workability	Friable cracking clays (indicated by very fine self-mulch), or Rigid soils with a loose, soft or firm surface when dry	Firm cracking clays (indicated by fine self-mulch) or Rigid soils with a hard setting surface when dry	Stiff cracking clays (indicated by coarse self-mulch with peds >10 mm, crusting or hard setting surface)		
Salinity	Rootzone EC <0.1 mS/cm or Rootzone Cl <300 ppm	Rootzone EC 0.15-0.3 mS/cm or Rootzone Cl 300-600 ppm	Rootzone EC 0.3-0.9 mS/cm or Rootzone Cl 600-900 ppm	Rootzone EC 0.9-1.2 mS/cm, or Rootzone Cl 900-1500 ppm	Rootzone EC >1.2 mS/cm or Rootzone Cl ≥1500 ppm
Rockiness	<10% coarse surface gravel (>6 cm diam.) and rock outcrop	10-20% coarse surface gravel and rock outcrop	20-50% surface cobble (6-20 cm diam.) and rock outcrop	50-90% surface cobble and rock outcrop, or 20-50% stone and boulders (>20 cm diam.)	>90% surface cobble and rock outcrop, or >50% stone and boulders and rock outcrop
Microrelief	No melonholes (semi-circular depressions <30 cm deep and usually surrounded by mounds)	Melonholes 30-60 cm deep cover <20% surface area or Melonholes >60 cm deep cover <10% surface area	Melonholes 30-60 cm deep cover 20-50% of surface area or Melonholes >60 cm deep cover 10-20% surface area	Melonholes 60-100 cm deep cover 50 % surface area	Melonholes at least 100 cm deep cover 50% surface area
Wetness	Undulating terrain or elevated plains	Low-lying level plains with melonholes covering <25% surface area, or Rigid soils with sodic subsoil (ESP 6-14) within 60 cm of the surface, or Non-sodic rigid soils with coarse pale grey and yellow mottles within 75 cm of the surface	Low-lying level plains with melonholes covering 25-50% surface area, or Rigid soils with strongly sodic subsoil (ESP ≥15) within 60 cm of the surface, or Non-sodic rigid soils with coarse pale grey and yellow mottles within 50 cm of the surface	Seasonal swamps and low-lying run-on areas	Permanent swamps and lakes
Topography	No gully dissection	Occasional deep gullies impede cultivation slightly	Many deep gullies reduce arable area by < 33% or require major changes to cultivation practices	Many deep gullies make the arable areas too small to cultivate	Abundant deep gullies prevent any practical cultivation
Water erosion	Slopes <0.5% on cracking clays without melonholes, or Slopes <1% on melonhole clays, or Slopes <1% on non-sodic rigid soils, or Slopes <0.5% on sodic rigid soils	Slopes 0.5-1% on cracking clays without melonholes or Slopes 1-3% on melonhole clays, or Slopes 1-2% on non-sodic rigid soils, or Slopes 0.5-1% on sodic rigid soils	Slopes 1-3% on cracking clays without melonholes or Slopes 2-4% on non-sodic rigid soils or Slopes 1-2% on sodic rigid soils	Slopes 3-5% on all cracking clays or Slopes 4-6% on non-sodic rigid soils or Slopes 2-3% on sodic rigid soils	Slopes >5% on all cracking clays or Slopes >6% on non-sodic rigid soils or Slopes >3% on sodic rigid soils
Flooding	No flooding	Rare flooding (only during abnormal 1 in 50 to 100 year events)	Infrequent flooding (inundation occurs <half the times that stream flow increases)	Occasional flooding (inundation occurs ≥half the times that stream flow increases)	Regular flooding (inundation occurs whenever stream flow increases)



**TABLE 2.2**  
**SUITABILITY FOR BEEF CATTLE GRAZING**

Limitation	Land suitability class (see Table 2.4)				
	1	2	3	4	5
Water availability (See Table 1.3)	PAWC >125 mm	PAWC 100-125 mm	PAWC 75-100mm	PAWC 50-75 mm	PAWC ≤50 mm
Nutrient deficiency	Brigalow, gidgee, blackwood or softwood scrub soils and former scrub soils <u>with</u> Bicarbonate P >10 ppm	Eucalypt vegetation and downs <u>with</u> Bicarbonate P >10 ppm	Other soils with Bicarbonate P 5-10 ppm <u>except</u> Sands and loams at least 75 cm deep or overlying rock at shallow depth	Sands and loams at least 75 cm deep or overlying rock at shallow depth, <u>with</u> Bicarbonate P 5-10 ppm, <u>or</u> Bicarbonate P ≤4 ppm	
Soil physical factors	Cracking clays with very fine self-mulch (peds <2 mm), <u>or</u> Rigid soils with a loose, soft or firm surface when dry	Cracking clays with fine self-mulch (peds 2-10 mm), <u>or</u> Rigid soils with a hard setting surface when dry	Cracking clays with coarse peds (peds ≥10 mm) or crust on the surface		
Salinity	Rootzone EC < 0.15 mS/cm <u>or</u> Rootzone Cl <300 ppm	Rootzone EC 0.15-0.3 mS/cm <u>or</u> Rootzone Cl 300-600 ppm	Rootzone EC 0.3-0.9 mS/cm <u>or</u> Rootzone Cl 600-900 ppm	Rootzone EC 0.9-1.2 mS/cm <u>or</u> Rootzone Cl 900-1500 ppm	Rootzone EC >1.2 mS/cm <u>or</u> Rootzone Cl ≥1500 ppm
Rockiness	<20% coarse surface gravel (>6 cm diam.) and rock outcrop	20-50% coarse surface gravel and rock outcrop	50-90% surface cobble and rock outcrop	>90% surface cobble and rock outcrop	Rock outcrop and surface coarse fragments cover total area
Microrelief	Melonholes cover <20% surface area (semi-circular depressions at least 30 cm deep and usually surrounded by mounds)	Shallow melonholes (30-60 cm deep) cover 20-50% surface area	Deep melonholes (>60 cm deep) cover 20-50% of surface area		
pH (1:5)	5.6-6.6	6.6-8.0 5.0-5.6	8.0-9.0 4.5-5.0	9.0-10.0 4.0-4.5	>10.0 < 4.0
ESP (10cm)% Exchangable Sodium Percentage	<5.0	5-10	10-15	15-30	>30
Wetness	Undulating terrain or elevated plains	Low-lying level plains, <u>or</u> Rigid soils with strongly sodic subsoil (ESP≥15) within 60 cm of the surface, <u>or</u> Non-sodic rigid soils with coarse pale grey and yellow mottles within 50 cm of the surface	Shallow seasonal and permanent swamps		Permanent lakes and deep swamps
Topography				Many deep gullies make cultivation for sowing pastures impractical, <u>or</u> Slopes >15% make cultivation along contours impractical	Strongly dissected terrain over ≥75% of the area preventing adequate herd management
Water erosion	Slopes <1% on sodic rigid soils <u>or</u> Slopes <3% on all other soils	Slopes 1-3% on sodic rigid soils <u>or</u> Slopes 3-6% on cracking clays, <u>or</u> Slopes 3-12% on non-sodic rigid soils	Slopes 3-6% on sodic rigid soils <u>or</u> Slopes 6-9% on cracking clays, <u>or</u> Slopes 12-20% on non-sodic rigid soils	Slopes 6-12% on sodic rigid soils <u>or</u> Slopes 9-15% on cracking clays <u>or</u> Slopes 20-45% on non-sodic rigid soils	Slopes >45%
Flooding	No flooding	Periodic flooding (from once in 50 years to whenever stream flow increases)			
Vegetation regrowth (management limitation)	Softwood, brigalow, gidgee or blackwood scrub without melonholes, <u>or</u> Queensland bluegrass grasslands, <u>or</u> Mountain coolabah, bloodwood and ironbark open woodlands	Brigalow, gidgee or blackwood scrub with melonholes, <u>or</u> Box and ironbark woodlands without wattle understorey, <u>or</u> Coolabah woodlands on flooded country		Eucalypt woodlands with wattle understorey <u>or</u> Broad-leaved teatree woodlands	

## 10 Suitability framework for the Inland Fitzroy and Southern Burdekin area

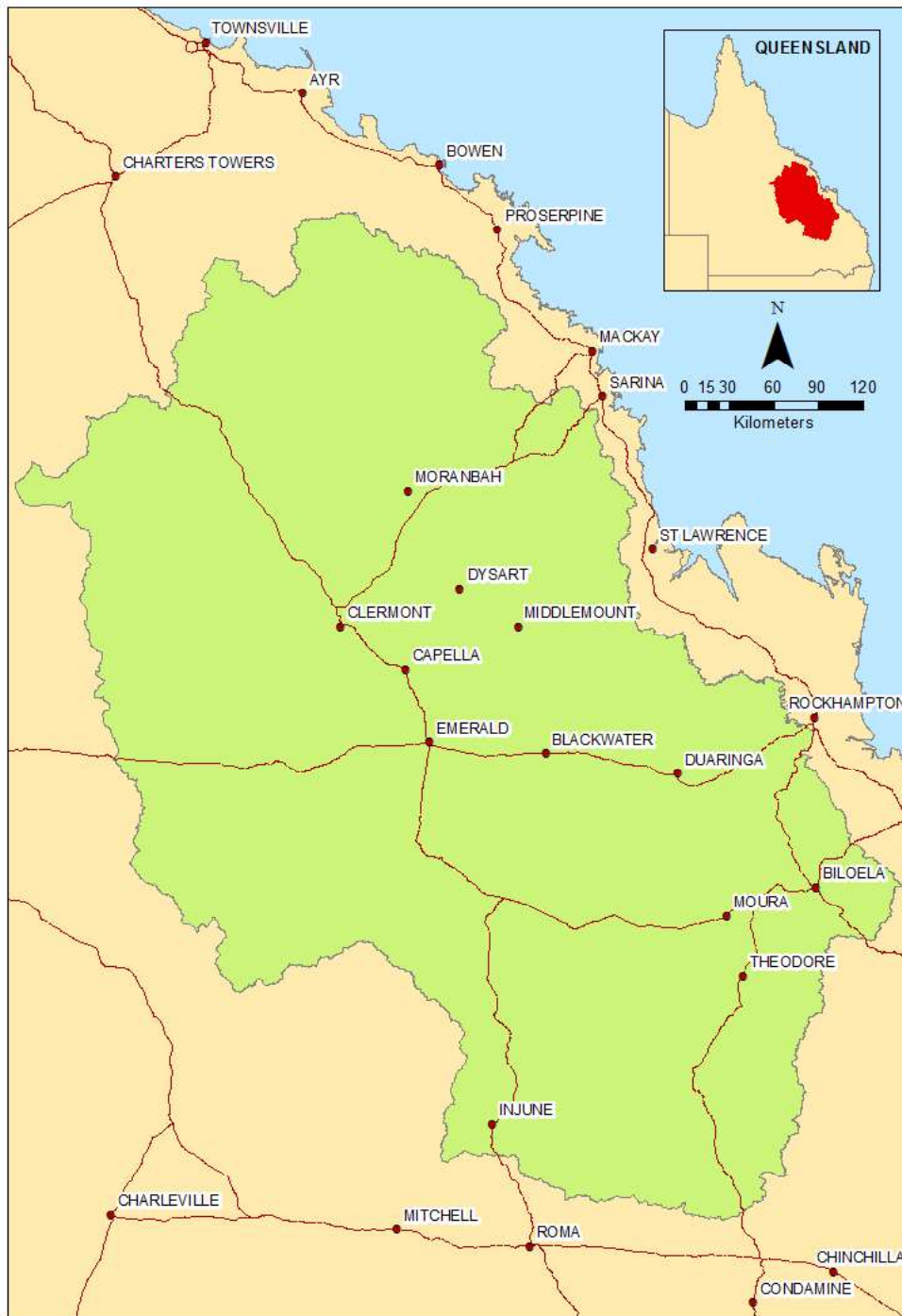


Figure 9. Area covered by the Inland Fitzroy and Southern Burdekin suitability framework

## E - Water erosion

Suitability subclasses for various land management options		
Limitation		
Value	Description	Group A
11	Slopes of 0-0.5% with non dispersive moderate to strongly coherent soil in the surface 200mm	1
12	Slopes of 0-0.5% with non dispersive weakly coherent soil in the surface 200mm	1
13	Slopes of 0-0.5% with dispersive soil in the surface 200mm	3
21	Slopes of 0.5-1% with non dispersive moderate to strongly coherent soil in the surface 200mm	1
22	Slopes of 0.5-1% with non dispersive weakly coherent soil in the surface 200mm	2
23	Slopes of 0.5-1% with dispersive soil in the surface 200mm	4
31	Slopes of 1-3% with non dispersive moderate to strongly coherent soil in the surface 200mm	2
32	Slopes of 1-3% with non dispersive weakly coherent soil in the surface 200mm	3
33	Slopes of 1-3% with dispersive soil in the surface 200mm	5
41	Slopes of 3-5% with non dispersive moderate to strongly coherent soil in the surface 200mm	3
42	Slopes of 3-5% with non dispersive weakly coherent soil in the surface 200mm	4
43	Slopes of 3-5% with dispersive soil in the surface 200mm	5
51	Slopes of 5-8% with non dispersive moderate to strongly coherent soil in the surface 200mm	3
52	Slopes of 5-8% with non dispersive weakly coherent soil in the surface 200mm	4
53	Slopes of 5-8% with dispersive soil in the surface 200mm	5
61	Slopes greater than 8% with non dispersive moderate to strongly coherent soil in the surface 200mm	5
62	Slopes greater than 8% with non dispersive weakly coherent soil in the surface 200mm	5
63	Slopes greater than 8% with dispersive soil in the surface 200mm	5

### Group A

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  
 Wheat-Dryland

## Es - Erosion hazard, subsoil erodibility

Limitation		Suitability subclasses for various land management options	
Value	Description	Group A	
11	Slopes of 0-0.5% with no subsoil (200-1000mm) dispersion	1	
12	Slopes of 0-0.5% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	1	
13	Slopes of 0-0.5% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	2	
21	Slopes of 0.5-1% with no subsoil (200-1000mm) dispersion	1	
22	Slopes of 0.5-1% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	2	
23	Slopes of 0.5-1% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	3	
31	Slopes of 1-3% with no subsoil (200-1000mm) dispersion	1	
32	Slopes of 1-3% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	3	
33	Slopes of 1-3% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	4	
41	Slopes of 3-5% with no subsoil (200-1000mm) dispersion	3	
42	Slopes of 3-5% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	3	
43	Slopes of 3-5% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	5	
51	Slopes of 5-8% with no subsoil (200-1000mm) dispersion	3	
52	Slopes of 5-8% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	4	
53	Slopes of 5-8% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	5	
61	Slopes greater than 8% with no subsoil (200-1000mm) dispersion	5	
62	Slopes greater than 8% with low to moderate dispersive subsoil (200-1000mm) and clay content greater than 20%	5	
63	Slopes greater than 8% with strongly dispersive subsoil (200-1000mm) on 2 or more tests and clay content greater than 20%	5	
Group A			
Barley-Dryland	Triticale-Dryland		
Chickpea-Dryland	Wheat-Dryland		
Cotton-Furrow Irrigated			
Maize-Dryland			
Millet-Dryland			
Mungbean-Dryland			
Oat-Dryland			
Safflower-Dryland			
Sorghum-Dryland			
Soybean-Dryland			
Sunflower-Dryland			



# M – Soil water availability

Limitation Value	Description	Suitability subclasses for various land management options				
		Group A	Group B	Group C	Group C	Group C
1	PAWC greater than 150mm/100cms	1	2	2	2	2
2	PAWC 125-150mm/100cms	2	2	2	3	3
3	PAWC 100-125mm/100cms	3	3	3	4	4
4	PAWC 75-100mm/100cms	3	4	4	5	5
5	PAWC 50-75mm/100cms	4	5	5	5	5
6	PAWC less than 50mm/100cms	5	5	5	5	5

Group A	Group B	Group C
Cotton-Furrow Irrigated	Maize-Dryland	Barley-Dryland
	Mungbean-Dryland	Chickpea-Dryland
	Safflower-Dryland	Millet-Dryland
	Sorghum-Dryland	Oat-Dryland
	Soybean-Dryland	Triticale-Dryland
	Sunflower-Dryland	Wheat-Dryland

## Pm - Narrow moisture range

Limitation		Suitability subclasses for various land management options	
Value	Description	Group A	
1	Wide moisture range for cultivation – moderately well drained to rapidly drained; not hard setting when dry and not 'spewy' (i.e. boggy) when wet. Deep sands and thick sandy surfaced texture contrast soils	1	
2	Moderate moisture range for cultivation – moderately well drained to rapidly drained; not hard setting when dry and not 'spewy' when wet. Moderately to strongly self-mulching clays	1	
3	Moderate moisture range for cultivation – moderately well drained to rapidly drained; predominantly hard setting when dry and not 'spewy' when wet. Well drained earths and moderately well drained hard setting loamy surfaced soils	2	
4	Moderate moisture range for cultivation (but less than Pm 3) – imperfectly drained to moderately well drained; not hard setting (or only weakly) when dry and 'spewy' when wet. Sandy surfaced (less than 0.4 m), sodic texture contrast soils	3	
5	Narrow moisture range for cultivation – imperfectly drained to moderately well drained; hard setting, firm or weakly self-mulching when dry and not 'spewy' when wet. Hard setting, firm or weakly self-mulching, pedal clays	3	
6	Narrow moisture range for cultivation – imperfectly drained to moderately well drained; hard setting when dry and 'spewy' when wet. Loamy surfaced (less than 0.4 m), sodic texture contrast soils or dermosols	3	
7	Very narrow moisture range for cultivation – imperfectly drained to moderately well drained; very hard setting when dry and 'spewy' when wet. Very hard setting, sodic clays	4	
Group A			
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			
Wheat-Dryland			

Ps - Surface condition

Limitation	Suitability subclasses for various land management options	
Value	Description	Group A
1	Soils with soft or loose sandy to sandy loam surface horizons	1
2	Very fine self-mulching clays (peds less than 2mm)	1
3	Soils with soft, firm or only weakly hard setting, sandy to loamy surface horizons	2
4	Fine self-mulching clays (peds greater than 2-5mm)	2
5	Coarse self-mulching clays (peds greater than 5–10mm); poor seed soil contact due to separation of large peds with drying	3
6	Clay soils with hard setting, firm pedal or weakly self-mulching surface horizons	3
7	Very coarse self-mulching clays (peds greater than 10mm)	4
8	Loamy, fine sand, silty or clayey surface soils that are extremely hard setting, massive or crusting	4
Group A		
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		
Wheat-Dryland		

## R - Rockiness

Limitation		Suitability subclasses for various land management options	
Value	Description	Group A	Group B
C2	Cobbles 60 to 200mm and abundance less than 10%	3	3
C3	Cobbles 60 to 200mm and abundance 10-20%	3	4
C4	Cobbles 60 to 200mm and abundance 20-50%	4	4
C5	Cobbles 60 to 200mm and abundance greater than 50%	4	4
G2	Gravels less than 20mm and abundance less than 10%	1	1
G3	Gravels less than 20mm and abundance 10-20%	2	2
G4	Gravels less than 20mm and abundance 20-50%	2	3
G5	Gravels less than 20mm and abundance greater than 50%	3	3
P2	Pebbles 20 to 60mm and abundance less than 10%	2	2
P3	Pebbles 20 to 60mm and abundance 10-20%	2	2
P4	Pebbles 20 to 60mm and abundance 20-50%	3	4
P5	Pebbles 20 to 60mm and abundance greater than 50%	4	4
S2	Stones greater than 200mm and abundance less than 10%	3	3
S3	Stones greater than 200mm and abundance 10-20%	3	4
S4	Stones greater than 200mm and abundance 20-50%	5	5
S5	Stones greater than 200mm and abundance greater than 50%	5	5

Group A	Group B
Barley-Dryland	Mungbean-Dryland
Chickpea-Dryland	Soybean-Dryland
Cotton-Furrow Irrigated	
Maize-Dryland	
Millet-Dryland	
Oat-Dryland	
Safflower-Dryland	
Sorghum-Dryland	
Sunflower-Dryland	
Triticale-Dryland	
Wheat-Dryland	



## Tm - Microrelief

Limitation		Suitability subclasses for various land management options	
Value	Description	Group A	
1	No microrelief across the majority (greater than 70%) of the land surface	1	
2	Very weakly developed microrelief (VI less than 0.1m) that occurs across much (30–70%) of the land surface	2	
3	Normal, lattice or linear gilgai (VI 0.1–0.3m) that occurs across less than 30% of the land surface	2	
4	Normal, lattice or linear gilgai (VI 0.1–0.3m) that occurs across much (30–70%) of the land surface	2	
5	Normal, lattice or linear gilgai (VI 0.1–0.3m) across the majority (greater than 70%) of the land surface	2	
6	Shallow, melonhole gilgai (VI 0.3–0.6m) that occurs across less than 30% of the land surface	2	
7	Shallow, melonhole gilgai (VI 0.3–0.6m) that occurs across much (30–70%) of the land surface	3	
8	Shallow, melonhole gilgai (VI 0.3–0.6m) across the majority (greater than 70%) of the land surface	4	
9	Strongly developed, deep, melonhole gilgai (VI 0.6–1.5m) that occurs across less than 30% of the land surface	4	
10	Strongly developed, deep, melonhole gilgai (VI 0.6–1.5m) that occurs across much (30–70%) of the land surface	5	
11	Strongly developed, deep, melonhole gilgai (VI 0.6–1.5m) across the majority (greater than 70%) of the land surface	5	

### Group A

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
Wheat-Dryland

**W - Wetness**

Limitation Value	Description	Suitability subclasses for various land management options		
		Group A	Group B	Group C
2	Very poorly to poorly drained	5	5	5
3H	Imperfectly drained and highly permeable	2	3	3
3M	Imperfectly drained and moderately permeable	3	3	3
3S	Imperfectly drained and slowly permeable	4	4	4
4H	Moderately well drained and highly permeable	1	1	2
4M	Moderately well drained and moderately permeable	1	1	2
4S	Moderately well drained and slowly permeable	2	2	2
5	Well drained	1	1	1
6	Rapidly drained	1	1	1

Group A	Group B	Group C
Barley-Dryland	Mungbean-Dryland	Cotton-Furrow Irrigated
Chickpea-Dryland	Safflower-Dryland	
Maize-Dryland	Soybean-Dryland	
Millet-Dryland	Sunflower-Dryland	
Oat-Dryland		
Sorghum-Dryland		
Triticale-Dryland		
Wheat-Dryland		

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