BHP Mitsubishi Alliance

Appendix A

Land Resources Assessment

CAVAL RIDGE MINE

Horse Pit Extension Project
Soil and Land Resource Assessment

Prepared for:

BM Alliance Coal Operations
BMA Brisbane Offices
480 Queen Street
Brisbane QLD 4000

SLR Ref: 620.13593.00004-R02
Version No: V6.0
December 2021

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Level 2, 15 Astor Terrace
Spring Hill QLD 4000 Australia
(PO Box 26 Spring Hill QLD 4004)
T: +61 7 3858 4800
E: brisbane@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

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

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

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

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
620.13593.00004-V6	13-12-2021	A. Koeman	K. Robertson	P. Smith
620.13593.00004-V5	28-10-2021	A. Koeman / K. Robertson	P. Smith	P. Smith
620.13593.00004-V4	12-10-2021	A. Koeman / K. Robertson	P. Smith	P. Smith
620.13593.00004-V3	27-09-2021	A. Koeman	R. Masters	P. Smith
620.13593.00004-V2	11-06-2021	A. Koeman	R. Masters	P. Smith
620.13593.00004-V1	28-04-2021	A. Koeman	R. Masters	P. Smith

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

The Caval Ridge Mine (CVM) is owned and operated by BM Alliance Coal Operations Pty Ltd (BMA), on behalf of the Central Queensland Coal Associates Joint Venture (CQCA JV). The CVM project was approved by the Coordinator-General under the State Development and Public Works Organisation Act 1971 (Qld) in 2010 and has been in operation since 2014. Operations at CVM are carried out under the conditions of Environmental Authority (EA) EPML00562013 and EPBC Approval (2008/4417).

The CVM is located primarily within Mining Lease (ML) 1775, with Harrow Creek acting as the southernmost boundary of CVM. Associated infrastructure for the CVM is located on ML 70403 and ML 70462. The CVM northern boundary is located approximately five (5) kilometres (km) south-west of Moranbah in the Bowen Basin, Queensland.

The CVM includes two pits: Horse Pit (north of Peak Downs Highway) and Heyford Pit (north of Harrow Creek), both located within ML 1775. The Horse Pit Extension (HPE) Project (the Project) is a proposed extension to current mining operations on mining lease (ML) 1775, ML 70403 and ML 70462.

The Project proposes to extend the footprint of the existing Horse Pit at the CVM. If approved, the extension is projected to extend the mine's life from the 2030's to the 2050's, protecting jobs and royalties into the future. Exploration activities will be ongoing for the life of the mine. The Project covers the existing MLs: ML 1775, ML 70403 and ML 70462 and will be confined to the Horse Pit area north of the Peak Downs Highway. The Project location and area is shown on Figure 1 and Figure 2.

SLR Consulting (SLR) has been engaged by BMA to undertake a Soil and Land Resource Assessment for the Project.

1.1 Purpose of this Document

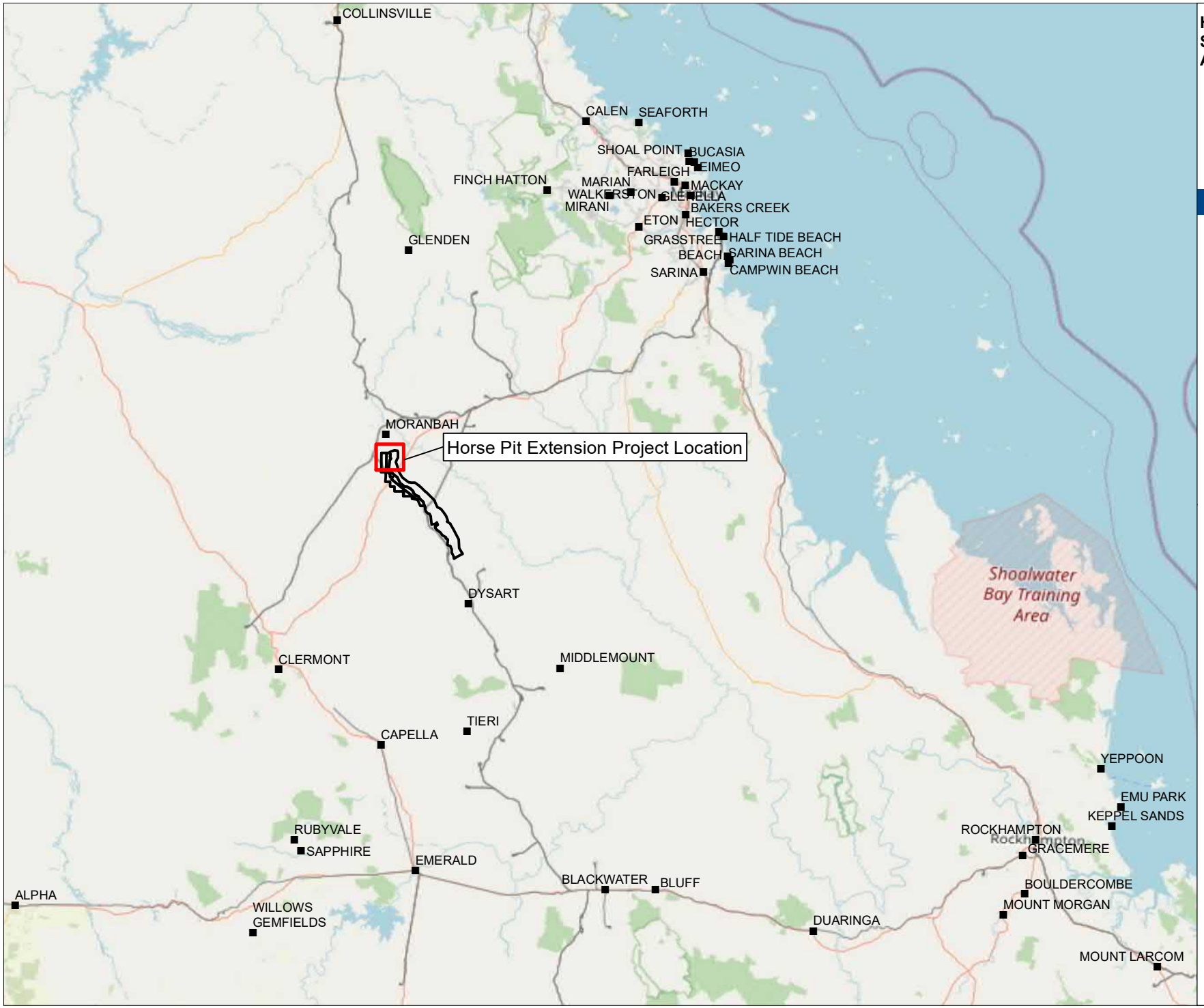
The purpose of this Report is to provide an assessment of impacts to the soil and land resources within the project area. The Soil and Land Resource Assessment involved a soil survey and assessment to outline:

- Soil types;
- Soil resources available for rehabilitation (including a soil balance);
- Soil qualities (erosion risk, dispersion, acid sulfate soils (ASS) and salinity risks);
- Soil and land resource assessment; and
- Management and mitigation measures for handling soil resources during the mine extension and rehabilitation.

1.2 Relevant Guidelines and Standards

The following guideline and standards were used for the Soil and Land Resource Assessment:

- Regional Land Suitability Frameworks for Queensland. Department of Natural Resources and Mines and the Department of Science, Information Technology, Innovation and the Arts (DNRM and DSIT), 2013;
- The Australian Soil Classification Second Edition . Isbell, R. F., 2016;
- Guidelines for Surveying Soil and Land Resources, 2nd edition, Australia. National Committee on Soil and Terrain (NCST), 2008; and
- Australian Soil and Land Survey Field Handbook, 3rd edition. National Committee on Soil and Terrain CSIRO Publishing (NCST), 2009.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Regional Locality

FIGURE 1

BHP Tenements

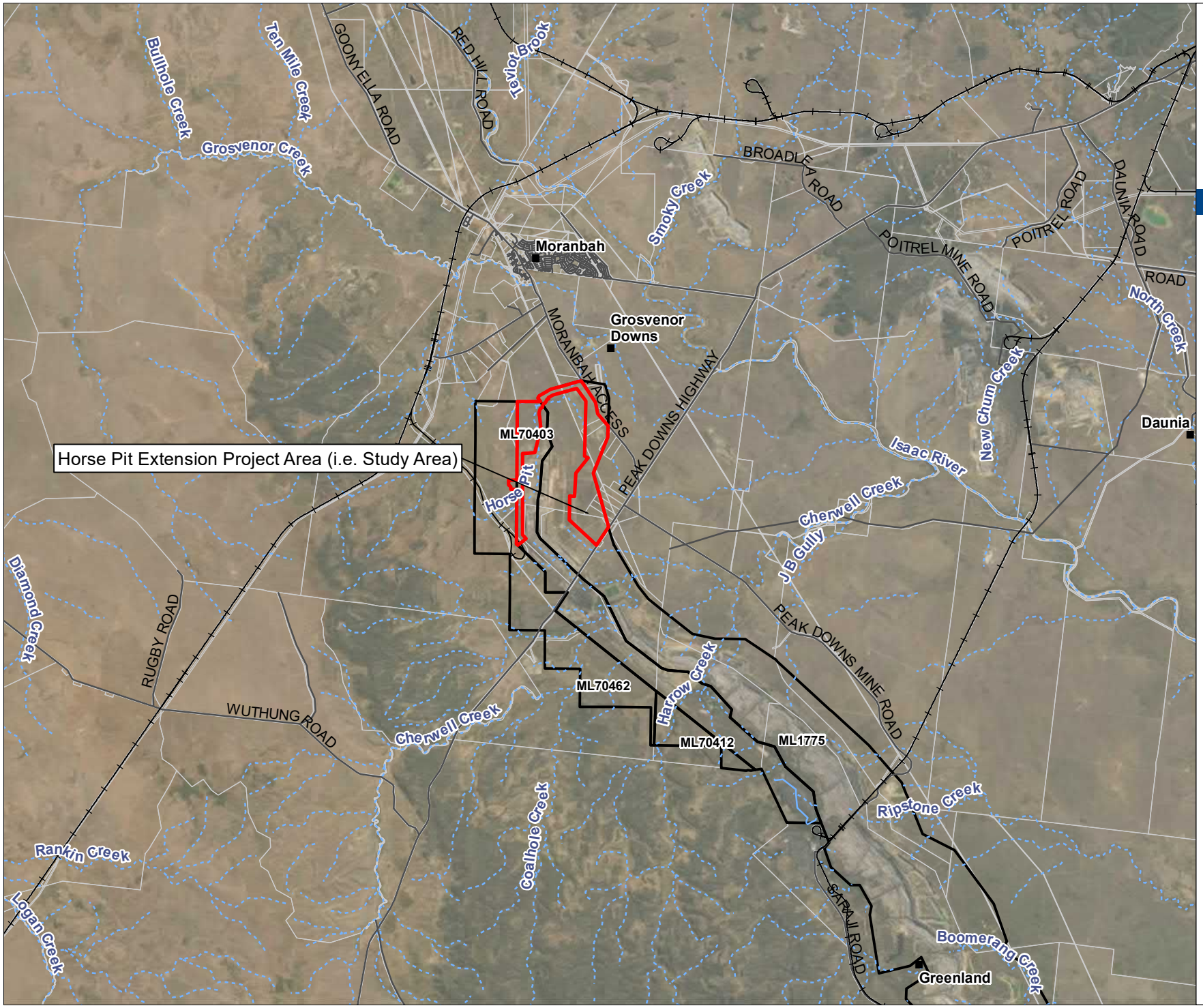
0 25 50 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:2,000,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F01 Regional Locality.mxd



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Site Layout

FIGURE 2

- Locality
- Roads
- Railway

Watercourse

- Perennial
- Non-perennial
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

N

0 5 10 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:250,000 at A4
Project Number:	620.13593.00004
Date:	12-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F02 Site Layout.mxd

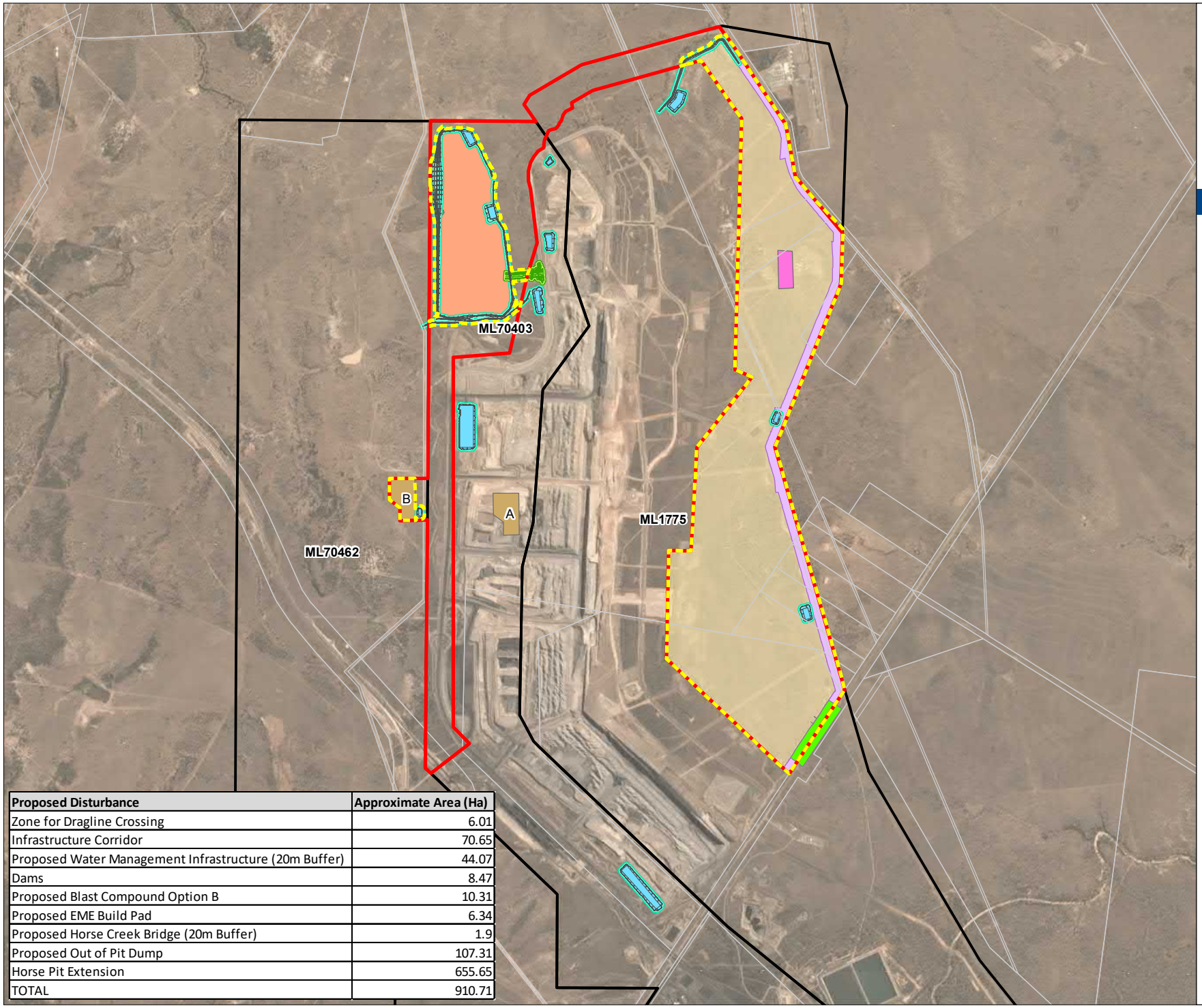
1.3 Study Area and Disturbance Footprint

The Study area for this Soil and Land Resource Assessment covers a total approximate area of 1,214 ha and includes approximately 910 ha of land proposed to be disturbed by the Project works and associated infrastructure. The Study area and disturbance footprint is depicted on Figure 3 and the proposed disturbance types and areas are summarised in Table 1.

Table 1 Proposed Disturbance Types and Disturbance Areas

Disturbance Type	Disturbance Area (ha) [1]
Horse Creek Bridge (including 20m Buffer)	1.90
Zone for Dragline Crossing	6.01
Dams (within Study area)	8.47
Water Management Infrastructure (including 20m Buffer)	44.07
EME Build Pad	6.34
Blast Compound (Option B)	10.31
Infrastructure Corridor	70.65
Out of Pit Dump	107.31
Horse Pit Extension	655.65
Total Disturbance Area Footprint	910.71

[1] The proposed disturbance areas exclude areas of overlap such that the total disturbance area footprint is representative of the actual proposed disturbance area. For instance, the Horse Pit Extension (HPE) area encompasses the EME Build Pad and some Dams, so the HPE area presented in this table does not take into account the EME Build Pad and Dam areas.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Proposed Disturbance Footprint

FIGURE 3

- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area
- BHP Tenements
- Cadastre
- Proposed Water Management Infrastructure
- Bridge over Horse Creek
- Proposed Horse Creek Bridge (20m Buffer)
- Zone for Dragline Crossing
- Dams
- Proposed Water Management Infrastructure (20m Buffer)
- Proposed EME Build Pad
- Proposed Blast Compound Options
- Infrastructure Corridor
- Proposed Out of Pit Dump
- Horse Pit Extension

0 0.5 1 km

Proposed Disturbance	Approximate Area (Ha)
Zone for Dragline Crossing	6.01
Infrastructure Corridor	70.65
Proposed Water Management Infrastructure (20m Buffer)	44.07
Dams	8.47
Proposed Blast Compound Option B	10.31
Proposed EME Build Pad	6.34
Proposed Horse Creek Bridge (20m Buffer)	1.9
Proposed Out of Pit Dump	107.31
Horse Pit Extension	655.65
TOTAL	910.71

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:55,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	JG

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F03 Proposed Disturbance.mxd

2 Methodology

2.1 Desktop Review of Geology, Geomorphology, Land Systems and Soils

A desktop assessment was undertaken to establish background information on the baseline soil and land resources within the Study area. Various sources have been reviewed during the desktop assessment, including, but not limited to:

- GSSE (2009), Caval Ridge Project Soil Survey and Land Resource Assessment Report, GSS Environmental;
- CSIRO land systems;
- Australian Soil Resource Information System (ASRIS);
- Terrain-based mapping images including contour information;
- Soil and Landscape Grid of Australia;
- Strategic Cropping Land (SCL) trigger mapping via Queensland Globe; and
- Queensland acid sulfate soil risk mapping.

Geology mapping, vegetation mapping, satellite imagery and aerial photographs were utilised to provide baseline soil mapping prior to undertaking the fieldwork component of the assessment.

2.2 Field Assessment and Sampling Program

2.2.1 Soil Types

Soil survey and mapping was undertaken to exceed a 1:25,000 survey intensity and required collection of the landform pattern and element information, soil profile data, and taxonomic parameters to distinguish soil types within the Study area, according to The Australian Soil Classification (Isbell, 2016) criteria.

2.2.2 Soil Qualities

Additional information was recorded in the field on erosion and evidence of potentially erosive soils, including tunnel, rill, gully and sheet erosion, which may require specific handling and management techniques during mining and rehabilitation. Observations were made for salinity risks, to inform the rehabilitation strategy.

2.2.3 Soil Field Program

The soil field program was designed to exceed a 1:25,000 survey scale intensity, and covered the Study area outlined on Figure 3. The field soil program was designed as an integrated free survey. An integrated free survey assumes that many land characteristics are interdependent and tend to occur in correlated sets (NCST, 2008). Survey points were irregularly located according to the survey teams' professional judgement, to enable the delineation of soil boundaries. Soil boundaries can be abrupt or gradual, and catena and toposequences are used to aid the description of gradual variation. Soil pits were excavated using a backhoe to a maximum depth of 1.2 m.

Three types of observations were used for this Soil and Land Resource Assessment:

- Detailed sites – Observation sites that allow for the identification of any physiographic factors or vegetation associations that characterise the site and associated map unit, along with the major pedological feature of the soil profile;
- Analysed sites – Detailed sites from which soil samples are collected and sent to a National Association of Testing Authorities (NATA) Australia accredited laboratory for analysis; and
- Check sites - Mapping observations examined in sufficient detail to allocate the site to a specific soil type and map unit.

A total of 36 detailed sites (prefix H) were assessed, with soil samples taken from each site. An additional 38 check sites (prefix C) were assessed to confirm soil type between detailed sites, to aid in soil mapping. This gave a survey density of 1 site per 16 ha, which exceeds a 1:25,000 survey scale (Refer to Figure 4).

Full laboratory testing was undertaken for 23 of the detailed sites (delineated by an 'X' in Figure 4). Typical sample depths were 0-10, 20-30, 50-60 and 90-100 centimetres (cm).

Laboratory analysis was performed by Environmental Analysis Laboratory (EAL) at the Southern Cross University Lismore, a laboratory with NATA accreditation for the analyses conducted. The soil testing suite included:

- pH $_{(1:5\ water)}$;
- Electrical conductivity (EC);
- Cation exchange capacity (CEC);
- Exchangeable sodium percentage (ESP);
- Particle size analysis (PSA);
- Colour (Munsell); and
- Emerson aggregate test (EAT).

Soil salinity in the laboratory analysed samples, was determined through the measurement of the EC of soil:water (1:5) suspensions. These values were converted to the EC of a saturated extract (ECe) based on soil texture. Laboratory certificates of analysis are shown in Appendix A.

Soil profiles within the Study area were assessed in accordance with the Australian Soil and Land Survey Field Handbook (NCST, 2009) soil classification procedures. Detailed soil profile descriptions were recorded covering the major parameters provided in Table 2.

Table 2 Field Assessment Parameters

Detailed Field Assessment Parameters	
Horizon depth including distinctiveness and shape	Pan presence and form
Field texture grade	Permeability and drainage
Field colour (Munsell colour chart)	Field pH
Pedality structure, grade and consistence	Field moisture
Soil fabric and stickiness	Surface condition
Stones (abundance and size)	Landform pattern / element
Mottles (amount, size and distinctiveness)	Current land use and previous disturbance
Segregations (abundance, nature, form and size)	Vegetation

Soil profile logging was undertaken in the field using SLR soil data sheets, including Global Positioning System (GPS) recordings and photographs of the landforms and soil profiles. Soils were classified in accordance with The Australian Soil Classification (ASC) (Isbell, 2016).

2.3 Land Classification Systems

The information reviewed and collected as part of the desktop and field assessments is utilised to determine land classifications pre-mining and assess impacts to land classifications post-mining. The land classification systems used for the impact assessment are:

- Land Suitability Class;
- Agricultural Land Class; and
- Land Capability Class.

All three classification systems are applied to the impact assessment to consider specific and broad land uses. These systems and their purpose for assessing impacts to land resources are summarised below.

2.3.1 Land Suitability Class

The land suitability classification was applied across the Study area in accordance with the Regional Land Suitability Frameworks for Queensland (DSITI & DNRM, 2015). This scheme uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards. The scheme consists of eight limitations that classify the land based on the severity against the suitability subclasses for various land management options.

The suitability framework provides the detail for assessing which crops are suitable for individual mapped areas of land or soil and defines land suitable for grazing also. Each hazard was assessed against a set of criteria tables described in the guideline, with each hazard ranked from 1 (most suitable) through to 5 (least suitable) with the overall ranking of the land determined by its most significant limitation.

2.3.2 Agricultural Land Class

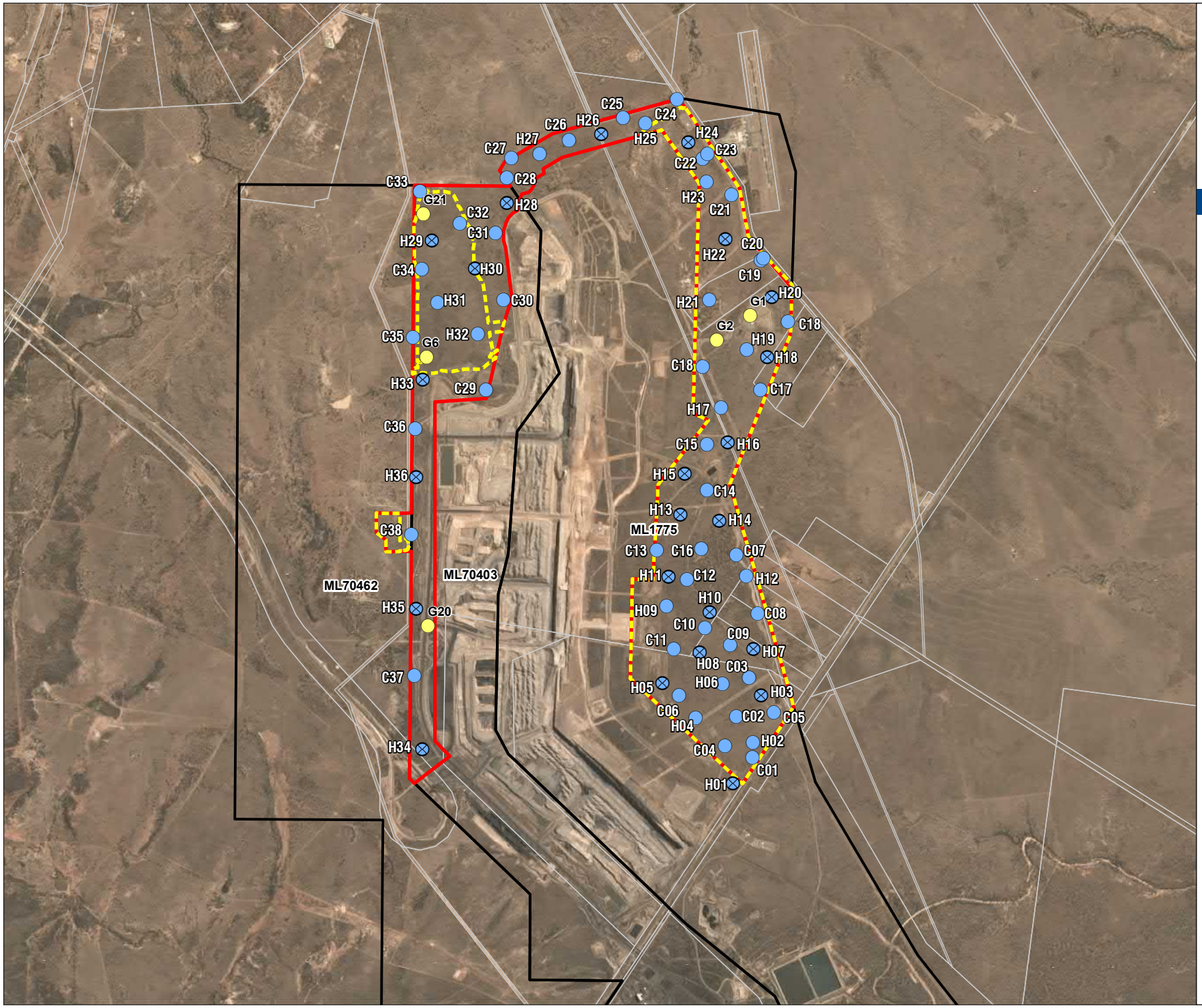
Agricultural Land Classification in Queensland follows a hierarchical scheme that allows the presentation of interpreted land evaluation data to indicate the location and extent of agricultural land that can be used sustainably for a wide range of land uses with minimal land degradation. Three broad classes of agricultural land and one non-agricultural land class are identified in the Agricultural Land Class system (DSITI & DNRM, 2015):

- Class A – Crop land;
- Class B – Limited crop land;
- Class C – Pasture (grazing) land; and
- Class D – Non-agricultural land.

2.3.3 Land Capability Class

Land capability classification evaluates the potential of land for broadly defined land uses, e.g. cropping, pastoral, non-agricultural. In Queensland, it is generally only used for broad scale assessment of land.

The system uses eight classes with limitations and hazards to agricultural and pastoral use becoming progressively greater from Class I to Class VIII, accompanied by a decreasing adaptability and choice of use. Lower-numbered classes (Classes I to III) are suited to more intense agricultural uses while higher-numbered classes are suited only to low-intensity agricultural use or conservation. Class VIII is unsuited to agricultural use.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Field Sampling Plan

FIGURE 4

- SLR Samples (SLR, 2020)
- Lab Tested Sample sites (SLR, 2020)
- Sample Sites (GSSE, 2010)
- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	12-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F04 Field Sampling Plan.mxd

3 Existing Environment

3.1 Climate

The Bureau of Meteorology (BoM) operates rainfall and evaporation gauges for several locations in the vicinity of the Project. The historical rainfall and evaporation records were analysed to determine the climate of the Study area. The gauges are summarised in Table 3.

Table 3 Rainfall and Evaporation Gauge Data

Gauge Number	BoM Name	Open - Closed	Number of Years of data & completeness	Elevation AHD (m)	Distance/ direction from site (km)
034014	Grosvenor Downs	1886 - 1972	86 years (31% complete)	Not available	13 NNE
034035^	Moranbah Airport	2012- Open	8 years (98% complete)	232.2	9 NNE
034038*	Moranbah Water Treatment Plant	1972 - 2012	40 years (96% complete)	235.7	17 NNW
034055	Mount Lebanon	1954 - 2005	50 years (98% complete)	294	13 SW

Annual average rainfall totals for the gauges were similar with 614 mm recorded at Moranbah WTP, 530 mm at Moranbah Airport and 581 mm from the SILO data set. It is noted that the Moranbah Airport site has been operational 8 years and therefore does not represent a long-term average (SLR, 2020).

3.2 Geology

The Study area is situated in the Bowen Basin, which is a north-south trending basin divided into broad morphotectonic zones. The Bowen Basin is characterised by gentle easterly dips and minor to moderate deformation on a relatively thin accumulation of sediments. The sediments and stratigraphic sequence were formed by the Permo-Triassic sediments of the Bowen Basin, which are overlain by a range of Tertiary and Quaternary sediments and alluvium. The Study area occurs in the western limb of the northern part of the basin, which is bounded by major faults and overlies the Collinsville Shelf in the area. The Moranbah Coal Measures contain the coal resource, which is currently mined as well as the future deposit for the Project (SLR, 2020).

3.3 Topography and Hydrology

The Project is located within the headwaters of the Isaac-Connors sub-catchment of the greater Fitzroy Basin. Horse Creek is the main waterways traversing the Study area. Horse Creek is a major tributary to Grosvenor Creek, which subsequently flows into the Isaac River. Caval Creek, Nine Mile Creek, Cherwell Creek and several other smaller tributaries of the Isaac River are also located within the catchment of the Study area (Refer to Figure 5).

Downstream of the Study area's catchment, the Isaac River flows south past Moranbah, converging first with the Connors River before joining the Mackenzie River. The Nogoa and Comet rivers merge east of Emerald to form the Mackenzie River, which then joins the Fitzroy River to discharge into the Coral Sea south-east of Rockhampton, near Port Alma.

The topographic elevations in and around the Study area range from approximately 220 m AHD (northeast of the Study area) to 250 m AHD (at the southern end of the project area). The Study area itself is mainly situated on the Isaac River floodplains, at an altitude of approximately 315 m AHD. Most of the Study area is situated on gently undulating lowlands and plains with slopes of 0 to 5 %.

3.4 Vegetation and Land Use

The Study area is highly modified from historic vegetation clearing and subject to ongoing direct and indirect effects of the operation of the CVM. However, the Study area was found to support a diversity of wildlife, habitat features and vegetation communities (E2M, 2020).

The vegetation within the Study area is largely regrowth brigalow and eucalypt woodland communities. Much of the regrowth brigalow community occurs on soils with a heavy clay content (E2M, 2020). Historically the Study area has been used for agriculture, predominantly cattle grazing native and improved pastures.

3.5 Land Systems

Three land systems occur within the Study area, with the majority dominated by lowlands with brigalow and cracking clay soils on weathered and fresh Permian shales and lithic sandstone (Refer to Figure 6). Minor land systems are hills with lancewood and narrow-leaved ironbark on weathered Tertiary and Permian rocks in the central west of the Study area, along with lowlands with box and texture contrast soils on undissected Tertiary land surface in the very south of the Study area.

3.6 Previous Investigations

3.6.1 Soil Classification

Previous investigations by GSS Environmental (GSSE, 2009) classified the soil profile of the Study area predominantly as:

- Uniform Clays across the majority of the Study area. These generally comprised of reddish yellow and light brownish to reddish brown and yellowish uniform clays that show little textural change down the profile;
- Yellow Duplex Soils located in the northern portion of the Study area. These soils were associated with the floodplain areas and were characterised by dark yellow sandy and clay loam of varying depths; and
- Brigalow Clays located in the eastern portion of the Study area. These soils were associated predominately on the lowlands and plains that have up to a 1% slope, these areas contain normal gilgai and melonhole. Brigalow Clays were characterised by brown light to medium clays throughout the profile.

3.6.2 Land Capability

Pre-mining land capability assessments indicated the majority of the Study area was classified as Class VI, predominately associated with the Uniform Clays (GSSE, 2009). Class VI land was described as not suitable for cultivation and is moderately susceptible to degradation requiring proper management for sustained pastoral use. The areas associated with the Yellow Duplex Soils were classified as Class V and described as suitable for grazing.

3.6.3 Land Suitability

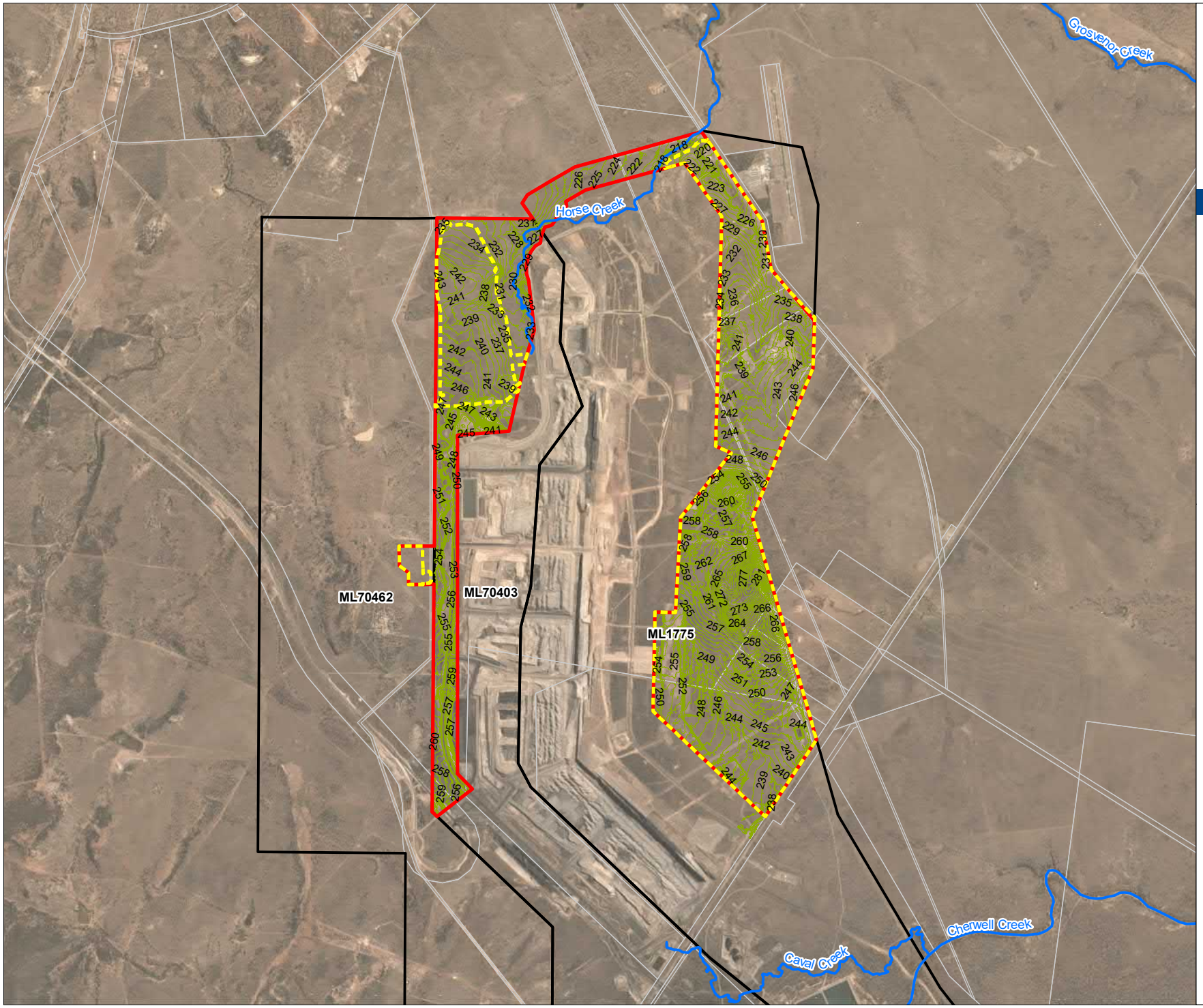
Based on the soil classification in Section 3.6.1 the majority of the survey area is classified as Class 5 for cropping and Class 2 and 3 for grazing (GSSE, 2009). Indicating that the land is unsuitable for cropping and the land may be suitable for grazing with minor and moderate limitations in place respectively. The land suitability results are summarised in Table 4.

Table 4 Land Suitability Classes

Soil Classification	Cropping	Grazing
Uniform Clays	5	2
Yellow Duplex Soils	5	3
Brigalow Clays	5	3

3.6.4 Agricultural Land

The Study area was mapped as Agricultural Land Class C (GSSE, 2009). Class C is classified as pasture land that is only suitable for improved or native pastures due to limitations which preclude continuous cultivation for crop production.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Topography & Hydrology

FIGURE 5

- 1m Contours
- Watercourses (Water Act 2000)
- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

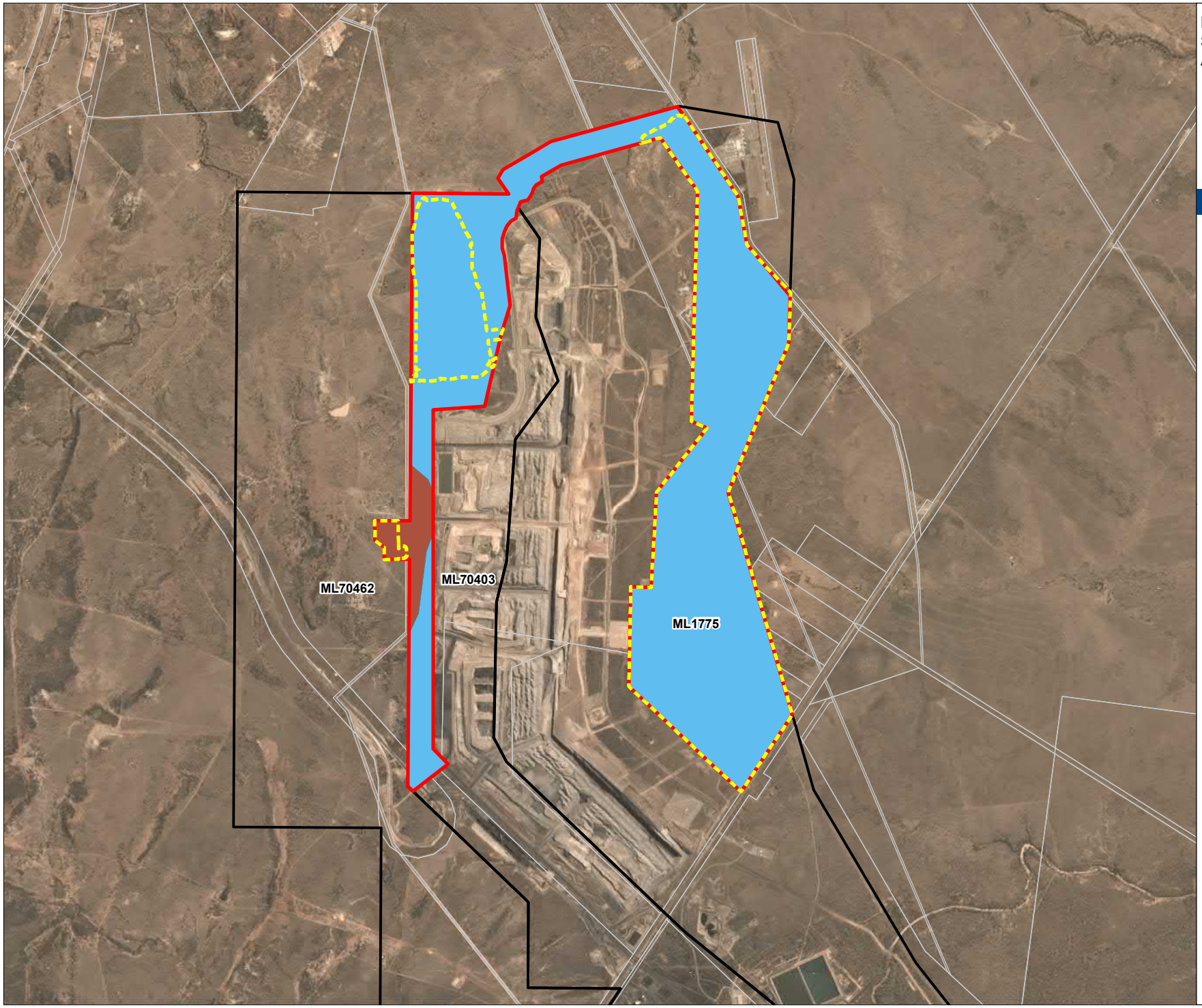
0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	12-Oct-2021
Drawn by:	PM

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F05 Topography & Hydrology.mxd



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Land Systems

FIGURE 6

Land Systems

- Hills with lancewood and narrow-leaved ironbark on weathered Tertiary and Permian rocks in the north-west, centre, and south-east; shallow rocky soils.
- Lowlands with brigalow and cracking clay soils on weathered and fresh Permian shales and lithic sandstone in the north and centre.
- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F06 Soil Landscapes.mxd

4 Soil Survey Results

4.1 Soil Classification and Description

The on-site soils assessment and subsequent laboratory analysis indicated a total of three soil orders within the Study area according to the Revised Australian Soil Classification (Isbell, 2016). These included Vertosols, Chromosols and Dermosols. Representative profile descriptions for all detailed profile descriptions (prefix H) are shown in Appendix B, while check site descriptions (prefix C) are shown in Appendix C.

4.1.1 Vertosols

These are soils with the following:

- A clay field texture or 35% or more clay throughout the solum except for a thin, surface crusty horizons 0.03 m or less thick; and
- When dry, open cracks occur at some time in most years. These are at least 5 mm wide and extend upward to the surface or to the base of any plough layer, peaty horizon, self-mulching horizon, or thin, surface crusty horizon; and
- Slickensides and/or lenticular peds occur at some depth in the solum.

The Vertosols were further classified into:

- Self-Mulching Brown Vertosols;
- Self-Mulching Black Vertosols;
- Red Vertosols; and
- Grey Vertosols.

Self-Mulching Brown and Black Vertosols were identified as dominant soils types.

The Vertosols on site generally consisted of brown to very dark brown light to heavy clay A horizons (topsoil) with moderate structure, overlying a medium to heavy medium clay B2 horizon with strong sub angular blocky structure. The topsoil showed neutral, non-sodic and non-saline properties with a few locations showing alkaline, sodic and saline properties. The B2 horizon generally showed strongly alkaline, strongly sodic and highly saline properties.

4.1.2 Chromosols

Chromosols are soils other than Hydrosols with a clear or abrupt texture contrast between the A horizon and a B horizon, which the major part of the B2 horizon is non-sodic and not strongly acidic.

The Chromosols were further classified into:

- Eutrophic Red Chromosols; and
- Eutrophic Brown Chromosols.

Both the Chromosols were identified as dominant soil types.

The Chromosols on site generally consisted of brown loam A horizons (topsoil) with weak structure, overlying a light to light medium clay B2 horizon with moderate angular blocky structure. The topsoil generally showed neutral, non-sodic and non-saline properties, whilst the B2 horizon showed mild to strong alkalinity, non-sodic to marginally sodic and non-saline to slightly saline properties.

4.1.3 Dermosols

These are soils other than Vertosols, Hydrosols, Calcarosols and Ferrosols which:

- Have B2 horizons with a structure more developed than weak throughout the major part of the horizon; and
- Do not have clear or abrupt textural B horizons.

The Dermosols were further classified into:

- Eutrophic Brown Dermosols;
- Eutrophic Black Dermosols;
- Eutrophic Red Dermosols; and

All Dermosols were not identified as a dominant soil type.

The Dermosols on site generally consisted of very dark brown clay loam to light clay A horizons (topsoil) with weak to moderate structure, overlying a light medium clay B2 horizon with strong sub angular blocky structure. The topsoil showed neutral, non-sodic and non-saline properties, whilst the B2 horizon generally showed strongly alkaline, strongly sodic and non-saline to highly saline properties.

4.2 Soil Map Units

Within the Study area, a total of three Soil Map Units (SMU) were identified based on the dominant ASC soil types (Refer to Figure 7). The majority soil type within the Study area is a Self-Mulching Vertosol, with a smaller area of Eutrophic Chromosols. The dominant and sub-dominant soil types per SMU is shown in Table 5 and summary of the SMUs are included in Sections 4.2.1 to 4.2.3.

Table 5 SMU Soil Types

Soil Map Unit	Dominant Soil Type	Sub-Dominant Soil Type	Hectares
1A	Self-Mulching Brown-Black Vertosol	Dermosols, Grey Vertosol	757
1B	Self-Mulching Brown-Black Vertosol	Dermosols, Grey Vertosol, Red Vertosol	404
2	Eutrophic Red-Brown Chromosol	Nil	53
		Total	1,214

SMUs with their associated detailed and check sites are summarised in Table 6. Figure 8 shows sampling sites and ASC soil type.

Table 6 Field Investigation Sites

Soil Map Unit	ASC Dominant Soil Type	Detailed Site	Check Site
1A	Self-Mulching Brown-Black Vertosol	H01, H02, H03, H04, H05, H06, H07, H08, H09, H10, H11, H12, H13, H14, H15, H16, H17, H18, H19, H20, H21, H22, H23, H24, H25	C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21 C22, C23
1B	Self-Mulching Brown-Black Vertosol	H29, H30, H31, H32, H33, H34, H35, H36	C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38
2	Eutrophic Red-Brown Chromosol	H26, H27, H28	C25, C26

4.2.1 Soil Map Unit 1A

4.2.1.1 Description

SMU 1A dominant soil types include Self-Mulching Brown-Black Vertosols and sub-dominant soil types included Dermosols and Grey Vertosol.

4.2.1.2 Location

SMU 1A is located in the western portion and comprises approximately 62% or 757 ha of the Study area.

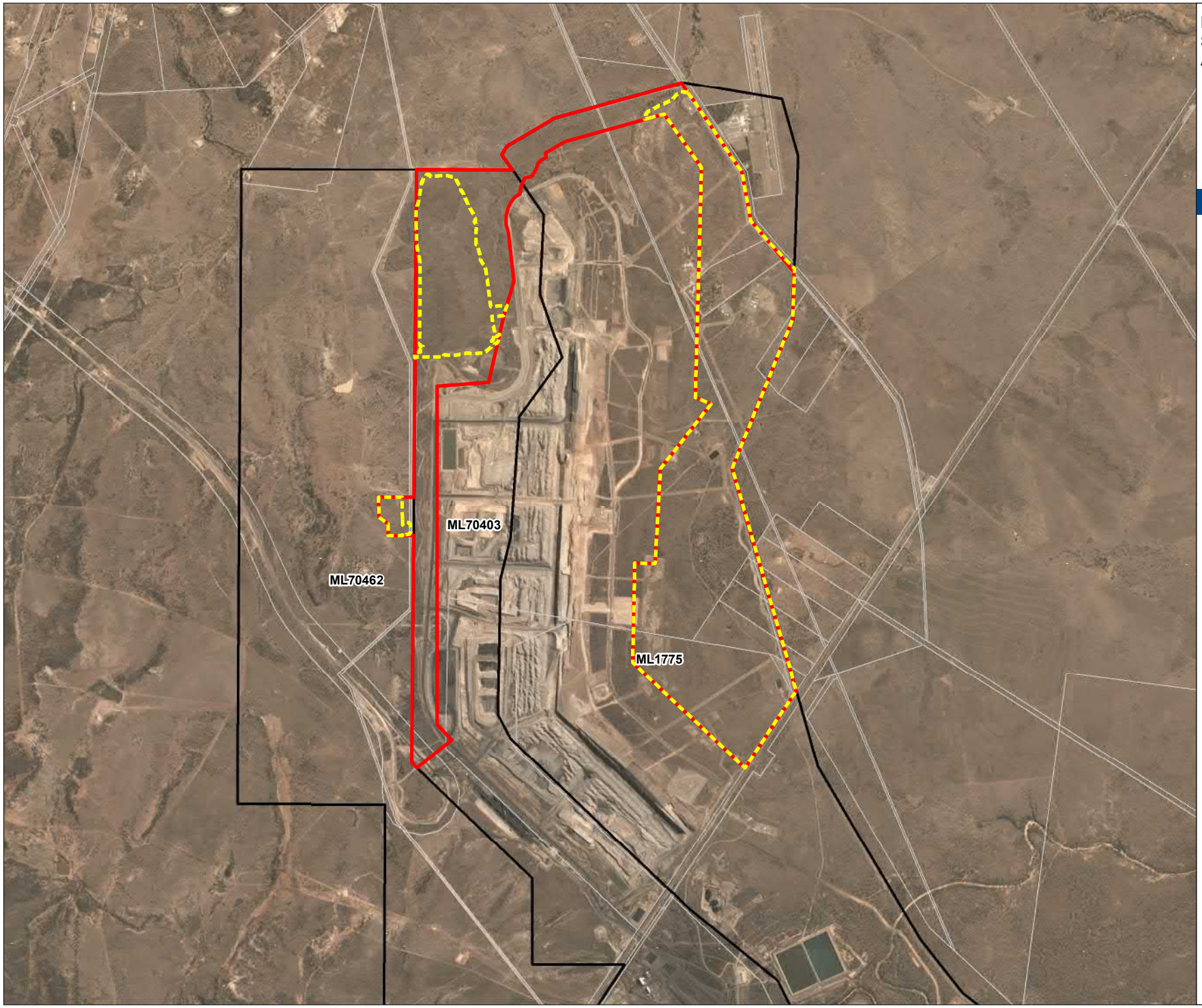
4.2.1.3 Land Use

At the time of the field assessment, the land use within SMU 1A was pasture.

4.2.1.4 Management Considerations

If undisturbed, soils within SMU 1A require standard Erosion and Sediment Controls (ESC). The topsoil is suitable for stripping and reuse using standard management controls. The subsoil generally exhibits strong alkalinity, high sodicity and high salinity. If the subsoil is exposed and not managed, in addition to severe agricultural productivity limitations, impacts may include:

- Erosion hazards including tunnel erosion;
- Impeded soil infiltration and permeability;
- Slumping failure of batters; and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Soil Map Units

FIGURE 7

Soil Map Units

- Self-Mulching Brown-Black Vertosol (1A)
- Self-Mulching Brown-Black Vertosol (1B)
- Eutrophic Red-Brown Chromosol (2)
- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

N

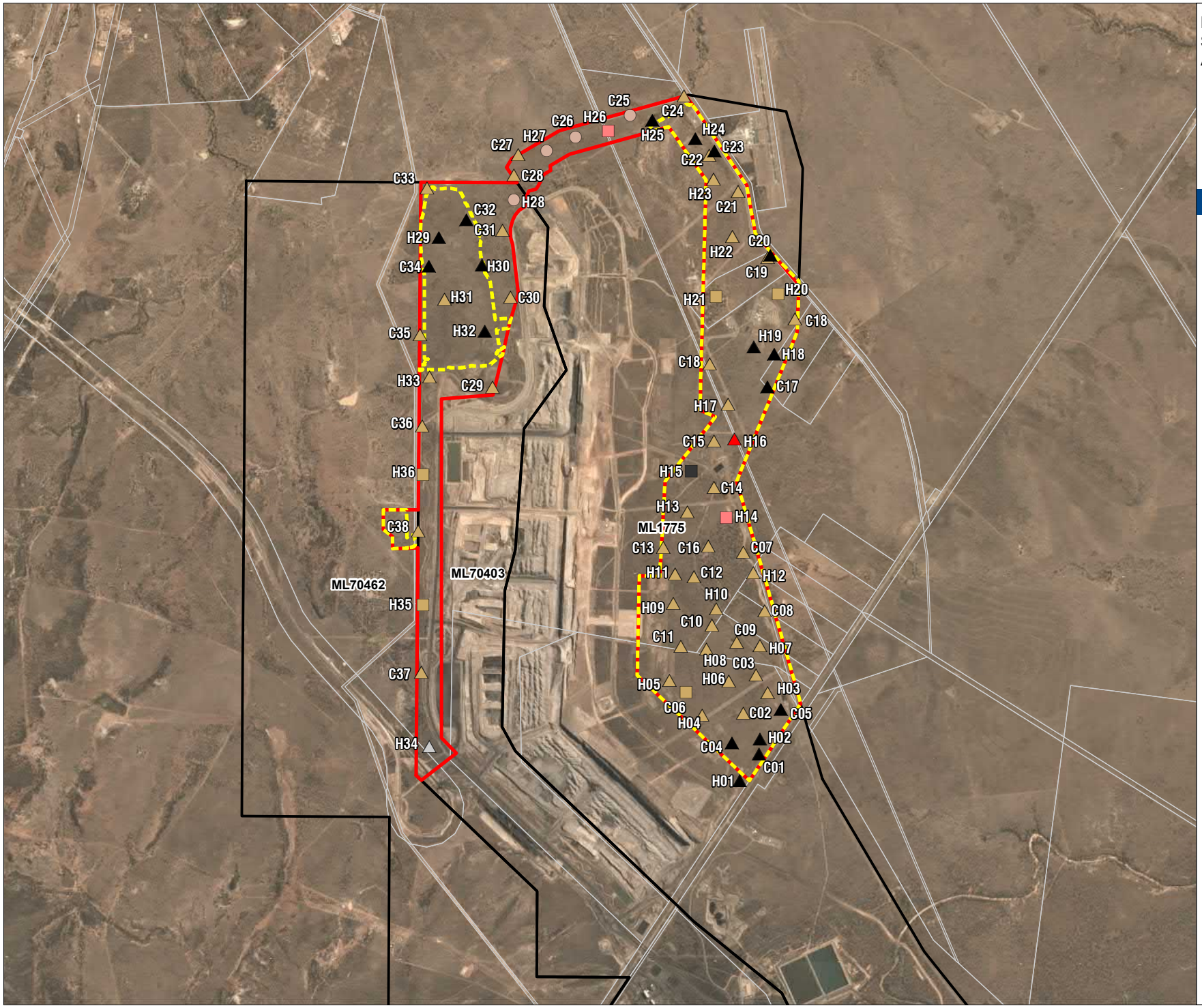
0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F07 ASC Soil Types.mxd



HORSE PIT EXTENSION PROJECT
SOIL AND LAND RESOURCE ASSESSMENT

Cropping Land Suitability Class Pre-Mining

FIGURE 8

- Brown Chromosol
- Red Chromosol
- Brown Dermosol
- Black Dermosol
- Red Dermosol
- Black Vertosol
- Brown Vertosol
- Grey Vertosol
- Red Vertosol
- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F08 Appendix Field Sampling Plan showing ASC Soil Types.mxd

4.2.2 Soil Map Unit 1B

4.2.2.1 Description

SMU 1A dominant soil types include Self-Mulching Brown-Black Vertosols and sub-dominant soil types include Dermosols, Grey Vertosols and Red Vertosols.

4.2.2.2 Location

SMU 1B is located in the eastern portion and comprises approximately 33% or 404 ha of the Study area.

4.2.2.3 Land Use

At the time of the field assessment, the land use within SMU 1B was pasture.

4.2.2.4 Management Considerations

If undisturbed, soils within SMU 1B require standard ESC. The topsoil is suitable for stripping and reuse using standard management controls. The subsoil generally exhibits strong alkalinity, high sodicity and high salinity. If the subsoil is exposed and not managed, in addition to severe agricultural productivity limitations, impacts may include:

- Erosion hazards including tunnel erosion;
- Impeded soil infiltration and permeability;
- Slumping failure of batters; and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.2.3 Soil Map Unit 2

4.2.3.1 Description

SMU 2 dominant soil type are Eutrophic Red-Brown Chromosols.

4.2.3.2 Location

SMU 2 is located in the northern portion and comprises approximately 5% or 53 ha of the Study area.

4.2.3.3 Land Use

At the time of the field assessment, the land use within SMU 2 was pasture.

4.2.3.4 Management Considerations

If undisturbed, soils within SMU 2 require standard ESC. The topsoil is suitable for stripping and reuse using standard management controls. The subsoil generally exhibits strong alkalinity, high sodicity and high salinity. If the subsoil is exposed and not managed, in addition to severe agricultural productivity limitations, impacts may include:

- Erosion hazards including tunnel erosion;

- Impeded soil infiltration and permeability;
- Slumping failure of batters; and
- Soil dispersion leading to soil structure breakdown, increased run-off and increased turbidity run-off.

4.3 Soil Resources

Based on the soil survey results, topsoil and subsoil resources are summarised in Table 7.

Table 7 Available Soil Resource Summary

Topsoil Map Unit	ASC Soil Type	Hectares	Topsoil Strip Depth (m)	Topsoil Volume (m^3)
1A	Self-Mulching Brown-Black Vertosol	757	0.16	1,211,200
1B	Self-Mulching Brown-Black Vertosol	404	0.14	565,600
2	Eutrophic Red-Brown Chromosol	53	0.30	159,000
Topsoil Volume Available				1,935,800
Topsoil Less 10% Handling Loss				1,742,220
Subsoil Map Unit	**ASC Soil Type**	**Hectares**	**Subsoil Strip Depth (m)**	**Subsoil Volume(m^3)**
1A	Self-Mulching Brown-Black Vertosol	757	0.84	6,358,800
1B	Self-Mulching Brown-Black Vertosol	404	0.86	3,474,400
2	Eutrophic Red-Brown Chromosol	53	0.70	371,000
Subsoil Volume Available				10,204,200
Subsoil Less 10% Handling Loss				9,183,780

5 Soil and Land Resource Impact Assessment

The soil and land resource impact assessment takes into consideration Land Suitability, Agricultural Land and Land Capability Assessments with comparison to pre- and post-mining disturbance and the post-mining conceptual final landform.

The proposed disturbance during mining includes those summarised in Section 1.3. The conceptual final landform includes two notable landform changes compared to the pre-mine landform. Firstly, a single proposed final void (as shown in Figure 9) of which the majority lies within the eastern portion of the Study area (the balance of the void area being within the pre-approved CVM EIS boundary). In addition to the proposed final void, the elevation of the out of pit dump area in the north-western portion of the Study area will increase compared to the pre-mine landform in some parts by over 100 m. The final conceptual landform is depicted in Figure 9. THE CVM Progressive Rehabilitation and Closure Plan (PRCP) is currently under preparation. The PCRP will define the required land use categories.

5.1 Land Suitability Methodology

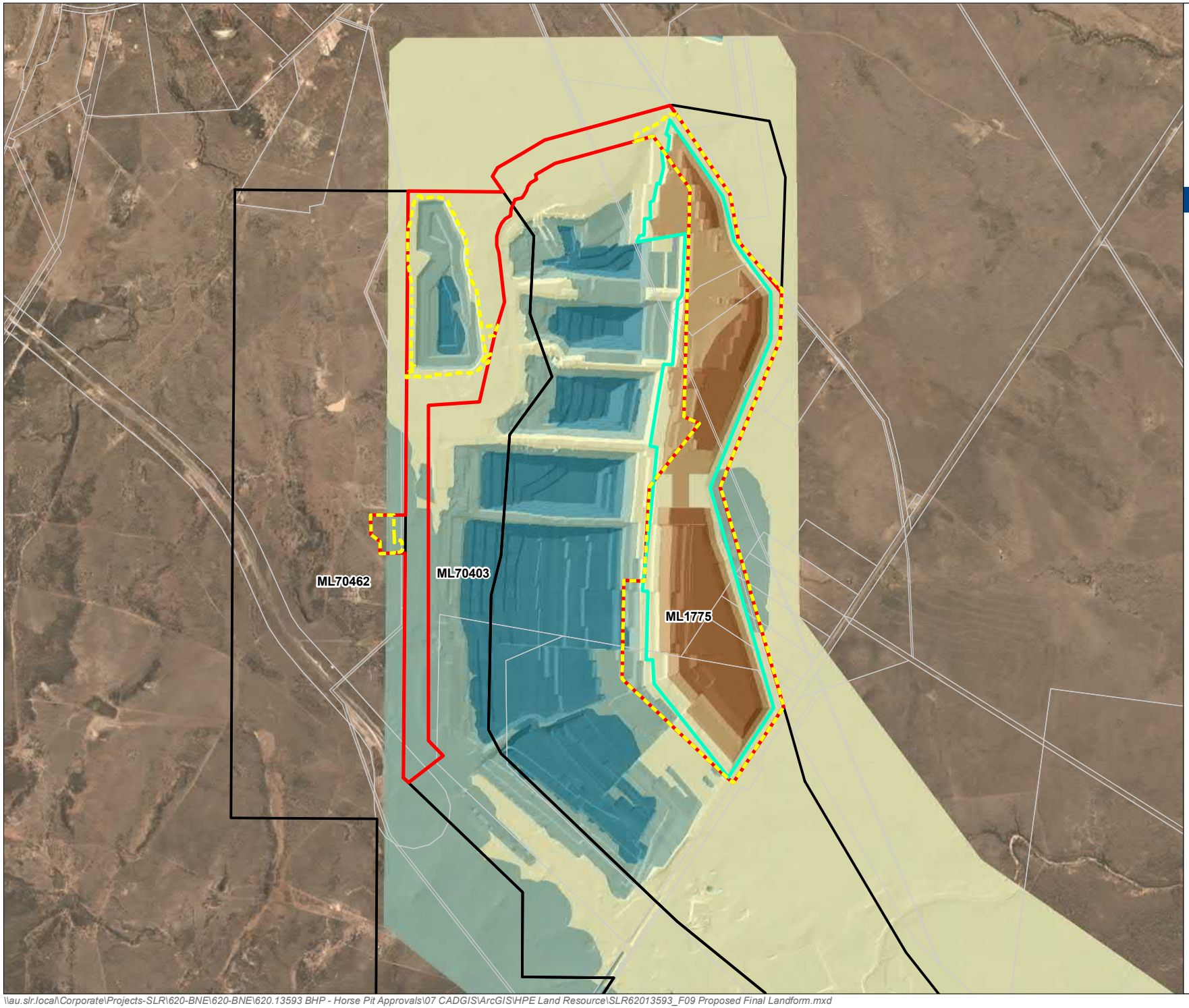
The information required for the land suitability assessment was collected during the desktop assessment and verified on the ground during the field survey and laboratory testing program. The land suitability classification was applied across the Study area in accordance with the Regional Land Suitability Frameworks for Queensland (DSITI & DNRM, 2015), in particular Section 10 Suitability Framework for the Inland Fitzroy and Southern Burdekin Area. This scheme uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards. The scheme consists of eight limitations that classify the land based on the severity against the suitability subclasses for various land management options. The eight limitations associated with the biophysical features that are assessed by the scheme are:

- 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).

The suitability framework provides the detail for assessing which crops are suitable for individual mapped areas of land or soil, in addition the suitability of the land for grazing is also considered. Each hazard was assessed against a set of criteria tables, as described in the guideline, with each hazard ranked from 1 (most suitable) through to 5 (least suitable) with the overall ranking of the land determined by its most significant limitation, as described in Table 8.

Table 8 Land Suitability Classes

Class	Description
1	Suitable land with negligible limitations and is highly productive requiring only simple management practices.
2	Suitable land with minor limitations which either reduce production or require more than simple management practices to sustain the use.
3	Suitable land with moderate limitations. Land which is moderately suited to a proposed use but which requires significant inputs to ensure sustainable use.
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.
5	Unsuitable land with extreme limitations that precludes its use.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Horse Pit Final Conceptual Landform

FIGURE 9

- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- Proposed Final Void
- BHP Tenements
- Cadastre

Elevation (mAHD)

- 300 - 390
- 250 - 300
- 200 - 250
- 150 - 200
- 95 - 150

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Dec-2021
Drawn by:	PM

SLR

BMA
BHP Mitsubishi Alliance

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F09 Proposed Final Landform.mxd

5.2 Land Suitability Results

Land Suitability Classes, as described in the guideline, are provided in Table 8 with each ranked from 1 (most suitable) through to 5 (least suitable) with the overall ranking of the land determined by its most significant limitation.

5.2.1 Pre-mining

The Land Suitability Assessment indicates 1,161 ha of land within the Study area is rated as Class 5 for cropping and Class 3 for grazing, consisting of SMU 1A and 1B. The main limitations for this area are soil wetness (w) and soil water availability (m). The balance of the Study area (53 ha) is rated as Class 4 for cropping and Class 2 for grazing, consisting of SMU2. The main limitation for this area is soil water availability (m). Results for the pre-mining Land Suitability Assessment are shown in Figure 10 and the detailed Land Suitability Assessment is provided in Appendix E (Table 1).

5.2.2 Post-Mining

Land suitability classes for areas not scheduled for the proposed mining activity disturbances will remain the same. This includes some Class 5 cropping (Class 3 grazing) areas and the entirety of the Class 4 cropping (Class 2 grazing) area comprising approximately 303 ha of the Study area.

Land suitability classes for areas scheduled for the proposed disturbance, that are outside the boundary of the proposed final void area, will be managed and rehabilitated. The approaches in Section 6 aim to return land to the appropriate land suitability classes. The out of pit dump area will include steeper slopes than the pre-mining landform and present additional limitations to that land, however as this area has been assessed as the least suitable category (i.e. Class 5) pre-mining, the suitability cannot decrease further. The PRCP for CVM will define the required land use categories.

Land suitability classes for the proposed final void are unable to be assessed as the area is defined to have ‘no-use’. The proposed final void area will impact on pre-mining Class 5 land areas comprising approximately 597 ha of the Study area, which results in a 51% shift in the total amount of Class 5 land within the Study area.

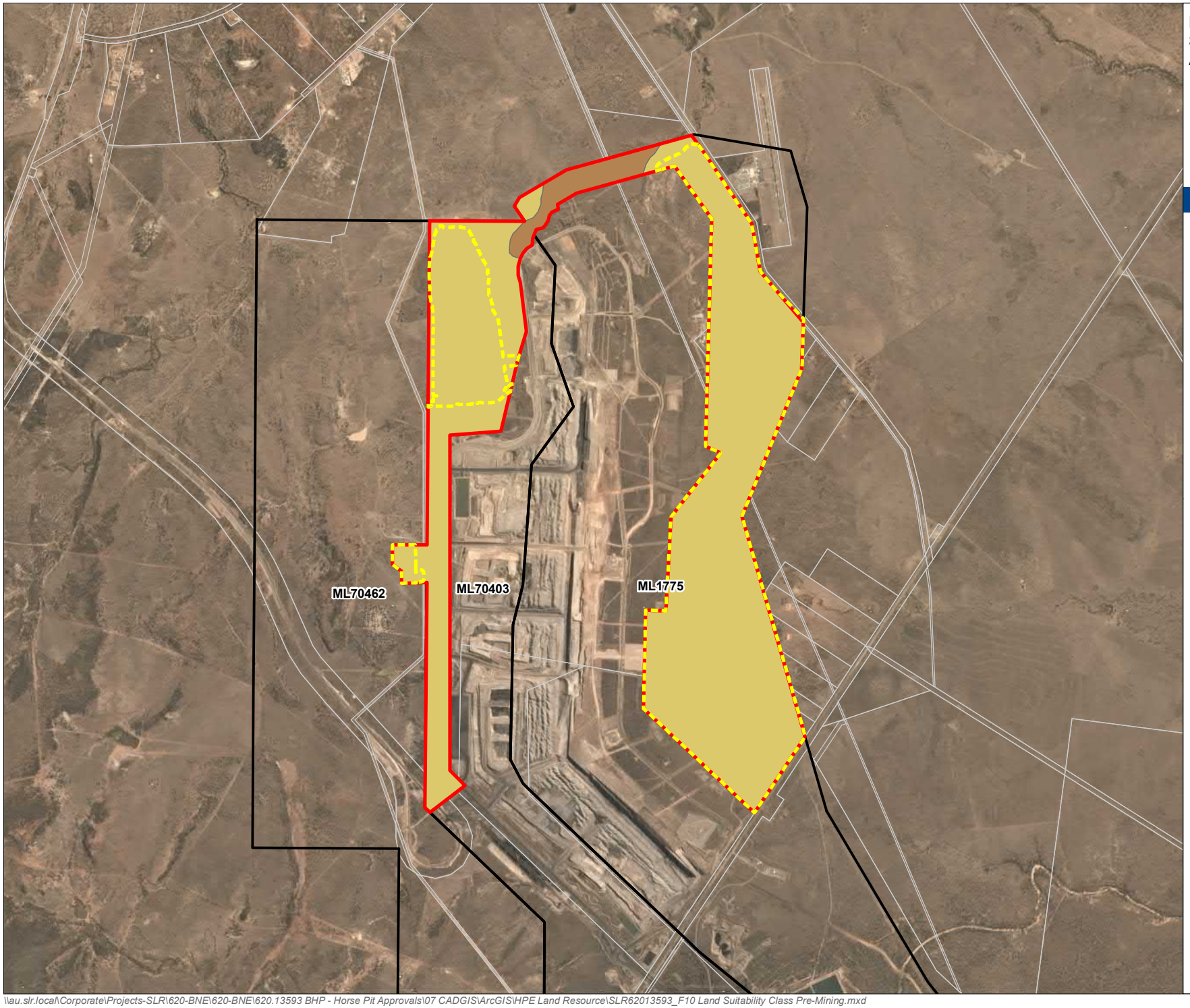
Changes in the areas of land suitability classes within the Study area between pre- and post-mining are summarised in Table 9 and the post-mining land suitability classes is depicted in Figure 11.

Table 9 Pre- and Post-Mining Land Suitability Classes

Cropping Suitability Class (Grazing Suitability Class)	Pre-Mining		Post-Mining	
	ha	%	ha	%
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4 (2)	53	5	53	5
5 (3)	1,161	95	564	46
NA[1]	0	0	597[2]	49
Total	1,214	100	1,214	100

[1] Not Assessable i.e. proposed final void area us defined to have 'no-use'.

[2] Estimated extent of final void within HPE Project area.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Land Suitability Class Pre-Mining

FIGURE 10

- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

Suitability Class

- Cropping 4 (Grazing 2)
- 5

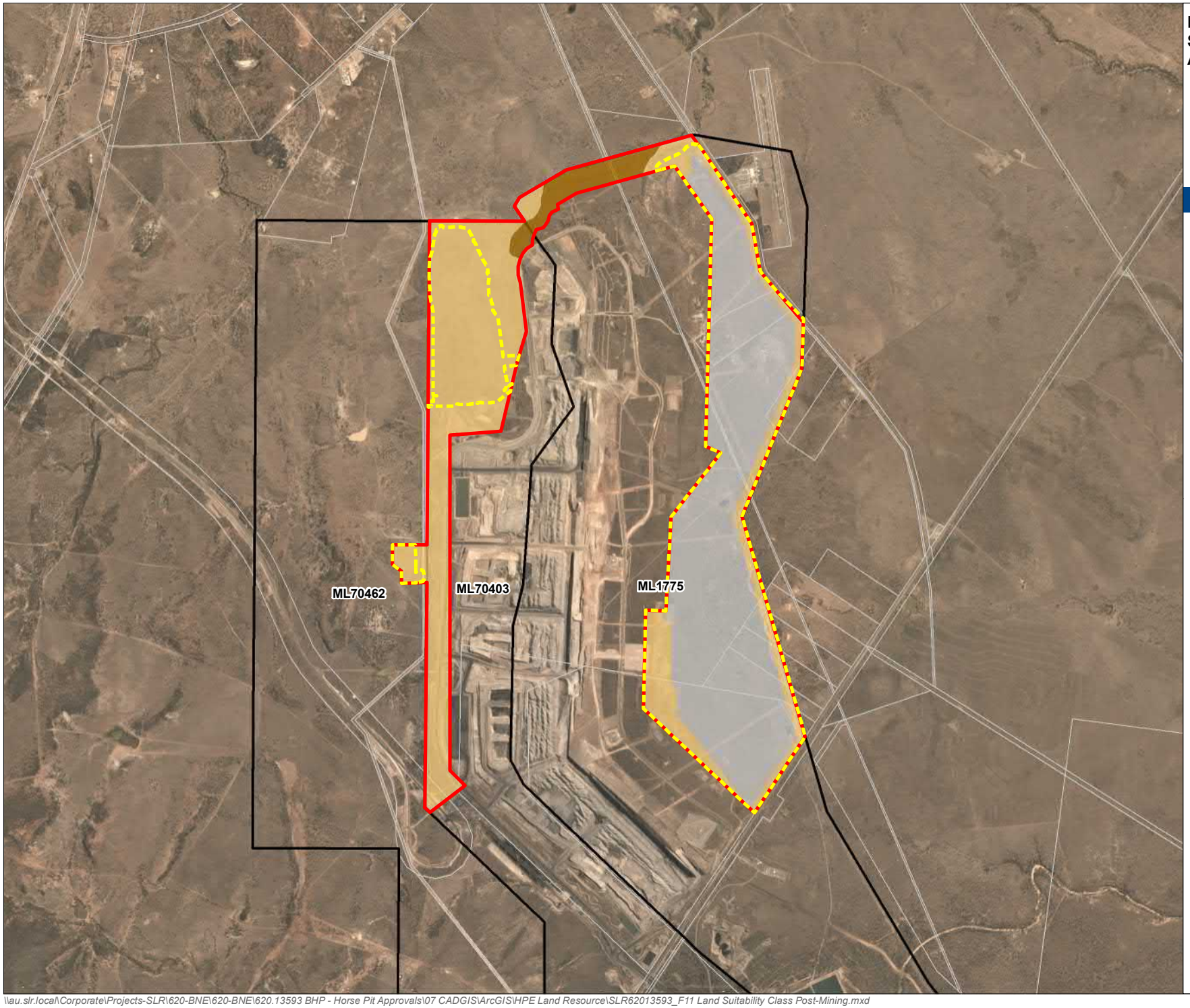
0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Dec-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F10 Land Suitability Class Pre-Mining.mxd



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Land Suitability Class Post-Mining

FIGURE 11

- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

Suitability Class

- Not Assessable
- Cropping 4 (Grazing 2)
- 5

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Dec-2021
Drawn by:	PM

SLR

BMA
BHP Mitsubishi Alliance

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F11 Land Suitability Class Post-Mining.mxd

5.3 Agricultural Land Class Assessment

Agricultural Land Classification in Queensland follows a simple hierarchical scheme that is applicable across the state. It allows the presentation of interpreted land evaluation data to indicate the location and extent of agricultural land that can be used sustainably for a wide range of land uses with minimal land degradation. Provision is also made to highlight areas that may be suitable for one specific crop considered important in a particular area. Three broad classes of agricultural land and one non-agricultural land class are identified in the Agricultural Land Class system (Table 10) (DSITI & DNRM, 2015):

- Class A – Crop land;
- Class B – Limited crop land;
- Class C – Pasture (grazing) land; and
- Class D – Non-agricultural land.

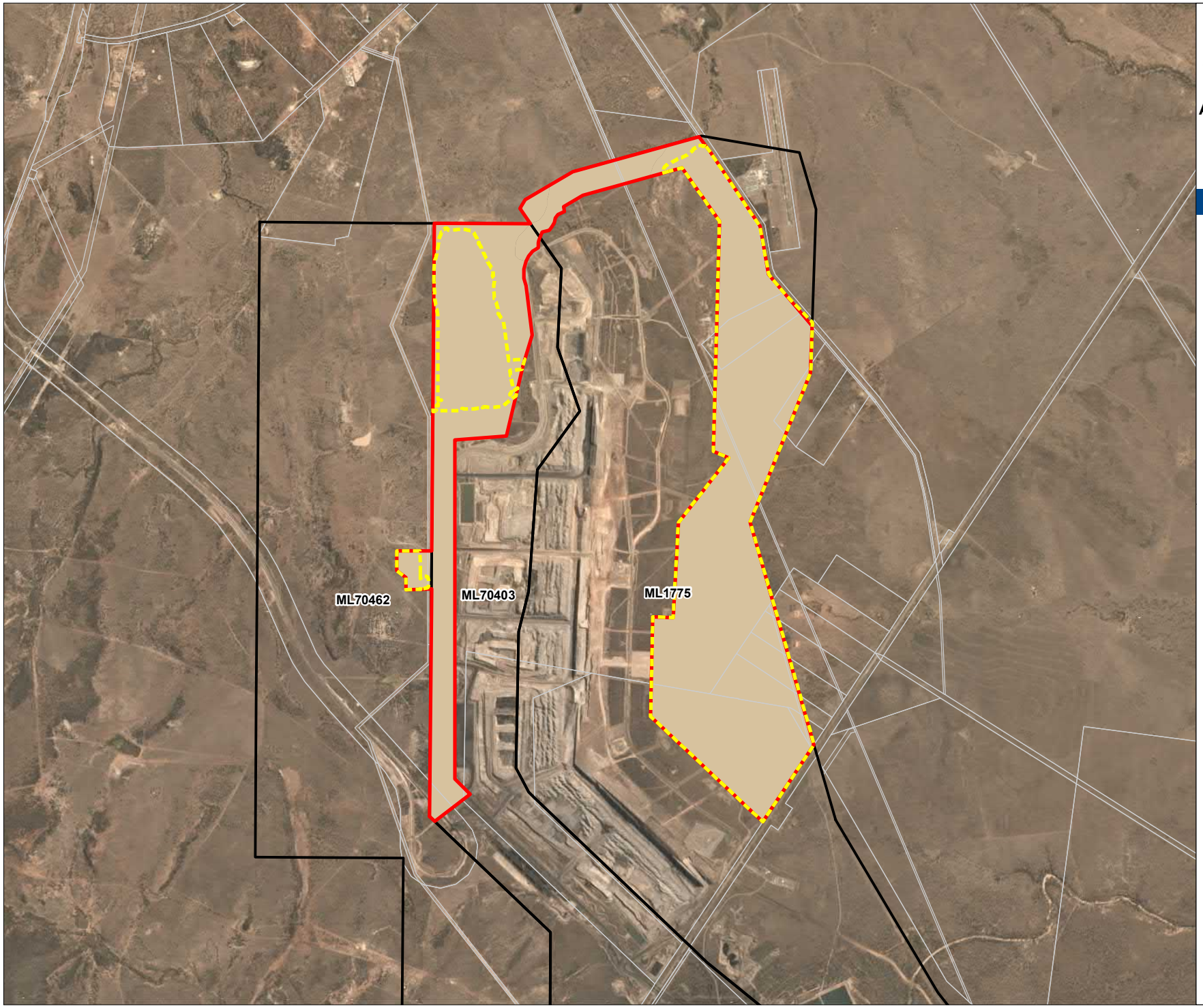
Table 10 Agricultural Land Classes

Class	Description
A	Crop land – Land that is suitable for current and potential crops with limitations to production which range from none to moderate levels.
B	Limited crop land – Land that is marginal for current and potential crops due to severe limitations; and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
C	Pasture land – Land that is suitable only for improved or native pastures due to limitations which preclude continuous cultivation for crop production; but some areas may tolerate a short period of ground disturbance for pasture establishment.
C1	Suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils.
C2	Suitable for grazing native pastures, with or without the introduction of pasture, and with lower fertility soils than C1.
C3	Suitable for light grazing of native pastures in accessible areas, and includes steep land more suited to forestry or catchment protection
D	Non-agricultural land – Land not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

5.4 Agricultural Land Class Results

5.4.1 Pre-Mining

The Agricultural Land Assessment indicates the entire Study area (1,214 ha), is rated as Agricultural Land Class C1, pastureland, suitable for grazing improved and native pastures. Results for the pre-mining Agricultural Land Assessment are shown in Figure 12.



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Agricultural Land Class Pre-Mining

FIGURE 12

- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

Agricultural Land Class

- C1

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F12 Ag Land Pre Mining.mxd

5.4.2 Post-Mining

Agricultural land classes for areas not scheduled for the proposed mining activity disturbances will remain the same. This includes Class C1 areas comprising approximately 303 ha of the Study area.

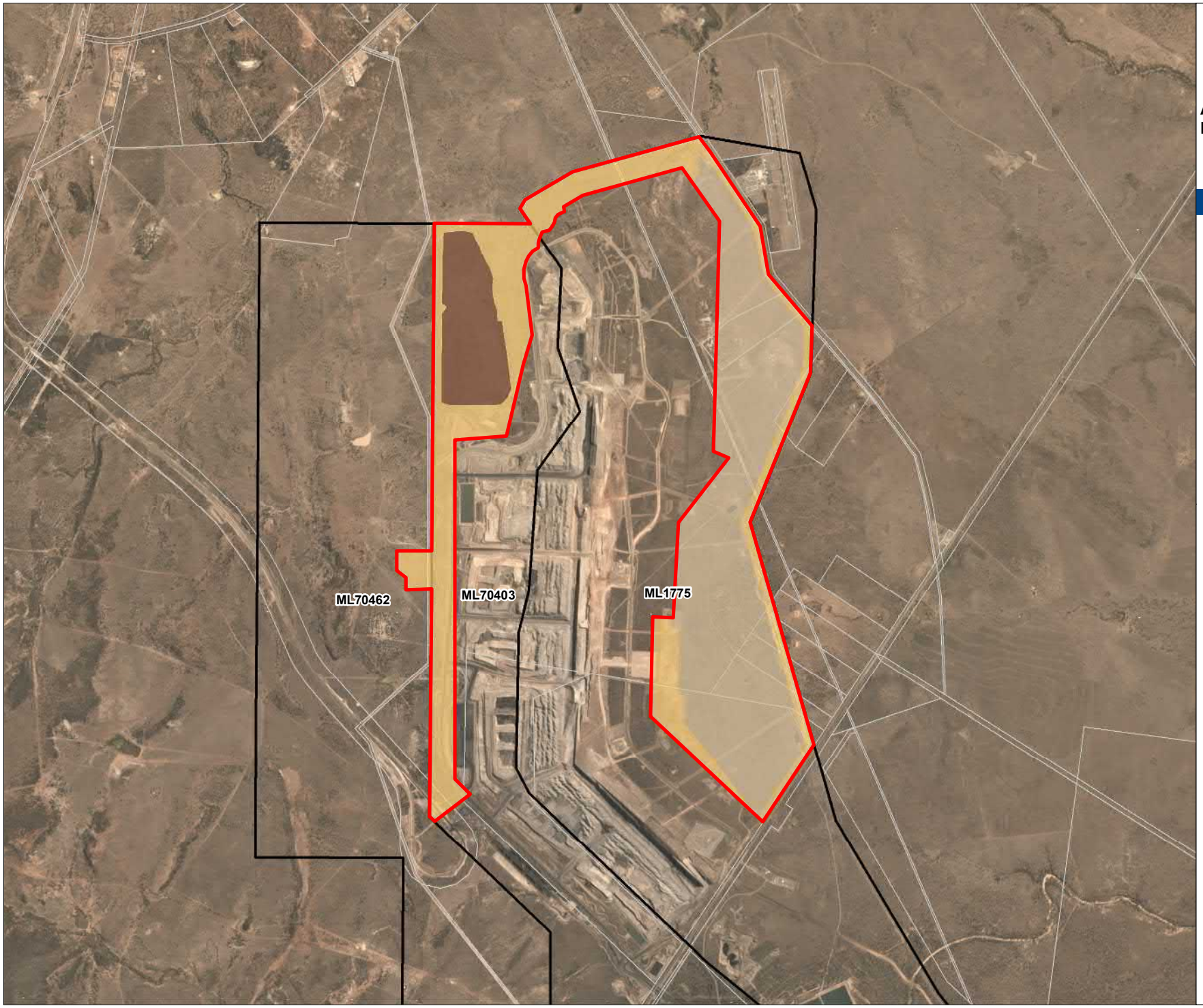
Agricultural land classes for areas scheduled for the proposed disturbance, that are outside the boundary of the proposed final void area, will be managed and rehabilitated. The approaches in Section 6 aim to return land to an appropriate land classes. However, the out of pit dump area will include steeper slopes than the pre-mining landform and present additional limitations to that land, which will likely result in a Class C3 categorisation. Current estimates show approximately 186 ha of land will be rehabilitated to the pre-mining class of C1 and 128 ha to Class C3, which represents a 11% shift of Class C1 to C3 land.

The agricultural land class for the proposed final void area will be Class D land as the area is defined to have 'no-use'. The proposed final void area will impact on pre-mining Class C1 areas comprising approximately 597 ha of the Study area, which will result in a 49% shift of Class C1 to Class D land.

Changes in the areas of agricultural land classes within the Study area between pre- and post-mining are summarised in Table 11 and the post-mining agricultural classes is depicted in Figure 13.

Table 11 Pre- and Post-Mining Agricultural Land Classes

Class	Pre-Mining		Post-Mining	
	ha	%	ha	%
A	0	0	0	0
B	0	0	0	0
C	0	0	0	0
C1	1,214	100	489	40
C2	0	0	0	0
C3	0	0	128	11
D	0	0	597	49
Total	1,214	100	1,214	100



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Agricultural Land Class Post-Mining

FIGURE 13

- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

Agricultural Land Class

- C1
- C3
- D

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F13 Ag Land Post Mining.mxd

5.5 Land Capability Assessment

Land capability classification evaluates the potential of land for broadly defined land uses, e.g. cropping, pastoral, non-agricultural. In Queensland, it is generally only used for broad scale assessment of land.

The system uses eight classes, described in Table 12, with limitations and hazards to agricultural and pastoral use becoming progressively greater from Class I to Class VIII, accompanied by a decreasing adaptability and choice of use. Lower-numbered classes (Classes I to III) are suited to more intense agricultural uses while higher-numbered classes are suited only to low-intensity agricultural use or conservation. Class VIII is unsuited to agricultural use.

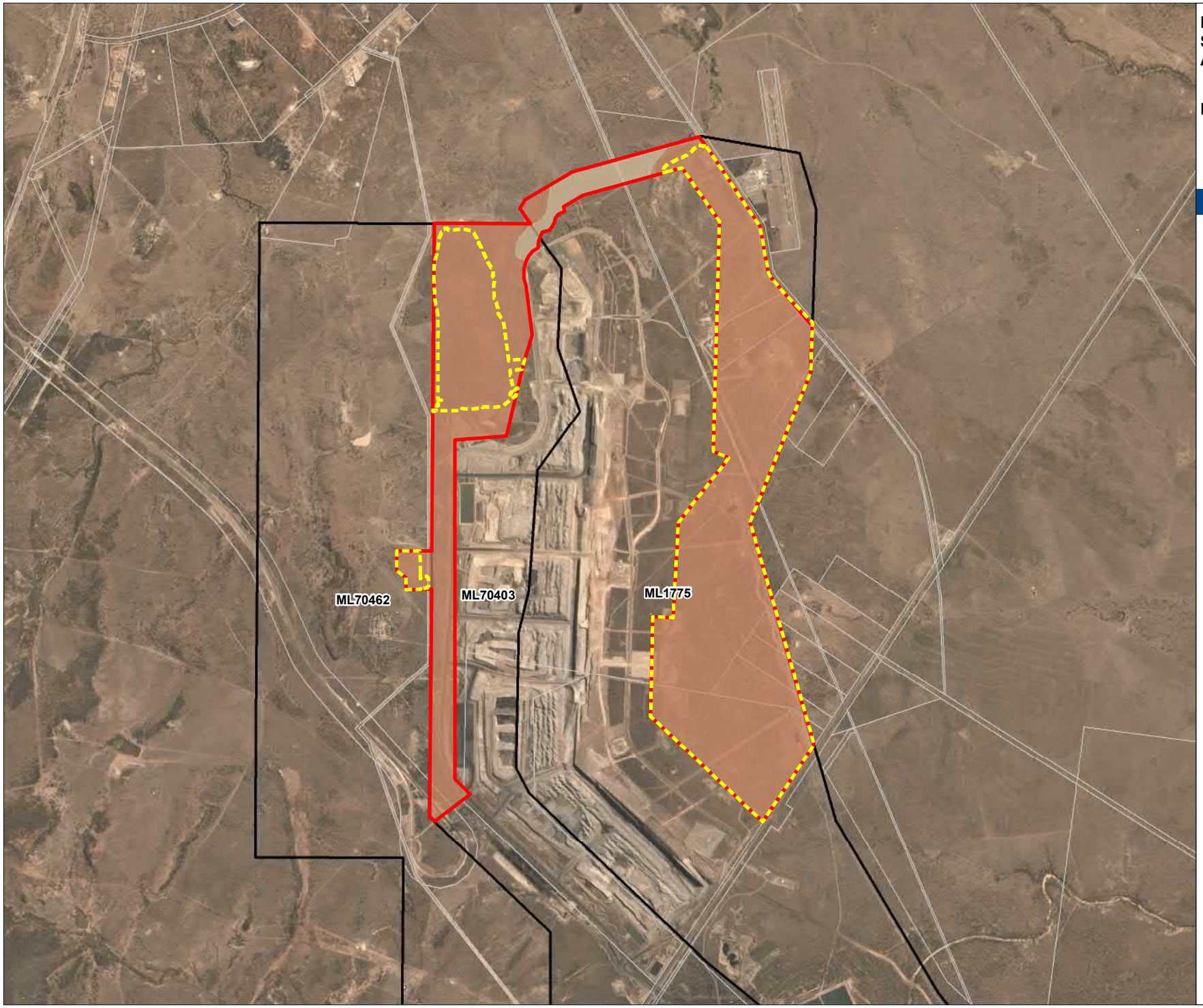
Table 12 Land Capability Classes

Class	Description
I	Land suitable for all agricultural and pastoral uses
II	Land suitable for all agricultural uses but with slight restrictions for cultivation
III	Land suitable for all agricultural uses but with moderate restrictions for cultivation
IV	Land primarily suited to pastoral use but which may be safely used for occasional cultivation with careful management
V	Land that in all other characteristics would be arable but has limitations that make cultivation impractical and/or uneconomic
VI	Land that is not suitable for cultivation but is well suited to pastoral use
VII	Land that is not suitable for cultivation but on which pastoral use is possible only with careful management
VIII	Land that has such severe limitations that it is unsuited for either cultivation or grazing

5.6 Land Capability Results

5.6.1 Pre-Mining

The Land Capability assessment indicates 1,161 ha of land within the Study area is rated as Class VI land that is not suitable for cultivation, but is well suited to grazing, consisting of SMU 1A and 1B. The main limitations for the Class VI area is erosion hazard (Es) and surface condition (Ps). The balance of the Study area (53 ha) is rated as Class V, land that in all other characteristics would be arable, but has limitations that make cultivation impractical and/or uneconomic for cropping. The main limitation for the Class V area is erosion hazard (Es) and surface condition (Ps). Results for the pre-mining Land Capability Assessment are shown in Figure 14 and the detailed Land Capability Assessment is provided in Appendix E (Table 1).



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Land Capability Class Pre-Mining

FIGURE 14

- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

Land Capability Class

- V
- VI

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA
BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F14 Land Capability Pre Mining.mxd

5.6.2 Post-Mining

Land capability classes for areas not scheduled for the proposed mining activity disturbances will remain the same. This includes some Class VI areas and the entirety of the Class V area comprising approximately 303 ha of the Study area.

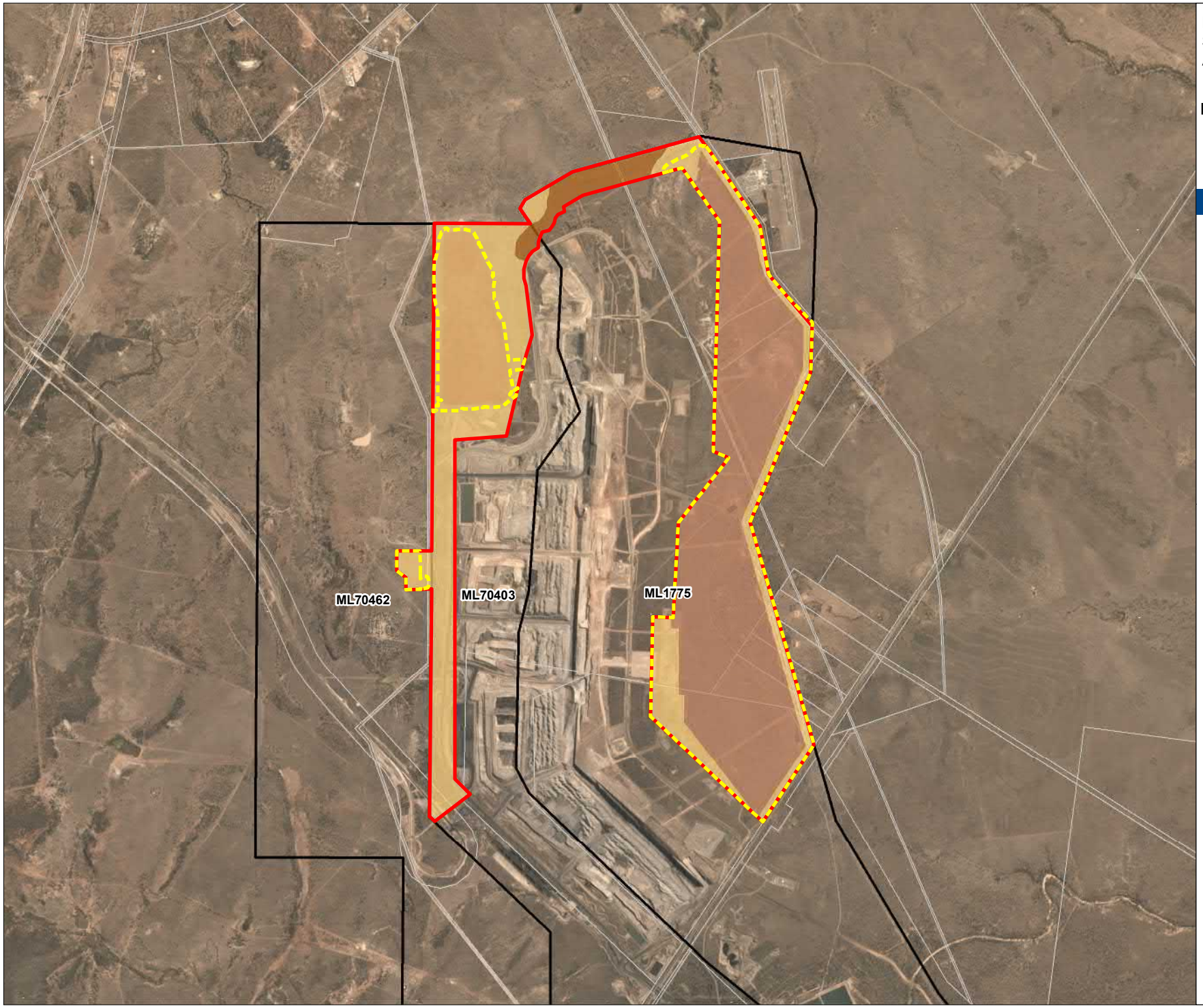
Land capability classes for areas scheduled for the proposed disturbance, that are outside the boundary of the proposed final void area, will be managed and rehabilitated. The approaches in Section 6 aim to return land to an appropriate land capability classes. However, the out of pit dump area will include steeper slopes than the pre-mining landform and present additional limitations to that land, which will likely result in a Class VII categorisation. Current estimates show approximately 186 ha of land will be rehabilitated to the pre-mining class of VI and 128 ha to Class VII, which represents a 11% shift of Class VI to VII land.

The land capability class for the proposed final void will be Class VIII land as the area is defined to have 'no-use'. The proposed final void area will impact on pre-mining Class VI areas comprising approximately 597 ha of the Study area, which will result in a 51% shift of Class VI to Class VII land.

Changes in the areas of land capability classes within the Study area between pre- and post-mining are summarised in Table 13 and the post-mining land capability classes are depicted in Figure 15.

Table 13 Pre- and Post-Mining Land Capability Classes

Class	Pre-Mining		Post-Mining	
	ha	%	ha	%
I	0	0	0	0
II	0	0	0	0
III	0	0	0	0
IV	0	0	0	0
V	53	4	53	4
VI	1,161	96	436	36
VII	0	0	128	11
VIII	0	0	597	49
Total	1,214	100	1,214	100



HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Land Capability Class Post-Mining

FIGURE 15

- Proposed Disturbance Footprint
- Horse Pit Extension Project Area (i.e. Study Area)
- BHP Tenements
- Cadastre

Capability Class

- V
- VI
- VII
- VIII

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SLR

BMA BHP Mitsubishi Alliance

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F15 Land Capability Post Mining.mxd

6 Rehabilitation

6.1 Rehabilitation Goals

In accordance with the conditions of the CVM EA (EPML00562013) (specifically Condition E3), all areas significantly disturbed by mining activities must be rehabilitated in accordance with Table E1 (of the EA). Table E1 outlines objectives, indicators and acceptance criteria for rehabilitation relating to goals for creating land that is:

- Safe to humans and wildlife;
- Non-polluting;
- Stable; and
- Able to sustain an agreed post-mining land use.

In consideration of the above, the mine-specific rehabilitation goals for the project area are that the land should be returned to a post-mine land use that will be:

- Stable;
- Self-sustaining; and
- Require minimal maintenance.

The stability of the post-mine landform will be achieved by applying sound rehabilitation practices. Stable landforms will be established following mining, using soils capable of supporting vegetation communities adapted to the local environment. The rehabilitation practices are designed to stabilise the landform, protect downstream water quality and aid a sustainable outcome for the project area.

6.2 Rehabilitation Methodology

Rehabilitation within the project area will be in accordance with the CVM rehabilitation commitments as per the upcoming progressive rehabilitation and closure plan (PRCP). A summary of rehabilitation methodology that may be included in the PRCP are outlined in the below sections.

6.2.1 Soil Sourcing, Substitution, Placement and Amelioration

Suitable topsoil will be stripped for use in later rehabilitation. The topsoil will either be stockpiled until suitable re-contoured areas are available, or directly returned immediately across areas to be rehabilitated. The results of the land resources assessment identified that the topsoil and subsoil resources are adequate for the rehabilitation of the disturbed areas. There is a volume of topsoil available to cover approximately 774 ha to a depth of 250 mm for rehabilitation. In addition to the topsoil, there are subsoil resources available which could cover approximately 4,080 ha to a depth of 250 mm. However, the subsoil would require amelioration with gypsum to allow it to be utilised as topsoil or for use in rock mulch as a topsoil substitute.

Topsoil from SMUs 1A and 1B (both Vertosols) could be stripped to a depth of 0.2 m without intrinsically changing the material properties of the won topsoil, given the already high clay content of the topsoil (A horizon) and similar chemical properties of the B21 horizons in these SMUs. This would provide an additional 361,080 m³ of available topsoil for later use.

Soil should be stripped in a slightly moist condition wherever possible. Material should not be stripped in either an excessively dry or wet condition. Stripping operations should not be undertaken during excessive dry periods to prevent pulverisation of the natural soil aggregates. Similarly, stripping during wet periods will not be undertaken to prevent damage of the resource through compaction by equipment.

To reduce soil degradation during stripping operations preference should be given to using equipment, which can grade or push soil into windrows such as graders or dozers for later collection by open bowl scrapers or for loading into rear dump trucks by front-end loaders. This will minimise compaction impacts of heavy equipment that is often necessary for economical transport of soil material. These techniques are examples of preferential, less aggressive soil handling systems, which may be adopted.

6.2.2 Soil Placement and Management

All soils removed will be placed in designated stockpile areas. Freshly stripped and placed topsoil retains seed that is more viable, micro-organisms and nutrients than stockpiled soil. Vegetation establishment is generally improved by the direct return of topsoil, and is considered 'best practice' topsoil management. Should long term storage stockpiles be proposed, accurate records are required indicating stockpile volumes with areas to be covered by each stockpile upon decommissioning and rehabilitation.

The following management and mitigation strategies should be implemented to reduce degradation during stockpiling operations.

- Locations of stockpiles should be recorded using GPS along with data relating to the soil type and volume. An inventory of available soil should be maintained and updated regularly to ensure adequate topsoil and subsoil materials are available for planned rehabilitation activities;
- The surface of soil stockpiles should be left in as coarsely structured condition as possible to promote rainfall infiltration and minimise erosion prior to cover vegetation becoming established. The coarse structure will also prevent anaerobic zones forming;
- Soil types with significantly different properties should be stockpiled separately;
- Storage time should be minimised, where possible. If long-term stockpiling is planned, stockpiles should be seeded with an annual cover crop species that produce sterile florets or seeds should be sown. A rapid growing and healthy annual pasture sward provides sufficient competition to minimise the emergence of undesirable weed species. The annual pasture species will not persist in the rehabilitation areas but will provide sufficient competition for emerging weed species, enhance the desirable micro-organism activity in the soil and minimise the erosivity potential of the stockpile;
- Subsoil and topsoil should be spread to depths according to target requirements; and
- Where possible, suitable subsoil and topsoil should be re-spread directly onto rehabilitation areas. Topsoil will be spread, treated with fertiliser and seeded in one consecutive operation, reducing the potential for compaction and also topsoil loss to wind and water erosion.

6.2.3 Soil and Material Balances

The soil volumes referenced in Table 7 approximate the total soil resources within the project area. These estimated volumes of suitable soil available are 1,742,220 m^3 of topsoil and 9,183,780 m^3 of subsoil. It is noted that depth of subsoil below the in-situ measurement of 1.0 m was not included in the calculations, and it is expected that additional subsoil resources may be available below this depth in both the Vertosols and Chromosols.

The soil survey and laboratory results were used to determine depth of soil material suitable for recovery and reuse as material in rehabilitation. Factors requiring management considerations include stones, sodicity, salinity and alkalinity of subsoils. Actual volumes of topsoil and subsoil from SMUs 1A and 1B which can be stripped due to surface disturbance is 1,439,820 m³ of Vertosol topsoil and 7,326,180 m³ of Vertosol subsoil, as summarised in Table 14. There is no proposed disturbance within SMU 2. Soil Map Units and disturbance areas are depicted in Figure 16.

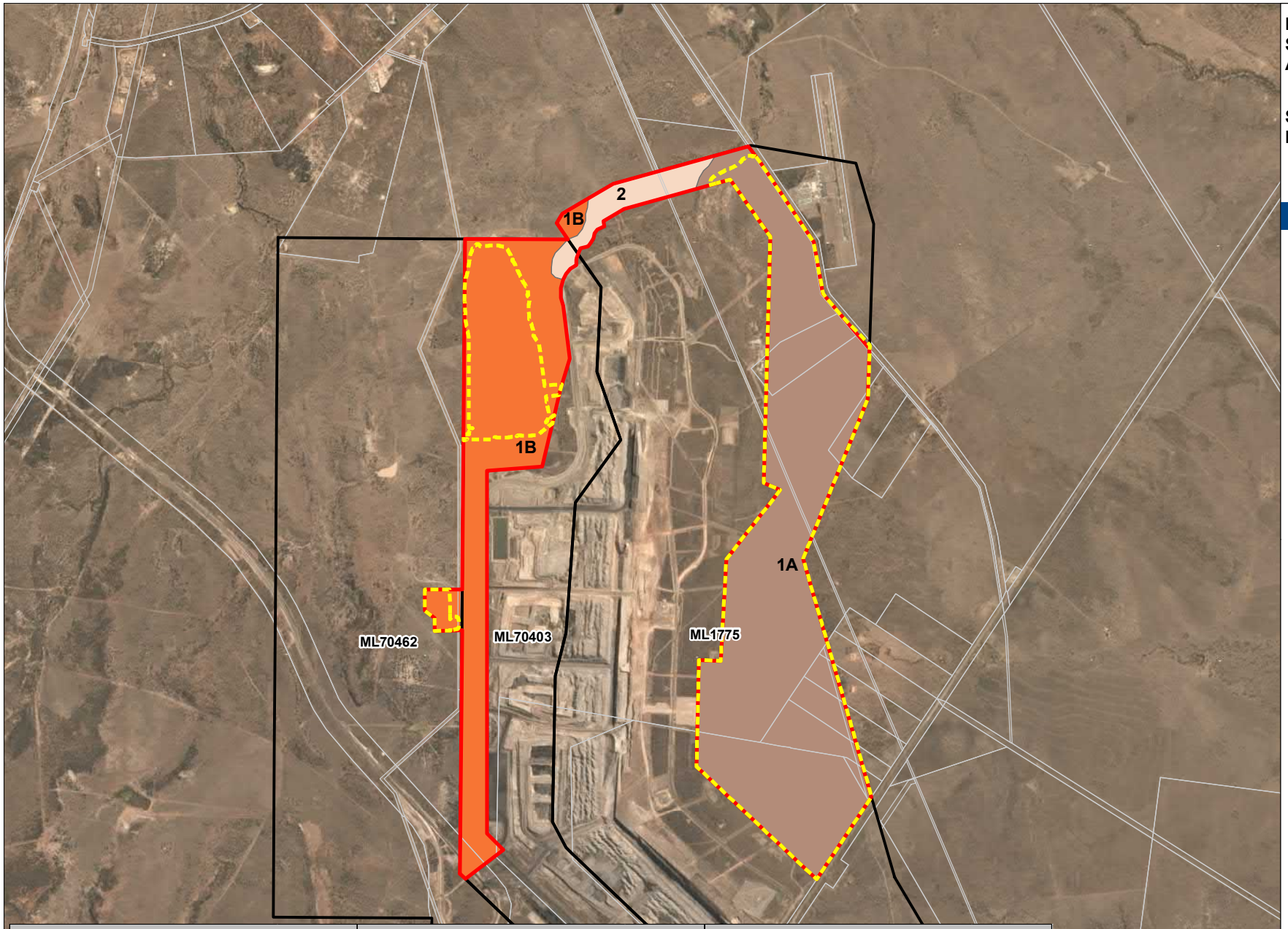
Table 14 Actual Disturbance Stripping Volumes

Soil Map Unit	ASC Soil Type	Hectares	Topsoil Strip Depth (m)	Topsoil Volume (m^3)
1A	Self-Mulching Brown-Black Vertosol	757	0.16	1,211,200
1B	Self-Mulching Brown-Black Vertosol	164	0.14	229,600
Topsoil Volume Available				1,599,800
Topsoil Less 10% Handling Loss				1,439,820
Soil Map Unit	**ASC Soil Type**	**Hectares**	**Subsoil Strip Depth (m)**	**Subsoil Volume(m^3)**
1A	Self-Mulching Brown-Black Vertosol	752	0.84	6,358,800
1B	Self-Mulching Brown-Black Vertosol	164	0.86	1,410,400
Subsoil Volume Available				8,140,200
Subsoil Less 10% Handling Loss				7,326,180

HORSE PIT EXTENSION PROJECT SOIL AND LAND RESOURCE ASSESSMENT

Soil Map Units and Proposed Disturbance

FIGURE 16



Proposed Disturbance Footprint

Horse Pit Extension Project Area (i.e. Study Area)

BHP Tenements

Cadastre

Soil Map Units

Self-Mulching Brown-Black Vertosol (1A)

Self-Mulching Brown-Black Vertosol (1B)

Eutrophic Red-Brown Chromosol (2)

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.13593.00004
Date:	13-Oct-2021
Drawn by:	ML

SMU 1A		SMU 1B		SMU 2	
Proposed Disturbance	Approx Area (ha)	Proposed Disturbance	Approx Area (ha)	Proposed Disturbance	Approx Area (ha)
Proposed EME Build Pad	6.34	Proposed Blast Compound Option B	10.31		
Dams	8.47	Proposed Water Management Infrastructure (20m Buffer)	44.07		
Infrastructure Corridor	70.65	Proposed Horse Creek Bridge (20m Buffer)	1.90		
Zone for Dragline Crossing	6.01	Proposed Out of Pit Dump	107.31		
Horse Pit Extension	655.65			Nil	0
SUBTOTAL	**747.12**		**163.59**		**0**
BALANCE	**9.86**		**240.01**		**0**
TOTAL	**756.98**		**403.6**		**52.9**

H:\Projects-SLR\620-BNE\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CADGIS\ArcGIS\HPE Land Resource\SLR62013593_F16 SMU Proposed Disturbance.mxd

6.2.4 Vegetation Establishment

6.2.4.1 Timing

Revegetation operations will consider both the season and timing of potential germination during the drier months. Where possible, direct seeding of native vegetation will be undertaken in the months October to February (inclusive).

6.2.4.2 Revegetation

The revegetation methods for all types of disturbed land within the Study area will normally consist of the following:

- Respreading of freshly stripped or stockpiled topsoil;
- Contour ripping;
- Application of appropriate fertiliser for plant establishment, after soil chemical analysis, if required; and
- Seeding with the appropriate seed mix.

Where appropriate, material will be placed on steep sloped to aid stability. Contour ripping will be used as an erosion control measure immediately after surface preparation and before revegetation. A seed mix containing appropriate species to support the nominated post mining land usewill be used to establish a sustainable vegetation cover.

6.2.5 Erosion and Sediment Control

The principal objectives of erosion and sediment control for rehabilitation areas are to:

- Minimise erosion and sedimentation from all active and rehabilitated areas, thereby minimising sediment ingress into surrounding surface waters;
- Segregate contact water (surface run-off from disturbed catchments e.g. active areas of disturbance, stockpiles and rehabilitated areas until stabilised) from clean water (surface run-off from catchments that are undisturbed or relatively undisturbed by Project-related activities and rehabilitated catchments) and maximise the retention time of contact water so that any discharge from the disturbance area is in line with the Environmental Authority (EA);
- Avoid the potential for runoff and incorporate suitable erosion and sediment control measures in accordance with the CVM Erosion and Sediment Control Plan (ESCP);
- Manage surface flows upstream of any surface disturbance during Project works so that rehabilitation activities are not affected by excessive run-on water;
- Establish sustainable long-term surface water management features following rehabilitation of the site, including implementation of an effective revegetation and maintenance program; and
- Monitor the effectiveness of erosion and sediment controls and maintain, in accordance with the requirements of the CVM ESCP.
- Land disturbance will be restricted to that necessary for the Project;
- Disturbance will be controlled using the CVM Permit to Disturb process and in accordance with the EA;
- All available topsoil will be salvaged for use in rehabilitation, where practicable;

- Erosion from topsoil stockpiles will be managed in accordance with the CVM ESCP, which requires stockpile sites to be located outside the limits of drainage lines, with controls to prevent mobilising stockpiled material and capture sediment;
- Topsoil stockpiles will be managed in accordance with the BHP Coal Topsoil Management Procedure;
- Stormwater and runoff from catchments directly upstream of the Study area will be diverted away from the Site during Project works;
- Hazardous materials will be stored in bunded areas or stored such that contaminated runoff is not generated; and
- Vehicles will be confined to maintained tracks and roads.

Table 15 summarises the risks associated with surface disturbance and the associated erosion and sediment control measures which can be applied.

Table 15 Erosion Causes and Control – Soil Disturbance Activities

Area	Control Measure
Cleared Land	Restrict clearing to areas essential for the Project works. Windrow vegetation debris along the contour. Minimise length of time soil is exposed. Divert run-off from undisturbed areas away from the Project works. Direct run-off from cleared areas to be dealt with as outlined in CVM ESCP.
Exposed Subsoils	Minimise length of time subsoil is exposed. Direct run-off from exposed areas to sediment dam(s).
Rehabilitation	Install drainage control works. Spread topsoil, rip on the contour and seed with appropriate seed mix. Direct run-off from rehabilitated areas to be dealt with as outlined in CVM ESCP.
Infrastructure	Confine traffic to maintained tracks and roads. Sediment will be controlled as outlined in the CVM ESCP. Rehabilitate disturbed areas around work sites promptly.

7 Land Resources Impacts and Mitigation Measures

7.1 Land Resources Impacts

Potential impacts to land resources and rehabilitation considered include the following:

- Reduced land resources due to mining activities (such as stripping topsoil) and land use;
- Reduced land use availability due to mining operations land use;
- Soil loss due to wind or water erosion;
- Reduction in soil quality and fertility including nutrient loss;
- Inability to achieve post-mine land uses; and
- Contamination of land due to leaks or spills from plant, storage facilities or infrastructure and/or transport of contaminated soil or water and introduction into previously uncontaminated areas.

7.2 Land Resources Mitigation Measures

The following general management strategies employed at CVM will continue for the Project to minimise the extent and severity of land disturbance and constraints on rehabilitation thus mitigating risks that could result in environmental impacts:

- Disturbance will be undertaken using a permitting system and limited by minimising clearing including re-use of already disturbed areas and existing infrastructure to support the mine plan;
- Appropriate storage and management of hydrocarbons and hazardous materials within the mine infrastructure area to prevent contamination of land e.g. bunding;
- Disturbance to be undertaken in consideration of weather and environmental, water flows, that could affect land resources during early mining activities;
- Topsoil will be stripped prior to mining and direct re-spread will be the preferred method to minimise topsoil handling and reduce damage to soil structure and propagules;
- Topsoil that is not directly re-spread will be stockpiled for re-use in rehabilitation and amelioration of long-term stockpiles/windrows;
- Appropriate surface water management measures to be implemented including clean water diversion, use of in pit sumps and sediment dams to capture mine affected runoff and stormwater as outlined in the updated Surface Water Management Plan ;
- Establishment of engineered waste dumps, levees and other landforms with appropriate non-dispersive materials design and features for erosion protection and location for optimal effectiveness, land suitability, and efficiency;
- Monitoring and maintenance of rehabilitation until post-mining land use and sustainable vegetation is established.

8 Conclusion

The aim of the Soil and Land Resource Assessment was to identify the soil types, soil resources available for rehabilitation, and the soil qualities to conduct an impact assessment. The impact assessment determines the impacts on existing soils and recommends practical and reasonable mitigation measures.

In line with this approach, 3 Soil Map Units (SMU) were identified in the baseline soil assessment, comprising the following:

- SMU 1A Self-Mulching Brown-Black Vertosol (757 ha);
- SMU 1B Self-Mulching Brown-Black Vertosol (404 ha); and
- SMU 2 Eutrophic Red-Brown Chromosol (53 ha).

The land suitability assessment indicates:

- SMUs 1A and 1B are rated as Class 5 (marginal land with severe limitations) (1,161 ha) for cropping and Class 3 (suitable land with moderate limitations) for grazing, with the main limitations being soil wetness (w) and soil water availability (m);
- SMU 2 (53 ha) is rated as Class 4 for cropping and Class 2 (suitable land with minor limitations) for grazing;
- There will be no decrease in Class 4 land within the Study area due to the proposed disturbances; and
- There will be a decrease of 597 ha in Class 5 land due to the proposed final void, representing a 51% decrease in Class 5 land.

The agricultural land assessment indicates:

- SMU 1A, 1B and 2 are rated as Agricultural Land Class C1 (1,214 ha), pasture land, suitable for grazing improved and native pastures;
- There will be a decrease of 128 ha from Class C1 land to Class C3 due to the steep slopes associated with the final landform of the out of pit dump area, representing a 11% decrease of Class C1 land; and
- There will be a decrease of 597 ha from Class C1 land to Class D due to the proposed final void, representing a further 49% decrease of Class C1 land.

The land capability assessment indicates:

- SMU 1A and 1B are rated as Class VI (1,161 ha), land that is not suitable for cultivation, but is well suited to grazing;
- SMU 2 is rated as Class V (53 ha), land that in all other characteristics would be arable, but has limitations that make cultivation impractical and/or uneconomic;
- There will be no decrease in Class V land within the Study area due to the proposed disturbances;
- There will be a decrease of 128 ha from Class VI land to Class VII due to the steep slopes associated with the final landform of the out of pit dump area, representing a 11% decrease of Class VI land; and
- There will be a decrease of 597 ha from Class VI land to Class VIII due to the proposed final void, representing a further 51% decrease of Class VI land.

The high clay content throughout the soil profile and self-mulching nature make the Vertosols (1,161 ha) especially suited for use in mine rehabilitation works. All soil types identified are suitable for use in rehabilitation, however due to subsoil having moderately high to high dispersivity, moderate to strong alkalinity and moderate to extreme salinity, the soil will require careful management during stripping, stockpiling and reinstatement. Management measures will include the application of gypsum prior to stripping and an applicable erosion and sediment control plan.

Soil resources within the project area suitable for use in rehabilitation comprise 1,742,240 m³ of topsoil and 9,183,780 m³ of subsoil. Approximately 1,439,820 m³ of topsoil and 7,326,180 m³ of subsoil is proposed to be stripped as part of the Project.

9 References

DNRM and DSIT. (2013). Regional Land Suitability Frameworks for Queensland. Department of Natural Resources and MInes and the Department of Science, Information Technology, Innovation and the Arts.

DSITI & DNRM (2015). Guidelines for agricultural land evaluation in Queensland (2nd edn). Queensland Government (Department of Science, Information Technology and Innovation and Department of Natural Resources and Mines), Brisbane, Queensland.

E2M. (2020). Horse Pit Expansion Project - Caval Ridge Mine. Milton: E3M Consulting.

Isbell, R. F. (2016). The Australian Soil Classification Second Edition. Australia: CSIRO Publishing.

NCST. (2008). Guidelines for Surveying Soil and Land Resources, 2nd edition. Australia: National Committee on Soil and Terrain CSIRO Publishing.

NCST. (2009). Australian Soil and Land Survey Field Handbook, 3rd edition. Collingwood, Australia: National Committee on Soil and Terrain CSIRO Publishing.

SLR. (2020). DRAFT BHP - Horse Pit Approvals Surface Water Resources. Sydney: SLR Consulting Australia (Pty) Ltd.

SLR. (2020). DRAFT Caval Ridge Mine Horse Pit Extension Project Groundwater Impact Assessment and Baseline Report. Brisbane: SLR Consulting Australia (Pty) Ltd.

APPENDIX A

Soil Laboratory Certificates of Analysis

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
		Sample ID:	H01 0-10	H01 20-30	H01 40-50	H01 90-100	H03 0-10
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/1	J7914/2	J7914/3	J7914/4	J7914/5
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.68	6.99	9.04	8.87	8.81
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.198	0.056	0.470	0.961	0.383
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	25	11	21	19	26
	Exchangeable Calcium (kg/ha)		11,111	4,838	9,573	8,752	11,610
	Exchangeable Calcium (mg/kg)		4,960	2,160	4,274	3,907	5,183
	Exchangeable Magnesium (cmol+/kg)		10	6.2	13	14	17
	Exchangeable Magnesium (kg/ha)		2,838	1,686	3,523	3,878	4,703
	Exchangeable Magnesium (mg/kg)		1,267	753	1,573	1,731	2,099
	Exchangeable Potassium (cmol+/kg)		0.29	0.42	0.22	0.23	0.50
	Exchangeable Potassium (kg/ha)		256	371	195	204	436
	Exchangeable Potassium (mg/kg)		114	166	87	91	195
	Exchangeable Sodium (cmol+/kg)		1.4	0.31	3.6	6.6	3.7
	Exchangeable Sodium (kg/ha)		740	157	1,854	3,419	1,890
	Exchangeable Sodium (mg/kg)		331	70	828	1,526	844
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		<1	<1	<1	1.0	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	37	18	38	41	47
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	67	61	56	48	55
	Magnesium (%)		28	35	34	35	37
	Potassium (%)		0.79	2.4	0.58	0.57	1.1
	Sodium - ESP (%)		3.9	1.7	9.5	16	7.8
	Aluminium (%)		0.01	0.01	0.01	0.01	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	2.4	1.7	1.6	1.4	1.5
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 4/3 Brown	5 YR 2.5/1 Black	7.5 YR 5/4 Brown	7.5 YR 5/4 Brown	7.5 YR 4/3 Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
		Sample ID:	H03 20-30	H03 50-60	H03 90-100	H05 0-10	H05 20-30
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/6	J7914/7	J7914/8	J7914/9	J7914/10
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.42	7.95	5.80	7.47	8.42
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	2.366	2.278	2.918	0.149	0.277
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	23	9.5	12	20	16
	Exchangeable Calcium (kg/ha)		10,358	4,265	5,329	9,103	7,168
	Exchangeable Calcium (mg/kg)		4,624	1,904	2,379	4,064	3,200
	Exchangeable Magnesium (cmol+/kg)		18	18	18	13	16
	Exchangeable Magnesium (kg/ha)		4,780	5,006	4,866	3,553	4,347
	Exchangeable Magnesium (mg/kg)		2,134	2,235	2,172	1,586	1,941
	Exchangeable Potassium (cmol+/kg)		0.45	0.46	0.43	0.52	0.34
	Exchangeable Potassium (kg/ha)		394	407	375	451	296
	Exchangeable Potassium (mg/kg)		176	182	167	201	132
	Exchangeable Sodium (cmol+/kg)		8.7	12	12	0.84	2.6
	Exchangeable Sodium (kg/ha)		4,455	5,932	6,182	435	1,362
	Exchangeable Sodium (mg/kg)		1,989	2,648	2,760	194	608
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.1	<1	1.4	<1	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	50	40	42	35	35
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	46	24	28	58	46
	Magnesium (%)		35	46	42	38	46
	Potassium (%)		0.90	1.2	1.0	1.5	0.97
	Sodium - ESP (%)		17	29	28	2.4	7.6
	Aluminium (%)		0.01	0.01	0.02	0.01	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.3	0.52	0.66	1.6	1.00
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 3/4 Dark Brown	7.5 YR 4/4 Brown	7.5 YR 5/3 Brown	10 YR 3/2 Very Dark Grayish Brown	10 YR 4/3 Brown
	Mottles Munsell Colour		..	..	7.5 YR 5/6 Strong Brown	..	..
	Degree of Mottling (%)		..	..	40	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
		Sample ID:	H05 60-70	H05 90-100	H07 0-10	H07 20-30	H07 50-60
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/11	J7914/12	J7914/13	J7914/14	J7914/15
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.40	8.36	6.54	8.18	8.00
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.998	1.342	0.079	3.124	1.693
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	13	12	13	19	7.2
	Exchangeable Calcium (kg/ha)		5,974	5,338	5,947	8,355	3,227
	Exchangeable Calcium (mg/kg)		2,667	2,383	2,655	3,730	1,441
	Exchangeable Magnesium (cmol+/kg)		21	23	5.2	12	12
	Exchangeable Magnesium (kg/ha)		5,631	6,127	1,404	3,242	3,304
	Exchangeable Magnesium (mg/kg)		2,514	2,735	627	1,447	1,475
	Exchangeable Potassium (cmol+/kg)		0.36	0.36	0.81	0.63	0.50
	Exchangeable Potassium (kg/ha)		312	319	712	552	436
	Exchangeable Potassium (mg/kg)		139	143	318	246	195
	Exchangeable Sodium (cmol+/kg)		6.7	8.2	0.55	3.9	7.8
	Exchangeable Sodium (kg/ha)		3,450	4,245	284	2,034	3,998
	Exchangeable Sodium (mg/kg)		1,540	1,895	127	908	1,785
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		<1	<1	1.6	1.3	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	41	43	20	35	28
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	32	28	67	53	26
	Magnesium (%)		50	52	26	34	44
	Potassium (%)		0.87	0.85	4.1	1.8	1.8
	Sodium - ESP (%)		16	19	2.8	11	28
	Aluminium (%)		0.01	0.01	0.04	0.02	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.64	0.53	2.6	1.6	0.59
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	10 YR 4/2 Dark Grayish Brown	10 YR 4/4 Dark Yellowish Brown	7.5 YR 2.5/2 Very Dark Brown	7.5 YR 3/4 Dark Brown	10 YR 4/4 Dark Yellowish Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 16	Sample 17	Sample 18	Sample 19	Sample 20
		Sample ID:	H07 90-100	H08 0-10	H08 30-40	H08 50-60	H08 90-100
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/16	J7914/17	J7914/18	J7914/19	J7914/20
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	5.47	7.07	8.75	8.65	8.52
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	2.268	0.124	0.322	1.567	2.110
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	4.6	15	25	21	21
	Exchangeable Calcium (kg/ha)		2,078	6,885	11,161	9,504	9,441
	Exchangeable Calcium (mg/kg)		928	3,073	4,983	4,243	4,215
	Exchangeable Magnesium (cmol+/kg)		12	10	16	18	20
	Exchangeable Magnesium (kg/ha)		3,256	2,762	4,246	4,990	5,324
	Exchangeable Magnesium (mg/kg)		1,454	1,233	1,896	2,228	2,377
	Exchangeable Potassium (cmol+/kg)		0.50	1.3	0.49	0.39	0.44
	Exchangeable Potassium (kg/ha)		437	1,132	426	339	390
	Exchangeable Potassium (mg/kg)		195	505	190	151	174
	Exchangeable Sodium (cmol+/kg)		9.9	0.83	2.6	8.7	11
	Exchangeable Sodium (kg/ha)		5,122	428	1,352	4,458	5,571
	Exchangeable Sodium (mg/kg)		2,287	191	604	1,990	2,487
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	0.02	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		4.3	<1	1.3	<1	<1
	Exchangeable Aluminium (mg/kg)		1.9	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	27	28	44	49	52
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	17	56	57	44	41
	Magnesium (%)		44	37	36	38	38
	Potassium (%)		1.8	4.7	1.1	0.80	0.86
	Sodium - ESP (%)		37	3.0	6.0	18	21
	Aluminium (%)		0.08	0.02	0.01	0.01	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.39	1.5	1.6	1.2	1.1
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 3/4 Dark Brown	7.5 YR 2.5/2 Very Dark Brown	10 YR 4/4 Dark Yellowish Brown	7.5 YR 3/4 Dark Brown	7.5 YR 4/6 Strong Brown
	Mottles Munsell Colour		..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 21	Sample 22	Sample 23	Sample 24	Sample 25
		Sample ID:	H10 0-10	H10 30-40	H10 50-60	H10 65-75	H11 0-10
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/21	J7914/22	J7914/23	J7914/24	J7914/25
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.67	7.84	8.59	8.61	8.10
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	2.474	1.014	1.309	1.384	0.287
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	7.8	5.8	7.4	9.2	28
	Exchangeable Calcium (kg/ha)		3,479	2,589	3,335	4,130	12,714
	Exchangeable Calcium (mg/kg)		1,553	1,156	1,489	1,844	5,676
	Exchangeable Magnesium (cmol+/kg)		3.5	13	14	13	10
	Exchangeable Magnesium (kg/ha)		950	3,494	3,737	3,539	2,737
	Exchangeable Magnesium (mg/kg)		424	1,560	1,668	1,580	1,222
	Exchangeable Potassium (cmol+/kg)		0.55	0.37	0.42	0.36	0.63
	Exchangeable Potassium (kg/ha)		483	323	365	317	551
	Exchangeable Potassium (mg/kg)		215	144	163	142	246
	Exchangeable Sodium (cmol+/kg)		0.56	5.6	7.3	7.0	0.80
	Exchangeable Sodium (kg/ha)		288	2,886	3,773	3,622	413
	Exchangeable Sodium (mg/kg)		128	1,289	1,684	1,617	184
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.4	1.7	1.1	1.2	1.2
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	12	25	29	30	40
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	63	23	26	31	71
	Magnesium (%)		28	52	47	44	25
	Potassium (%)		4.5	1.5	1.4	1.2	1.6
	Sodium - ESP (%)		4.5	23	25	24	2.0
	Aluminium (%)		0.05	0.03	0.02	0.02	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	2.2	0.45	0.54	0.71	2.8
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 2.5/2 Very Dark Brown	10 YR 4/4 Dark Yellowish Brown	5 YR 4/6 Yellowish Red	7.5 YR 4/6 Strong Brown	10 YR 3/6 Dark Yellowish Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 26	Sample 27	Sample 28	Sample 29	Sample 30
		Sample ID:	H11 30-40	H11 50-60	H11 90-100	H13 0-10	H13 20-30
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/26	J7914/27	J7914/28	J7914/29	J7914/30
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.36	8.04	6.64	6.32	8.26
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	1.037	1.434	1.713	1.479	1.160
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	16	9.8	7.3	5.9	4.6
	Exchangeable Calcium (kg/ha)		7,086	4,411	3,282	2,646	2,075
	Exchangeable Calcium (mg/kg)		3,163	1,969	1,465	1,181	926
	Exchangeable Magnesium (cmol+/kg)		14	14	13	8.7	10
	Exchangeable Magnesium (kg/ha)		3,722	3,714	3,555	2,373	2,779
	Exchangeable Magnesium (mg/kg)		1,662	1,658	1,587	1,060	1,241
	Exchangeable Potassium (cmol+/kg)		0.37	0.38	0.39	0.44	0.25
	Exchangeable Potassium (kg/ha)		323	335	343	383	218
	Exchangeable Potassium (mg/kg)		144	150	153	171	97
	Exchangeable Sodium (cmol+/kg)		5.3	8.1	11	1.5	6.8
	Exchangeable Sodium (kg/ha)		2,737	4,165	5,414	787	3,514
	Exchangeable Sodium (mg/kg)		1,222	1,859	2,417	351	1,569
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.0	1.1	<1	1.4	1.7
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	35	32	31	17	22
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	45	31	23	36	21
	Magnesium (%)		39	43	42	53	47
	Potassium (%)		1.0	1.2	1.3	2.6	1.1
	Sodium - ESP (%)		15	25	34	9.2	31
	Aluminium (%)		0.01	0.02	0.01	0.04	0.04
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.2	0.72	0.56	0.68	0.45
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	10 YR 5/6 Yellowish Brown	7.5 YR 5/6 Strong Brown	10 YR 5/6 Yellowish Brown	10 YR 3/2 Very Dark Grayish Brown	10 YR 5/4 Yellowish Brown
	Mottles Munsell Colour		..	..	5 YR 4/6 Yellowish Red	..	..
	Degree of Mottling (%)		..	..	40	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 31	Sample 32	Sample 33	Sample 34	Sample 35
		Sample ID:	H13 50-60	H13 90-100	H14 0-10	H14 20-30	H14 50-60
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/31	J7914/32	J7914/33	J7914/34	J7914/35
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.96	6.75	6.16	6.81	7.17
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	1.429	1.549	0.067	0.034	0.047
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	2.9	2.1	4.1	4.3	2.1
	Exchangeable Calcium (kg/ha)		1,299	930	1,830	1,949	960
	Exchangeable Calcium (mg/kg)		580	415	817	870	428
	Exchangeable Magnesium (cmol+/kg)		9.4	9.3	2.6	2.6	3.8
	Exchangeable Magnesium (kg/ha)		2,570	2,524	707	707	1,024
	Exchangeable Magnesium (mg/kg)		1,148	1,127	316	316	457
	Exchangeable Potassium (cmol+/kg)		0.32	0.34	0.94	0.23	0.21
	Exchangeable Potassium (kg/ha)		281	302	821	198	185
	Exchangeable Potassium (mg/kg)		126	135	366	88	82
	Exchangeable Sodium (cmol+/kg)		8.9	9.6	0.12	0.33	0.56
	Exchangeable Sodium (kg/ha)		4,597	4,965	63	170	288
	Exchangeable Sodium (mg/kg)		2,052	2,217	28	76	128
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.2	1.1	1.8	1.1	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	22	21	7.7	7.5	6.7
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	13	9.7	53	58	32
	Magnesium (%)		44	43	34	35	56
	Potassium (%)		1.5	1.6	12	3.0	3.2
	Sodium - ESP (%)		41	45	1.6	4.4	8.4
	Aluminium (%)		0.03	0.03	0.12	0.07	0.04
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.31	0.22	1.6	1.7	0.57
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	10 YR 4/4 Dark Yellowish Brown	10 YR 5/4 Yellowish Brown	2.5 YR 2.5/3 Dark Reddish Brown	2.5 YR 2.5/3 Dark Reddish Brown	2.5 YR 2.5/3 Dark Reddish Brown
	Mottles Munsell Colour		..	..	10 YR 2/1	..	..
			..	..	Black	..	..
	Degree of Mottling (%)		..	..	20	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 36	Sample 37	Sample 38	Sample 39	Sample 40
		Sample ID:	H14 90-100	H15 0-10	H15 20-30	H15 50-60	H15 90-100
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/36	J7914/37	J7914/38	J7914/39	J7914/40
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.35	6.74	7.27	9.05	8.48
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.961	0.039	0.052	1.100	1.213
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	0.67	6.0	8.4	8.4	2.0
	Exchangeable Calcium (kg/ha)		303	2,705	3,774	3,755	892
	Exchangeable Calcium (mg/kg)		135	1,208	1,685	1,676	398
	Exchangeable Magnesium (cmol+/kg)		14	2.4	2.9	18	16
	Exchangeable Magnesium (kg/ha)		3,693	665	789	4,927	4,482
	Exchangeable Magnesium (mg/kg)		1,649	297	352	2,200	2,001
	Exchangeable Potassium (cmol+/kg)		0.33	0.51	0.25	0.22	0.22
	Exchangeable Potassium (kg/ha)		291	448	215	189	191
	Exchangeable Potassium (mg/kg)		130	200	96	85	85
	Exchangeable Sodium (cmol+/kg)		7.3	0.15	0.24	7.5	11
	Exchangeable Sodium (kg/ha)		3,775	78	125	3,882	5,631
	Exchangeable Sodium (mg/kg)		1,685	35	56	1,733	2,514
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		<1	1.6	1.5	<1	1.2
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	22	9.1	12	34	30
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	3.1	66	71	24	6.7
	Magnesium (%)		62	27	25	53	56
	Potassium (%)		1.5	5.6	2.1	0.63	0.74
	Sodium - ESP (%)		33	1.7	2.1	22	37
	Aluminium (%)		0.02	0.09	0.06	0.01	0.02
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.05	2.5	2.9	0.46	0.12
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	5 YR 3/4 Dark Reddish Brown	7.5 YR 2.5/3 Very Dark Brown	7.5 YR 2.5/2 Very Dark Brown	7.5 YR 5/4 Brown	10 YR 5/6 Yellowish Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 41	Sample 42	Sample 43	Sample 44	Sample 45
		Sample ID:	H16 0-10	H16 20-30	H16 50-60	H16 90-100	H18 0-10
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/41	J7914/42	J7914/43	J7914/44	J7914/45
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.18	6.55	6.24	6.43	8.34
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.059	0.063	0.617	0.804	0.110
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	4.0	4.5	2.5	3.2	35
	Exchangeable Calcium (kg/ha)		1,793	2,002	1,122	1,424	15,909
	Exchangeable Calcium (mg/kg)		801	894	501	636	7,102
	Exchangeable Magnesium (cmol+/kg)		2.1	2.2	11	15	23
	Exchangeable Magnesium (kg/ha)		569	604	2,957	4,101	6,191
	Exchangeable Magnesium (mg/kg)		254	270	1,320	1,831	2,764
	Exchangeable Potassium (cmol+/kg)		1.0	0.22	<0.12	<0.12	0.79
	Exchangeable Potassium (kg/ha)		895	193	<112	<112	694
	Exchangeable Potassium (mg/kg)		399	86	<50	<50	310
	Exchangeable Sodium (cmol+/kg)		0.18	0.25	2.9	4.7	0.26
	Exchangeable Sodium (kg/ha)		90	128	1,482	2,404	134
	Exchangeable Sodium (mg/kg)		40	57	662	1,073	60
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.7	<1	1.2	1.6	2.0
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	7.3	7.2	16	23	59
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	55	62	15	14	60
	Magnesium (%)		29	31	67	65	38
	Potassium (%)		14	3.1	0.46	0.48	1.3
	Sodium - ESP (%)		2.4	3.5	18	20	0.44
	Aluminium (%)		0.11	0.07	0.04	0.03	0.02
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.9	2.0	0.23	0.21	1.6
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	2.5 YR 2.5/3 Dark Reddish Brown	2.5 YR 2.5/4 Dark Reddish Brown	10 YR 3/6 Dark Yellowish Brown	7.5 YR 3/4 Dark Brown	10 YR 2/1 Black
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 46	Sample 47	Sample 48	Sample 49	Sample 50
		Sample ID:	H18 20-30	H18 50-60	H18 90-100	H20 0-10	H20 20-30
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/46	J7914/47	J7914/48	J7914/49	J7914/50
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.52	8.19	8.43	7.19	9.00
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.110	0.123	0.115	0.063	0.507
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	36	35	35	6.6	20
	Exchangeable Calcium (kg/ha)		16,342	15,724	15,581	2,969	9,170
	Exchangeable Calcium (mg/kg)		7,296	7,019	6,956	1,326	4,094
	Exchangeable Magnesium (cmol+/kg)		21	29	30	5.5	12
	Exchangeable Magnesium (kg/ha)		5,707	7,920	8,282	1,496	3,174
	Exchangeable Magnesium (mg/kg)		2,548	3,536	3,698	668	1,417
	Exchangeable Potassium (cmol+/kg)		0.23	0.17	0.19	0.42	0.26
	Exchangeable Potassium (kg/ha)		199	145	170	371	227
	Exchangeable Potassium (mg/kg)		89	65	76	166	101
	Exchangeable Sodium (cmol+/kg)		0.39	1.1	1.4	0.77	3.1
	Exchangeable Sodium (kg/ha)		202	568	708	395	1,591
	Exchangeable Sodium (mg/kg)		90	254	316	176	710
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.9	1.3	1.3	1.2	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	58	65	67	13	35
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	63	54	52	50	58
	Magnesium (%)		36	44	46	41	33
	Potassium (%)		0.39	0.25	0.29	3.2	0.73
	Sodium - ESP (%)		0.68	1.7	2.1	5.8	8.7
	Aluminium (%)		0.02	0.01	0.01	0.04	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.7	1.2	1.1	1.2	1.8
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	10 YR 2/1 Black	10 YR 2/1 Black	5 YR 2.5/1 Black	10 YR 3/3 Dark Brown	10 YR 5/4 Yellowish Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 51	Sample 52	Sample 53	Sample 54	Sample 55
		Sample ID:	H20 50-60	H20 90-100	H22 0-10	H22 20-30	H22 50-60
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/51	J7914/52	J7914/53	J7914/54	J7914/55
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	9.11	8.78	8.56	8.84	8.66
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.844	1.315	0.332	0.524	1.403
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	19	5.5	21	23	9.5
	Exchangeable Calcium (kg/ha)		8,320	2,466	9,423	10,321	4,276
	Exchangeable Calcium (mg/kg)		3,714	1,101	4,206	4,608	1,909
	Exchangeable Magnesium (cmol+/kg)		15	15	15	16	18
	Exchangeable Magnesium (kg/ha)		3,962	4,053	4,092	4,447	4,828
	Exchangeable Magnesium (mg/kg)		1,769	1,809	1,827	1,985	2,155
	Exchangeable Potassium (cmol+/kg)		0.33	0.33	0.56	0.38	0.40
	Exchangeable Potassium (kg/ha)		292	291	490	336	347
	Exchangeable Potassium (mg/kg)		131	130	219	150	155
	Exchangeable Sodium (cmol+/kg)		5.6	8.4	1.8	3.7	9.7
	Exchangeable Sodium (kg/ha)		2,892	4,314	931	1,931	5,019
	Exchangeable Sodium (mg/kg)		1,291	1,926	416	862	2,241
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.1	1.3	<1	1.2	1.6
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	39	29	38	43	37
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	47	19	55	53	25
	Magnesium (%)		37	51	39	38	47
	Potassium (%)		0.85	1.1	1.5	0.88	1.1
	Sodium - ESP (%)		14	29	4.7	8.6	26
	Aluminium (%)		0.01	0.02	0.01	0.01	0.02
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.3	0.37	1.4	1.4	0.54
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	10 YR 4/4 Dark Yellowish Brown	10 YR 5/4 Yellowish Brown	10 YR 4/4 Dark Yellowish Brown	10 YR 3/4 Dark Yellowish Brown	7.5 YR 4/3 Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 56	Sample 57	Sample 58	Sample 59	Sample 60
		Sample ID:	H22 90-100	H24 0-10	H24 20-30	H24 50-60	H24 90-100
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/56	J7914/57	J7914/58	J7914/59	J7914/60
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.59	8.97	9.15	9.03	8.71
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	1.495	0.200	0.243	0.752	1.537
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	10	24	24	22	24
	Exchangeable Calcium (kg/ha)		4,638	10,725	10,563	9,669	10,900
	Exchangeable Calcium (mg/kg)		2,071	4,788	4,716	4,317	4,866
	Exchangeable Magnesium (cmol+/kg)		17	12	12	14	14
	Exchangeable Magnesium (kg/ha)		4,737	3,280	3,361	3,809	3,845
	Exchangeable Magnesium (mg/kg)		2,115	1,464	1,500	1,701	1,716
	Exchangeable Potassium (cmol+/kg)		0.42	0.69	0.34	0.32	0.31
	Exchangeable Potassium (kg/ha)		371	608	298	278	274
	Exchangeable Potassium (mg/kg)		166	272	133	124	122
	Exchangeable Sodium (cmol+/kg)		10	2.5	3.2	7.6	11
	Exchangeable Sodium (kg/ha)		5,182	1,304	1,666	3,925	5,458
	Exchangeable Sodium (mg/kg)		2,313	582	744	1,752	2,437
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.2	1.4	1.3	1.0	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	38	39	39	43	49
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	27	61	60	50	49
	Magnesium (%)		46	31	31	32	29
	Potassium (%)		1.1	1.8	0.86	0.73	0.63
	Sodium - ESP (%)		26	6.5	8.2	18	21
	Aluminium (%)		0.02	0.02	0.02	0.01	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.59	2.0	1.9	1.5	1.7
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 5/4 Brown	5 YR 2.5/1 Black	7.5 YR 2.5/1 Black	7.5 YR 3/1 Very Dark Gray	5 YR 4/2 Dark Reddish Gray
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 61	Sample 62	Sample 63	Sample 64	Sample 65
		Sample ID:	H26 0-10	H26 15-25	H26 30-40	H26 60-70	H28 0-10
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/61	J7914/62	J7914/63	J7914/64	J7914/65
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.36	6.57	7.06	7.57	6.95
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.069	0.052	0.037	0.062	0.040
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	3.2	3.1	4.7	5.8	8.2
	Exchangeable Calcium (kg/ha)		1,453	1,413	2,118	2,581	3,699
	Exchangeable Calcium (mg/kg)		649	631	946	1,152	1,651
	Exchangeable Magnesium (cmol+/kg)		1.2	0.96	3.1	5.9	3.7
	Exchangeable Magnesium (kg/ha)		318	262	842	1,608	1,008
	Exchangeable Magnesium (mg/kg)		142	117	376	718	450
	Exchangeable Potassium (cmol+/kg)		0.58	0.27	0.34	0.27	0.70
	Exchangeable Potassium (kg/ha)		506	235	298	233	615
	Exchangeable Potassium (mg/kg)		226	105	133	104	275
	Exchangeable Sodium (cmol+/kg)		0.08	<0.065	<0.065	0.28	0.09
	Exchangeable Sodium (kg/ha)		39	<33	<33	143	47
	Exchangeable Sodium (mg/kg)		17	<15	<15	64	21
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.1	1.3	1.6	1.7	1.4
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	5.1	4.4	8.2	12	13
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	64	72	58	47	65
	Magnesium (%)		23	22	38	48	29
	Potassium (%)		11	6.1	4.2	2.2	5.5
	Sodium - ESP (%)		1.5	0.38	0.43	2.3	0.71
	Aluminium (%)		0.10	0.15	0.10	0.07	0.05
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	2.8	3.3	1.5	0.97	2.2
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 3/4 Dark Brown	5 YR 3/3 Dark Reddish Brown	5 YR 4/6 Yellowish Red	7.5 YR 5/6 Strong Brown	10 YR 2/2 Very Dark Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 66	Sample 67	Sample 68	Sample 69	Sample 70
		Sample ID:	H28 44105	H28 30-40	H28 60-70	H29 0-10	H29 20-30
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/66	J7914/67	J7914/68	J7914/69	J7914/70
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.13	9.01	8.84	7.49	7.94
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.183	0.396	1.118	0.073	0.081
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	14	24	18	45	52
	Exchangeable Calcium (kg/ha)		6,198	10,587	7,878	20,203	23,406
	Exchangeable Calcium (mg/kg)		2,767	4,726	3,517	9,019	10,449
	Exchangeable Magnesium (cmol+/kg)		9.5	14	17	12	12
	Exchangeable Magnesium (kg/ha)		2,577	3,888	4,605	3,165	3,388
	Exchangeable Magnesium (mg/kg)		1,151	1,736	2,056	1,413	1,512
	Exchangeable Potassium (cmol+/kg)		0.45	0.40	0.47	0.29	0.17
	Exchangeable Potassium (kg/ha)		394	351	414	253	146
	Exchangeable Potassium (mg/kg)		176	157	185	113	65
	Exchangeable Sodium (cmol+/kg)		1.2	2.8	6.5	0.56	1.2
	Exchangeable Sodium (kg/ha)		601	1,464	3,331	290	609
	Exchangeable Sodium (mg/kg)		268	653	1,487	129	272
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.5	1.3	1.4	1.6	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	25	41	41	57	66
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	55	57	42	78	79
	Magnesium (%)		38	35	41	20	19
	Potassium (%)		1.8	0.98	1.1	0.50	0.25
	Sodium - ESP (%)		4.7	6.9	16	0.98	1.8
	Aluminium (%)		0.03	0.02	0.02	0.01	0.00
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.5	1.7	1.0	3.9	4.2
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 4/2 Brown	5 YR 3/3 Dark Reddish Brown	7.5 YR 3/2 Dark Brown	7.5 YR 2.5/1 Black	5 YR 2.5/1 Black
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 71	Sample 72	Sample 73	Sample 74	Sample 75
		Sample ID:	H29 50-60	H29 90-100	H30 0-10	H30 20-30	H30 50-60
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/71	J7914/72	J7914/73	J7914/74	J7914/75
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.41	8.52	7.31	8.42	8.72
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.141	0.199	0.060	0.234	0.891
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	54	61	17	27	20
	Exchangeable Calcium (kg/ha)		24,453	27,288	7,849	12,335	8,916
	Exchangeable Calcium (mg/kg)		10,917	12,182	3,504	5,507	3,980
	Exchangeable Magnesium (cmol+/kg)		12	12	9.8	11	14
	Exchangeable Magnesium (kg/ha)		3,329	3,346	2,676	3,023	3,729
	Exchangeable Magnesium (mg/kg)		1,486	1,494	1,194	1,350	1,665
	Exchangeable Potassium (cmol+/kg)		<0.12	0.18	0.41	0.33	0.27
	Exchangeable Potassium (kg/ha)		<112	157	356	287	241
	Exchangeable Potassium (mg/kg)		<50	70	159	128	107
	Exchangeable Sodium (cmol+/kg)		1.9	2.3	0.60	1.3	5.2
	Exchangeable Sodium (kg/ha)		988	1,206	308	650	2,666
	Exchangeable Sodium (mg/kg)		441	538	137	290	1,190
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	69	76	28	40	39
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	79	80	62	68	51
	Magnesium (%)		18	16	35	28	35
	Potassium (%)		0.16	0.24	1.4	0.82	0.70
	Sodium - ESP (%)		2.8	3.1	2.1	3.1	13
	Aluminium (%)		0.00	0.00	0.01	0.01	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	4.5	4.9	1.8	2.5	1.4
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 2.5/1 Black	5 YR 2.5/1 Black	10 YR 3/2 Very Dark Grayish Brown	7.5 YR 3/2 Dark Brown	10 YR 4/3 Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 76	Sample 77	Sample 78	Sample 79	Sample 80
		Sample ID:	H30 75-85	H33 0-10	H33 20-30	H33 50-60	H33 90-100
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/76	J7914/77	J7914/78	J7914/79	J7914/80
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.55	7.08	7.68	8.61	9.24
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	1.171	0.049	0.046	0.223	0.532
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	10.0	12	8.8	7.4	19
	Exchangeable Calcium (kg/ha)		4,467	5,284	3,929	3,309	8,540
	Exchangeable Calcium (mg/kg)		1,994	2,359	1,754	1,477	3,813
	Exchangeable Magnesium (cmol+/kg)		13	6.2	4.4	11	12
	Exchangeable Magnesium (kg/ha)		3,496	1,694	1,203	3,089	3,352
	Exchangeable Magnesium (mg/kg)		1,561	756	537	1,379	1,497
	Exchangeable Potassium (cmol+/kg)		0.31	0.41	0.14	0.17	0.16
	Exchangeable Potassium (kg/ha)		274	362	124	146	136
	Exchangeable Potassium (mg/kg)		122	162	55	65	61
	Exchangeable Sodium (cmol+/kg)		6.2	0.50	0.95	3.1	4.5
	Exchangeable Sodium (kg/ha)		3,199	256	487	1,614	2,325
	Exchangeable Sodium (mg/kg)		1,428	114	217	721	1,038
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	29	19	14	22	36
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	34	62	61	33	53
	Magnesium (%)		44	33	31	52	34
	Potassium (%)		1.1	2.2	0.99	0.76	0.43
	Sodium - ESP (%)		21	2.6	6.6	14	13
	Aluminium (%)		0.01	0.02	0.02	0.01	0.01
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.77	1.9	2.0	0.65	1.5
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	10 YR 4/4 Dark Yellowish Brown	7.5 YR 2.5/2 Very Dark Brown	7.5 YR 2.5/3 Very Dark Brown	7.5 YR 4/4 Brown	5 YR 4/4 Reddish Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 81	Sample 82	Sample 83	Sample 84	Sample 85
		Sample ID:	H34 0-10	H34 20-30	H34 50-60	H34 90-100	H35 0-10
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/81	J7914/82	J7914/83	J7914/84	J7914/85
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.22	8.39	8.19	8.09	6.63
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.568	1.217	1.389	1.475	0.059
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	6.2	3.5	2.8	2.0	4.9
	Exchangeable Calcium (kg/ha)		2,787	1,584	1,235	896	2,199
	Exchangeable Calcium (mg/kg)		1,244	707	551	400	982
	Exchangeable Magnesium (cmol+/kg)		14	13	12	12	2.4
	Exchangeable Magnesium (kg/ha)		3,848	3,465	3,358	3,138	649
	Exchangeable Magnesium (mg/kg)		1,718	1,547	1,499	1,401	290
	Exchangeable Potassium (cmol+/kg)		0.36	0.34	0.40	0.36	1.0
	Exchangeable Potassium (kg/ha)		312	296	350	319	894
	Exchangeable Potassium (mg/kg)		139	132	156	143	399
	Exchangeable Sodium (cmol+/kg)		2.6	8.6	10	10	0.41
	Exchangeable Sodium (kg/ha)		1,338	4,439	5,271	5,336	212
	Exchangeable Sodium (mg/kg)		597	1,982	2,353	2,382	95
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	23	25	26	24	8.7
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	27	14	11	8.2	56
	Magnesium (%)		61	50	48	48	27
	Potassium (%)		1.5	1.3	1.6	1.5	12
	Sodium - ESP (%)		11	34	40	43	4.7
	Aluminium (%)		0.01	0.01	0.01	0.00	0.04
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.44	0.28	0.22	0.17	2.1
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	5 YR 2.5/1 Black	10 YR 5/2 Grayish Brown	10 YR 5/3 Brown	10 YR 5/3 Brown	7.5 YR 2.5/2 Very Dark Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 86	Sample 87	Sample 88	Sample 89	Sample 90
		Sample ID:	H35 20-30	H35 50-60	H35 90-100	H36 0-10	H36 20-30
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/86	J7914/87	J7914/88	J7914/89	J7914/90
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.29	9.35	8.50	6.70	6.01
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.068	0.735	0.109	0.095	0.033
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	6.2	12	5.8	10	2.7
	Exchangeable Calcium (kg/ha)		2,761	5,503	2,606	4,491	1,217
	Exchangeable Calcium (mg/kg)		1,233	2,457	1,163	2,005	543
	Exchangeable Magnesium (cmol+/kg)		4.1	10	7.7	3.0	1.4
	Exchangeable Magnesium (kg/ha)		1,117	2,738	2,088	816	380
	Exchangeable Magnesium (mg/kg)		499	1,222	932	364	170
	Exchangeable Potassium (cmol+/kg)		0.35	0.18	0.15	1.1	0.35
	Exchangeable Potassium (kg/ha)		310	160	132	973	305
	Exchangeable Potassium (mg/kg)		139	72	59	434	136
	Exchangeable Sodium (cmol+/kg)		1.0	7.5	2.6	0.22	0.15
	Exchangeable Sodium (kg/ha)		525	3,850	1,320	116	76
	Exchangeable Sodium (mg/kg)		234	1,719	589	52	34
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		<1	<1	<1	<1	1.3
	Exchangeable Aluminium (mg/kg)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	12	30	16	14	4.6
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	53	41	36	70	59
	Magnesium (%)		35	34	47	21	30
	Potassium (%)		3.0	0.61	0.93	7.7	7.6
	Sodium - ESP (%)		8.8	25	16	1.6	3.2
	Aluminium (%)		0.03	0.01	0.01	0.03	0.14
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.5	1.2	0.76	3.3	1.9
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 3/4 Dark Brown	7.5 YR 4/4 Brown	7.5 YR 4/4 Brown	5 YR 2.5/2 Dark Reddish Brown	7.5 YR/2.5/2 Very Dark Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 91	Sample 92	Sample 93	Sample 94	Sample 95
		Sample ID:	H36 50-60	H36 90-100	H37 0-10	H37 20-30	H37 35-45
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/91	J7914/92	J7914/93	J7914/94	J7914/95
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	5.45	7.21	6.65	6.23	6.41
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.025	0.112	0.023	0.011	0.021
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	1.0	0.63	2.7	1.3	3.7
	Exchangeable Calcium (kg/ha)		460	283	1,233	586	1,663
	Exchangeable Calcium (mg/kg)		205	126	550	262	742
	Exchangeable Magnesium (cmol+/kg)		1.2	7.6	1.0	0.55	2.1
	Exchangeable Magnesium (kg/ha)		319	2,068	275	150	570
	Exchangeable Magnesium (mg/kg)		143	923	123	67	254
	Exchangeable Potassium (cmol+/kg)		0.21	0.14	0.34	0.34	0.48
	Exchangeable Potassium (kg/ha)		185	120	301	299	424
	Exchangeable Potassium (mg/kg)		83	54	134	134	189
	Exchangeable Sodium (cmol+/kg)		0.13	1.6	0.07	<0.065	0.14
	Exchangeable Sodium (kg/ha)		66	811	36	<33	73
	Exchangeable Sodium (mg/kg)		29	362	16	<15	33
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	0.23	<0.01	<0.01	0.02	0.01
	Exchangeable Aluminium (kg/ha)		46	1.9	<1	3.7	2.5
	Exchangeable Aluminium (mg/kg)		20	<1	<1	1.7	1.1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	0.10	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		2.3	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		1.0	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	2.9	9.9	4.2	2.3	6.4
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	36	6.3	66	57	58
	Magnesium (%)		41	76	24	24	33
	Potassium (%)		7.4	1.4	8.2	15	7.5
	Sodium - ESP (%)		4.5	16	1.7	2.4	2.2
	Aluminium (%)		7.9	0.10	0.07	0.81	0.19
	Hydrogen (%)		3.5	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	0.87	0.08	2.7	2.4	1.8
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	10 YR 4/3 Brown	10 YR 5/3 Brown	7.5 YR 3/3 Dark Brown	7.5 YR 3/3 Dark Brown	7.5 YR 5/6 Strong Brown
	Mottles Munsell Colour		..	5 YR 4/6 Yellowish Red	..	..	..
	Degree of Mottling (%)		..	10	..	..	..

Environmental Analysis Laboratory

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT

100 samples supplied by SLR Consulting Australia Pty Ltd on 3/09/2020 . Lab Job No.J7914
Analysis requested by Murray Fraser. Your Job: PO SLR 620.13593.00004 Horse Pit
10 Kings Road NEW LAMBTON NSW 2305

			Sample 96	Sample 97	Sample 98	Sample 99	Sample 100
		Sample ID:	H37 50-60	H38 0-10	H38 20-30	H38 50-60	H38 80-90
		Crop:	Soil	Soil	Soil	Soil	Soil
		Client:	Horse Pit	Horse Pit	Horse Pit	Horse Pit	Horse Pit
	Parameter	Method reference	J7914/96	J7914/97	J7914/98	J7914/99	J7914/100
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.52	6.00	8.29	8.01	8.69
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.021	0.019	0.387	0.517	0.738
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	4.3	2.7	8.1	6.2	5.7
	Exchangeable Calcium (kg/ha)		1,939	1,208	3,642	2,799	2,574
	Exchangeable Calcium (mg/kg)		866	539	1,626	1,250	1,149
	Exchangeable Magnesium (cmol+/kg)		2.4	1.3	6.2	6.0	6.6
	Exchangeable Magnesium (kg/ha)		654	352	1,675	1,627	1,798
	Exchangeable Magnesium (mg/kg)		292	157	748	726	803
	Exchangeable Potassium (cmol+/kg)		0.52	0.36	0.66	0.55	0.66
	Exchangeable Potassium (kg/ha)		459	314	574	484	581
	Exchangeable Potassium (mg/kg)		205	140	256	216	259
	Exchangeable Sodium (cmol+/kg)		0.14	0.08	2.1	2.8	4.1
	Exchangeable Sodium (kg/ha)		72	42	1,107	1,449	2,096
	Exchangeable Sodium (mg/kg)		32	19	494	647	936
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	<0.01	0.01	<0.01	<0.01	<0.01
	Exchangeable Aluminium (kg/ha)		1.9	2.2	1.1	<1	<1
	Exchangeable Aluminium (mg/kg)		<1	1.0	<1	<1	<1
	Exchangeable Hydrogen (cmol+/kg)	**Rayment & Lyons 2011 - 15G1 (Acidity Titration)	<0.01	<0.01	<0.01	<0.01	<0.01
	Exchangeable Hydrogen (kg/ha)		<1	<1	<1	<1	<1
	Exchangeable Hydrogen (mg/kg)		<1	<1	<1	<1	<1
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	7.4	4.4	17	16	17
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	58	61	48	40	34
	Magnesium (%)		32	29	36	38	39
	Potassium (%)		7.1	8.1	3.8	3.5	3.9
	Sodium - ESP (%)		1.9	1.8	13	18	24
	Aluminium (%)		0.13	0.25	0.03	0.03	0.03
	Hydrogen (%)		0.00	0.00	0.00	0.00	0.00
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	1.8	2.1	1.3	1.0	0.87
	Moist Munsell Colour	**Inhouse Munsell Soil Colour Classification	7.5 YR 5/6 Strong Brown	5 YR 2.5/1 Black	10 YR 5/3 Brown	10 YR 5/4 Yellowish Brown	10 YR 5/4 Yellowish Brown
	Mottles Munsell Colour		..	..	..	..	..
			..	..	..	..	..
	Degree of Mottling (%)		..	..	..	..	..

GRAIN SIZE ANALYSIS (hydrometer and sieving techniques)

100 soil samples supplied by SLR Consulting Australia on 3 September, 2020 - Lab Job No. J7914.
Analysis requested by Murray Fraser. Project: PO SLR620.13593.00004 Horse Pit
(10 Kings road NEW LAMBTON NSW 2305)

SAMPLE ID	Lab Code	EMMERSON AGGREGATE CLASS	MOISTURE CONTENT (% of water in air-dry sample)	TOTAL GRAVEL > 2 mm (% of total oven-dry equivalent)	GRAVEL > 4.75 mm (% of total oven-dry equivalent)	GRAVEL 2.00-4.75 mm (% of total oven-dry equivalent)	COARSE SAND 200-2000 µm (0.2-2.0 mm) (% of total oven-dry equivalent)	FINE SAND 20-200 µm (0.02-0.2 mm) (% of total oven-dry equivalent)	SILT 2-20 µm ISSS (% of total oven-dry equivalent)	CLAY < 2 µm (% of total oven-dry equivalent)	Total soil fractions (incl. Gravel)
H01 0-10	J7914/1	4	11.6%	2.3%	0.0%	2.3%	17.1%	23.9%	10.1%	46.5%	100.0%
H01 20-30	J7914/2	3	7.4%	6.3%	0.0%	6.3%	21.6%	27.2%	13.6%	31.2%	100.0%
H01 40-50	J7914/3	3	10.5%	1.0%	0.0%	1.0%	17.3%	22.8%	12.5%	46.3%	100.0%
H01 90-100	J7914/4	3	10.7%	1.7%	0.0%	1.7%	16.9%	22.3%	11.1%	47.9%	100.0%
H03 0-10	J7914/5	3	13.6%	10.0%	0.0%	10.0%	7.8%	2.2%	16.0%	64.0%	100.0%
H03 20-30	J7914/6	3	15.2%	3.6%	0.0%	3.6%	7.7%	7.8%	13.3%	67.6%	100.0%
H03 50-60	J7914/7	4	15.7%	2.3%	0.0%	2.3%	5.4%	2.3%	19.3%	70.6%	100.0%
H03 90-100	J7914/8	4	16.9%	1.2%	0.0%	1.2%	3.6%	3.5%	16.8%	75.0%	100.0%
H05 0-10	J7914/9	3	12.6%	2.4%	0.0%	2.4%	6.4%	23.8%	7.1%	60.2%	100.0%
H05 20-30	J7914/10	3	12.2%	3.0%	0.0%	3.0%	6.5%	19.0%	13.0%	58.5%	100.0%
H05 60-70	J7914/11	3	13.7%	3.5%	0.0%	3.5%	6.2%	13.6%	14.2%	62.5%	100.0%
H05 90-100	J7914/12	4	14.5%	0.2%	0.0%	0.2%	5.2%	17.5%	11.7%	65.4%	100.0%
H07 0-10	J7914/13	3	9.2%	38.4%	19.8%	18.6%	10.2%	11.6%	8.5%	31.4%	100.0%
H07 20-30	J7914/14	3	11.9%	32.3%	4.4%	27.9%	9.8%	1.4%	11.4%	45.2%	100.0%
H07 50-60	J7914/15	3	12.5%	22.6%	0.0%	22.6%	11.3%	4.6%	18.8%	42.7%	100.0%
H07 90-100	J7914/16	3	13.7%	8.9%	0.0%	8.9%	9.4%	9.2%	13.1%	59.5%	100.0%
H08 0-10	J7914/17	3	11.3%	10.8%	4.5%	6.3%	5.3%	18.8%	15.6%	49.6%	100.0%
H08 30-40	J7914/18	3	11.9%	20.5%	6.0%	14.5%	6.3%	6.0%	10.9%	56.3%	100.0%
H08 50-60	J7914/19	3	13.5%	11.6%	3.1%	8.5%	5.6%	6.9%	18.7%	57.2%	100.0%
H08 90-100	J7914/20	4	15.2%	10.9%	5.0%	5.9%	5.1%	6.1%	11.3%	66.6%	100.0%
H10 0-10	J7914/21	3	6.2%	25.9%	12.9%	13.0%	11.1%	9.3%	22.3%	31.4%	100.0%
H10 30-40	J7914/22	2	11.2%	29.6%	17.0%	12.6%	8.4%	4.0%	12.1%	45.8%	100.0%
H10 50-60	J7914/23	2	12.3%	17.9%	10.7%	7.2%	8.7%	1.3%	19.6%	52.6%	100.0%
H10 65-75	J7914/24	2	11.1%	20.4%	10.2%	10.2%	7.9%	1.2%	13.7%	56.8%	100.0%
H11 0-10	J7914/25	4	9.2%	5.4%	0.0%	5.4%	4.4%	8.2%	21.0%	61.0%	100.0%
H11 30-40	J7914/26	4	11.7%	4.6%	0.0%	4.6%	4.3%	2.6%	24.0%	64.5%	100.0%
H11 50-60	J7914/27	2	12.4%	2.5%	0.0%	2.5%	3.4%	2.0%	20.4%	71.6%	100.0%
H11 90-100	J7914/28	2	12.9%	1.2%	0.0%	1.2%	3.1%	5.5%	23.8%	66.4%	100.0%
H13 0-10	J7914/29	3	8.3%	5.9%	0.0%	5.9%	7.9%	12.7%	21.0%	52.5%	100.0%
H13 20-30	J7914/30	2	10.7%	4.0%	0.0%	4.0%	4.5%	7.2%	21.9%	62.5%	100.0%
H13 50-60	J7914/31	2	11.4%	4.3%	0.0%	4.3%	4.9%	5.1%	22.2%	63.5%	100.0%
H13 90-100	J7914/32	2	11.7%	1.8%	0.0%	1.8%	4.4%	9.3%	23.3%	61.2%	100.0%
H14 0-10	J7914/33	3	6.6%	14.2%	0.0%	14.2%	22.7%	28.3%	6.3%	28.5%	100.0%
H14 20-30	J7914/34	3	8.6%	33.8%	18.1%	15.7%	16.9%	12.2%	13.4%	23.8%	100.0%
H14 50-60	J7914/35	2	4.9%	73.8%	62.9%	10.9%	7.5%	3.3%	4.5%	10.9%	100.0%
H14 90-100	J7914/36	2	8.3%	69.8%	61.9%	7.9%	5.5%	3.0%	3.0%	18.7%	100.0%
H15 0-10	J7914/37	3	5.1%	15.9%	0.0%	15.9%	16.6%	28.1%	12.3%	27.2%	100.0%
H15 20-30	J7914/38	3	6.5%	24.0%	13.6%	10.4%	15.2%	24.9%	8.2%	27.8%	100.0%
H15 50-60	J7914/39	4	15.3%	3.6%	0.0%	3.6%	12.8%	16.1%	14.0%	53.4%	100.0%
H15 90-100	J7914/40	2	12.6%	0.7%	0.0%	0.7%	10.8%	17.2%	18.6%	52.7%	100.0%

checked: .....
Graham Lancaster (Nata signatory)
Laboratory Manager

GRAIN SIZE ANALYSIS (hydrometer and sieving techniques)

100 soil samples supplied by SLR Consulting Australia on 3 September, 2020 - Lab Job No. J7914.
Analysis requested by Murray Fraser. Project: PO SLR620.13593.00004 Horse Pit
(10 Kings road NEW LAMBTON NSW 2305)

SAMPLE ID	Lab Code	EMMERSON AGGREGATE CLASS	MOISTURE CONTENT (% of water in air-dry sample)	TOTAL GRAVEL > 2 mm (% of total oven-dry equivalent)	GRAVEL > 4.75 mm (% of total oven-dry equivalent)	GRAVEL 2.00-4.75 mm (% of total oven-dry equivalent)	COARSE SAND 200-2000 µm (0.2-2.0 mm) (% of total oven-dry equivalent)	FINE SAND 20-200 µm (0.02-0.2 mm) (% of total oven-dry equivalent)	SILT 2-20 µm ISSS (% of total oven-dry equivalent)	CLAY < 2 µm (% of total oven-dry equivalent)	Total soil fractions (incl. Gravel)
H16 0-10	J7914/41	3	9.1%	10.0%	0.0%	10.0%	21.7%	20.2%	13.0%	35.1%	100.0%
H16 20-30	J7914/42	3	10.3%	33.9%	17.0%	16.9%	13.8%	7.6%	20.0%	24.7%	100.0%
H16 50-60	J7914/43	2	12.7%	23.1%	0.0%	23.1%	8.4%	0.6%	2.6%	65.3%	100.0%
H16 90-100	J7914/44	2	14.6%	6.6%	0.0%	6.6%	10.9%	5.0%	6.6%	71.0%	100.0%
H18 0-10	J7914/45	3	20.0%	23.8%	13.1%	10.7%	13.6%	12.6%	13.3%	36.6%	100.0%
H18 20-30	J7914/46	4	19.9%	28.3%	19.0%	9.3%	17.8%	10.8%	9.7%	33.3%	100.0%
H18 50-60	J7914/47	3	20.1%	0.3%	0.0%	0.3%	2.8%	18.8%	12.7%	65.5%	100.0%
H18 90-100	J7914/48	4	20.9%	0.4%	0.0%	0.4%	2.4%	13.3%	14.5%	69.4%	100.0%
H20 0-10	J7914/49	3	5.0%	1.9%	0.0%	1.9%	36.6%	28.0%	8.2%	25.3%	100.0%
H20 20-30	J7914/50	4	8.5%	2.8%	0.0%	2.8%	32.5%	19.0%	11.7%	34.0%	100.0%
H20 50-60	J7914/51	3	9.3%	6.5%	0.0%	6.5%	25.5%	18.8%	12.2%	36.9%	100.0%
H20 90-100	J7914/52	2	11.1%	0.4%	0.0%	0.4%	26.9%	18.6%	13.4%	40.7%	100.0%
H22 0-10	J7914/53	3	11.9%	5.5%	0.0%	5.5%	13.0%	19.9%	14.5%	47.1%	100.0%
H22 20-30	J7914/54	3	12.4%	3.8%	0.0%	3.8%	12.1%	14.3%	20.7%	49.0%	100.0%
H22 50-60	J7914/55	3	12.7%	2.8%	0.0%	2.8%	10.3%	14.9%	22.6%	49.4%	100.0%
H22 90-100	J7914/56	3	13.4%	0.5%	0.0%	0.5%	9.2%	17.6%	26.8%	45.9%	100.0%
H24 0-10	J7914/57	3	12.7%	1.6%	0.0%	1.6%	15.6%	20.1%	16.9%	45.8%	100.0%
H24 20-30	J7914/58	3	11.2%	1.5%	0.0%	1.5%	16.4%	14.9%	21.5%	45.7%	100.0%
H24 50-60	J7914/59	3	12.7%	1.0%	0.0%	1.0%	13.3%	20.4%	17.6%	47.6%	100.0%
H24 90-100	J7914/60	3	14.4%	2.8%	0.0%	2.8%	16.3%	19.0%	16.0%	45.9%	100.0%
H26 0-10	J7914/61	3	3.6%	5.0%	0.0%	5.0%	30.8%	38.8%	11.1%	14.2%	100.0%
H26 15-25	J7914/62	3	4.3%	15.6%	0.0%	15.6%	28.8%	33.6%	9.4%	12.6%	100.0%
H26 30-40	J7914/63	3	9.3%	12.5%	0.0%	12.5%	20.6%	24.7%	6.3%	35.9%	100.0%
H26 60-70	J7914/64	2	7.7%	18.3%	0.0%	18.3%	14.3%	21.6%	8.8%	37.0%	100.0%
H28 0-10	J7914/65	3	7.3%	12.5%	0.0%	12.5%	22.5%	38.9%	8.8%	17.3%	100.0%
H28 44105	J7914/66	3	12.7%	3.4%	0.0%	3.4%	16.1%	32.2%	10.0%	38.2%	100.0%
H28 30-40	J7914/67	3	11.9%	2.2%	0.0%	2.2%	13.1%	33.7%	9.6%	41.4%	100.0%
H28 60-70	J7914/68	3	12.5%	2.4%	0.0%	2.4%	12.1%	25.8%	15.7%	43.8%	100.0%
H29 0-10	J7914/69	4	19.4%	0.0%	0.0%	0.0%	3.4%	25.4%	11.4%	59.8%	100.0%
H29 20-30	J7914/70	4	18.5%	0.2%	0.0%	0.2%	4.6%	27.8%	10.7%	56.7%	100.0%
H29 50-60	J7914/71	4	18.6%	0.3%	0.0%	0.3%	3.0%	21.1%	10.8%	64.8%	100.0%
H29 90-100	J7914/72	4	19.7%	0.6%	0.0%	0.6%	4.1%	28.9%	5.3%	61.0%	100.0%
H30 0-10	J7914/73	3	9.9%	0.6%	0.0%	0.6%	13.6%	30.9%	14.5%	40.5%	100.0%
H30 20-30	J7914/74	3	10.7%	3.8%	0.0%	3.8%	9.8%	22.3%	12.4%	51.7%	100.0%
H30 50-60	J7914/75	4	10.8%	0.8%	0.0%	0.8%	10.0%	25.7%	7.9%	55.6%	100.0%
H30 75-85	J7914/76	4	10.1%	2.7%	0.0%	2.7%	14.3%	20.8%	9.1%	53.3%	100.0%
H33 0-10	J7914/77	3	7.2%	8.9%	0.0%	8.9%	14.0%	20.9%	14.2%	41.9%	100.0%
H33 20-30	J7914/78	3	11.7%	10.7%	0.0%	10.7%	20.1%	19.1%	9.5%	40.6%	100.0%
H33 50-60	J7914/79	2	12.2%	3.2%	0.0%	3.2%	13.1%	8.4%	12.1%	63.2%	100.0%
H33 90-100	J7914/80	2	11.6%	4.0%	0.0%	4.0%	14.3%	18.9%	7.0%	55.8%	100.0%
H34 0-10	J7914/81	3	7.1%	7.3%	0.0%	7.3%	15.0%	17.7%	12.1%	47.9%	100.0%

checked: .....
Graham Lancaster (Nata signatory)
Laboratory Manager

GRAIN SIZE ANALYSIS (hydrometer and sieving techniques)

100 soil samples supplied by SLR Consulting Australia on 3 September, 2020 - Lab Job No. J7914.
Analysis requested by Murray Fraser. Project: PO SLR620.13593.00004 Horse Pit
(10 Kings road NEW LAMBTON NSW 2305)

SAMPLE ID	Lab Code	**EMMERSON AGGREGATE CLASS**	**MOISTURE CONTENT** (% of water in air-dry sample)	**TOTAL GRAVEL > 2 mm** (% of total oven-dry equivalent)	**GRAVEL > 4.75 mm** (% of total oven-dry equivalent)	**GRAVEL 2.00-4.75 mm** (% of total oven-dry equivalent)	**COARSE SAND 200-2000 µm (0.2-2.0 mm)** (% of total oven-dry equivalent)	**FINE SAND 20-200 µm (0.02-0.2 mm)** (% of total oven-dry equivalent)	**SILT 2-20 µm ISSS** (% of total oven-dry equivalent)	**CLAY < 2 µm** (% of total oven-dry equivalent)	Total soil fractions (incl. Gravel)
H34 20-30	J7914/82	2	10.8%	0.5%	0.0%	0.5%	8.0%	13.6%	19.8%	58.2%	100.0%
H34 50-60	J7914/83	2	11.8%	1.4%	0.0%	1.4%	5.8%	17.7%	22.8%	52.4%	100.0%
H34 90-100	J7914/84	2	11.1%	0.5%	0.0%	0.5%	7.5%	18.4%	21.9%	51.7%	100.0%
H35 0-10	J7914/85	3	5.1%	7.4%	0.0%	7.4%	39.5%	19.1%	9.5%	24.6%	100.0%
H35 20-30	J7914/86	2	6.0%	8.5%	0.0%	8.5%	23.8%	20.7%	13.0%	34.0%	100.0%
H35 50-60	J7914/87	2	9.5%	9.9%	1.2%	8.7%	24.7%	8.4%	10.0%	47.0%	100.0%
H35 90-100	J7914/88	2	10.3%	7.1%	0.0%	7.1%	18.4%	8.1%	12.8%	53.5%	100.0%
H36 0-10	J7914/89	3	3.9%	6.2%	0.0%	6.2%	24.6%	26.1%	13.2%	29.8%	100.0%
H36 20-30	J7914/90	3	3.2%	1.8%	0.0%	1.8%	35.0%	34.9%	11.3%	17.0%	100.0%
H36 50-60	J7914/91	3	3.6%	19.3%	0.0%	19.3%	26.3%	26.0%	10.7%	17.8%	100.0%
H36 90-100	J7914/92	2	8.4%	16.7%	0.0%	16.7%	20.1%	17.2%	10.0%	36.0%	100.0%
H37 0-10	J7914/93	3	0.8%	0.1%	0.0%	0.1%	36.4%	43.6%	7.0%	12.9%	100.0%
H37 20-30	J7914/94	3	1.6%	0.5%	0.0%	0.5%	38.3%	43.8%	4.7%	12.8%	100.0%
H37 35-45	J7914/95	2	3.8%	3.0%	0.0%	3.0%	27.9%	33.2%	5.7%	30.2%	100.0%
H37 50-60	J7914/96	2	8.3%	1.5%	0.0%	1.5%	23.8%	25.5%	3.6%	45.5%	100.0%
H38 0-10	J7914/97	3	1.5%	1.0%	0.0%	1.0%	16.5%	29.0%	6.5%	46.9%	100.0%
H38 20-30	J7914/98	3	9.2%	0.2%	0.0%	0.2%	42.9%	23.8%	12.2%	20.9%	100.0%
H38 50-60	J7914/99	2	8.4%	0.7%	0.0%	0.7%	18.5%	20.8%	10.2%	49.8%	100.0%
H38 80-90	J7914/100	2	9.1%	0.2%	0.0%	0.2%	20.2%	20.4%	12.2%	47.0%	100.0%

Note:

1: The Hydrometer Analysis method was used to determine the percentage sand, silt and clay,
modified from SOP meth004 (California Dept of Pesticide Regulation), using method of Gee & Bauder (1986),
in *Methods of Soil Analysis. Part 1* Agron. Monogr. 9 (2nd Ed). Klute, A., American Soc. of Agronomy Inc., Soil Sci. Soc. America Inc., Madison WI: 383-411.

2: Australian Standard 1289.3.8.1-1997 (see attached)

3. Emerson Aggregate Class numbers are defined in the EAT Flow Chart on a separate tab.

4. ** NATA accreditation does not cover the performance of this service.

5. Analysis conducted between sample arrival date and reporting date.

6. This report is not to be reproduced except in full. Results only relate to the item tested.

7. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal).

8. This report was issued on 18/09/2020.

checked: .....
Graham Lancaster (Nata signatory)
Laboratory Manager

APPENDIX B

Detailed Soil Profile Descriptions

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Vertosols are clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular structural aggregates.

Table 1 Summary: Self-Mulching Black Vertosol (Site 1)

Overview	
Landscape Site 1 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H01
Other Mapped Sites	H02 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Terrace Plain
Dominant Land Use	Pasture
Vegetation	Brigalow, Carissa
Slope (%)	<1
Aspect	Nil

Table 2 Profile: Self-Mulching Black Vertosol (Site 1)

Profile	Horizon / Depth (m)	Description
comp 	A1 0.0 – 0.10	Brown (7.5YR 4/3) medium clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 6-20mm; nil segregations; abundant fine roots; imperfectly drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.30	Black (5YR 2.5/1) clay loam, strong structure of 20-50 mm blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; nil segregations; course roots common; clear and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.30 – 0.55	Brown (7.5YR 5/4) medium clay, strong structure of 20-50mm subangular blocky peds with a rough fabric and firm consistence. 20-50%, dark faint mottling; 10-20% stone content 20-60mm; 10-20% soft calcareous nodules 6-20mm; course roots common. Sampled 0.40 – 0.50.
	B23 0.55-100	Brown (7.5YR 5/4) medium clay, strong structure of 20-50mm subangular blocky peds with a rough fabric and firm consistence. 10-20%, dark faint mottling; 2-10% stone content 6-20mm; Nil segregations; course roots common. Layer continues beyond sampling depth. Sampled 0.90 – 0.100.

Table 3 Chemical Parameters: Self-Mulching Black Vertosol (Site 1)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	8.7	Strongly Alkaline	3.9	Non-Sodic	1.5	Non-Saline	2.4	Ca Low
B21	7.0	Neutral	1.7	Non-Sodic	0.5	Non-Saline	1.7	Ca Low
B22	9.0	Very Strongly Alkaline	9.5	Marginally Sodic	3.5	Slightly Saline	1.6	Ca Low
B23	8.9	Strongly Alkaline	16.3	Strongly Sodic	7.2	Moderately Saline	1.4	Ca Low

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 4 Summary: Self-Mulching Black Vertosol (Site 2)

Overview	
Landscape Site 2 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H02
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	1-3%
Aspect	Southwest

Table 5 Profile: Self-Mulching Black Vertosol (Site 2)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Very dark grey (10YR 3/1) light clay, moderate structure of 10-50mm subangular blocky peds with a rough fabric and moderate consistence. Nil mottling; 2-10% stone content 6-20mm; nil segregations; abundant fine roots; well drained; gradual and irregular boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Very dark grey (10YR 3/1) medium clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 2-10% stone content 20-60mm; 2-10% soft calcareous nodules <2mm; course roots common; gradual and irregular boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 0.80	Black (10YR 2/1) medium heavy clay, strong structure of 100-200mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 10-20% soft calcareous nodules 2-6mm; course roots common. Sampled 0.50 – 0.60.
	B23 0.80 – 1.00	Very dark greyish brown (10YR 3/2) medium clay, strong structure 100-200mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 2-10% stone content 20-60mm; 2-10% soft calcareous nodules <2mm; course roots common. Layer continues beyond sampling depth. Sampled 0.90 – 1.00.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 6 Summary: Self-Mulching Brown Vertosol (Site 3)

Overview	
Landscape Site 3 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H03
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Residual Crest
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	Southwest

Table 7 Profile: Self-Mulching Brown Vertosol (Site 3)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Brown (7.5YR 4/3) heavy clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 2-6mm; Nil segregations; abundant fine roots; well drained; clear and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Dark brown (7.5YR 3/4) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. 2-10% pale faint mottles; 10-20% stone content 2-6mm, 2-10% soft calcareous nodules 2-6mm; course roots common; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Brown (7.5YR 4/4) heavy clay, strong structure of 50-100mm subangular blocky peds with a rough fabric and firm consistence. 10-20% orange distinct mottles; 10-20% stone content 2-6mm; 10-20% soft calcareous nodules 2-6mm; course roots common. Layer continues beyond sampling depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Table 8 Chemical Parameters: Self-Mulching Brown Vertosol (Site 3)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	8.8	Strongly Alkaline	7.8	Marginally Sodic	2.2	Slightly Saline	1.5	Ca Low
B21	8.4	Strongly Alkaline	17.4	Strongly Sodic	13.7	Highly Saline	1.3	Ca Low
B22	8.0	Moderately Alkaline	28.9	Strongly Sodic	13.2	Highly Saline	0.5	Ca Deficient
	5.8	Moderately Acidic	28.5	Strongly Sodic	16.9	Extremely Saline	0.7	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 9 Summary: Self-Mulching Brown Vertosol (Site 4)

Overview	
Landscape Site 4 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H04
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow, Eucalyptus
Slope (%)	<1
Aspect	Southeast

Table 10 Profile: Self-Mulching Brown Vertosol (Site 4)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Brown (7.5YR 4/3) medium clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; Nil stone content; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.55	Yellowish brown (10YR 5/6) light medium clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. 2-10% pale faint mottles; 20-50% stone content 60-200mm; 2-10% Ferromanganiferous fragments 6-20mm; course roots common; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.55 – 1.0	Yellowish brown (10YR 5/8) light medium clay, strong structure of 50-100mm subangular blocky peds with a rough fabric and strong consistence. 2-10% orange faint mottles; 10-20% stone content 20-60mm; 2-10% soft calcareous nodules 20-60mm; course roots common. Layer continues beyond sample depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 11 Summary: Self-Mulching Brown Vertosol (Site 5)

Overview	
Landscape Site 5 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H05
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	Southeast

Table 12 Profile: Self-Mulching Brown Vertosol (Site 5)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Very dark greyish brown (10YR 3/2) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 10-20% stone content 6-20mm; Nil segregations; abundant fine roots; well drained; clear and even boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Brown (10YR 4/3) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 2-10% calcareous concretions 2-6mm; course roots common; poorly drained; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 0.80	Dark greyish brown (10YR 4/2) heavy clay, strong structure 100-200mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 10-20% stone content 6-20mm; <2% calcareous concretions 2-6mm; poorly drained; course roots common. Sampled 0.60 – 0.70.
	B23 0.80 – 1.0	Dark yellowish brown (10YR 4/4) heavy clay, strong structure 200-500mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 10-20% stone content 20-60mm; Nil segregations; poorly drained; course roots common. Layer continues beyond sample depth. Sampled 0.90 – 1.0.

Table 13 Chemical Parameters: Self-Mulching Brown Vertosol (Site 5)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.5	Mildly Alkaline	2.4	Non-Sodic	0.9	Non-Saline	1.6	Ca Low
B21	8.4	Strongly Alkaline	7.6	Marginally Sodic	1.6	Non-Saline	1.0	Ca Deficient
B22	8.4	Moderately Alkaline	16.3	Strongly Sodic	5.8	Moderately Saline	0.6	Ca Deficient
B23	8.4	Moderately Alkaline	19.2	Strongly Sodic	7.8	Moderately Saline	0.5	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 14 Summary: Self-Mulching Brown Vertosol (Site 6)

Overview	
Landscape Site 6 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H06
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow, Caesalpinia
Slope (%)	1-3
Aspect	South

Table 15 Profile: Self-Mulching Brown Vertosol (Site 6)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.30	Very dark brown (10YR 2/2) light clay, weak structure of 10-20 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 10-20% stone content 6-20mm; Nil segregations; abundant fine roots; well drained; clear and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.30 – 0.50	Brown (10YR 4/3) medium clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 6-20mm; 10-20% soft calcareous nodules <2mm; many fine roots; sharp and wavy boundary. Sampled 0.30 – 0.40.
	B22 0.50 – 0.90	Brown (10YR 4/3) medium clay, strong structure 50-100mm subangular blocky with a rough fabric and very firm consistence. 10-20%, pale faint mottling; 2-10% stone content 6-20mm; 2-10% soft calcareous nodules 2-6mm; common course roots. Sampled 0.60 – 0.70.
	B23 0.90 – 1.0	Brown (10YR 5/8) light medium clay, strong structure 50-100mm subangular blocky with a rough fabric and very firm consistence. 10-20%, pale prominent mottling; Nil stone content; 10-20% ferro-manganiferous concretions 2-6%; course roots common. Layer continues beyond sample depth. Sampled 0.90 – 1.0.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 16 Summary: Self-Mulching Brown Vertosol (Site 7)

Overview	
Landscape Site 7 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H07
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	South

Table 17 Profile: Self-Mulching Brown Vertosol (Site 7)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Very dark brown (7.5YR 2.5/2) heavy clay, moderate structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 20-50% stone content 20-60mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.60	Dark brown (7.5YR 3/4) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and firm consistence. 2-10% pale faint mottles; 10-20% stone content 20-60mm; 20-50% soft calcareous nodules 6-20mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.60 – 1.0	Dark yellowish brown (10YR 4/4) heavy clay, strong structure 50-100mm subangular blocky with a rough fabric and very firm consistence. 20-50% grey distinct mottles; 2-10% stone content 20-60mm; 10-20% ferro-manganiferous concretions <2mm; course roots common. Layer continues beyond sample depth Sampled 0.50 – 0.60 and 0.90- 1.0.

Table 18 Chemical Parameters: Self-Mulching Brown Vertosol (Site 7)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.5	Neutral	2.8	Non-Sodic	0.5	Non-Saline	2.6	Ca Low
B21	8.2	Moderately Alkaline	11.2	Sodic	18.1	Extremely Saline	1.6	Ca Low
B22	8.0	Moderately Alkaline	28.1	Strongly Sodic	9.8	Highly Saline	0.6	Ca Deficient
	5.5	Strongly Acidic	36.8	Strongly Sodic	13.2	Highly Saline	0.4	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 19 Summary: Self-Mulching Brown Vertosol (Site 8)

Overview	
Landscape Site 8 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H08
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	

Table 20 Profile: Self-Mulching Brown Vertosol (Site 8)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Very dark brown (7.5YR 2.5/2) Heavy clay, strong structure of 100-200mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 10-20% stone content 20-60mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.50	Dark yellowish brown (10YR 4/4) Heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 10-20% stone content 20-60mm; 2-10% soft calcareous nodules 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.30 – 0.40.
	B22 0.50 – 1.0	Dark brown (7.5YR 3/4) Heavy clay, strong structure of 100-200mm subangular blocky peds with a rough fabric and firm consistence. 10-20%, pale faint mottling; 2-10% stone content 6-20mm; Nil segregations; common fine roots. Layer continues beyond sample depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Table 21 Chemical Parameters: Self-Mulching Brown Vertosol (Site 8)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.1	Neutral	3.0	Non-Sodic	0.7	Non-Saline	1.5	Ca Low
B21	8.8	Strongly Alkaline	6.0	Marginally Sodic	1.9	Non-Saline	1.6	Ca Low
B22	8.7	Strongly Alkaline	17.8	Strongly Sodic	9.1	Highly Saline	1.2	Ca Low
	8.5	Strongly Alkaline	20.9	Strongly Sodic	12.2	Highly Saline	1.1	Ca Low

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 22 Summary: Self-Mulching Brown Vertosol (Site 9)

Overview	
Landscape Site 9 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H09
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	Nil

Table 23 Profile: Self-Mulching Brown Vertosol (Site 9)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Black (10YR 2/1) light medium clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 10-20% stone content 6-20mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.40	Dark brown (10YR 3/3) medium clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. 10-20% pale faint mottling; 10-20% stone content 20-60mm; Nil segregations; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.40 – 1.0	Dark yellowish brown (10YR 4/4) medium heavy clay, strong structure of 50-100mm subangular blocky peds with a rough fabric and strong consistence. 20-50% grey paint mottling; 10-20% stone content 20-60mm; <2% soft calcareous nodules <2mm; course roots common. Layer continues beyond sampling depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 24 Summary: Self-Mulching Brown Vertosol (Site 10)

Overview	
Landscape Site 10 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H10
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow, Eucalyptus, Mountain Coolibah
Slope (%)	1-3
Aspect	Southeast

Table 25 Profile: Self-Mulching Brown Vertosol (Site 10)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Very dark brown (7.5YR 2.5/2) silty clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 20-50% stone content 20-60mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.40	Dark yellowish brown (10YR 4/4) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 20-50% stone content 20-60mm; Nil segregations; many fine roots; gradual and wavy boundary. Sampled 0.30 – 0.40.
	B22 0.40 – 0.65	Yellowish red (5YR 4/6) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 20-50% stone content 20-60mm; Nil segregations; course roots common; gradual and wavy boundary. Sampled 0.50 – 0.60.
	B23 +0.65	Strong brown (7.5YR 4/6) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 20-50% stone content 20-60mm; Nil segregations; course roots common. Sampled 0.65 – 0.75.

Table 26 Chemical Parameters: Self-Mulching Brown Vertosol (Site 10)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.7	Neutral	4.5	Non-Sodic	21.3	Extremely Saline	2.2	Ca Low
B21	7.8	Moderately Alkaline	22.8	Strongly Sodic	5.9	Moderately Saline	0.4	Ca Deficient
B22	8.6	Strongly Alkaline	25.3	Strongly Sodic	7.6	Moderately Saline	0.5	Ca Deficient
B23	8.6	Strongly Alkaline	23.8	Strongly Sodic	8.0	Highly Saline	0.7	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 27 Summary: Self-Mulching Brown Vertosol (Site 11)

Overview	
Landscape Site 11 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H11
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	1-3
Aspect	Southwest

Table 28 Profile: Self-Mulching Brown Vertosol (Site 11)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.30	Dark yellowish brown (10YR 3/6) heavy clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; <2% stone content 6-20mm; nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.30 – 0.50	Yellowish brown (10YR 5/6) silty clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. 2-10% pale faint mottling; <2% stone content 2-6mm; <2% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.30 – 0.40.
	B22 0.50 – 0.80	Strong brown (7.5YR 5/6) heavy clay, strong structure of 50-100mm of subangular blocky peds with a rough fabric and very firm consistence. 10-20% orange distinct; <2% stone content 2-6mm; <2% ferro-manganiferous concretions <2mm; course roots common; gradual and wavy boundary. Sampled 0.50 – 0.60.
	B22 0.80 – 1.0	Yellowish brown (10YR 5/6) heavy clay, strong structure of 50-100mm subangular blocky peds with a rough fabric and very firm consistence. 20-50% red distinct mottling; <2% stone content 2-6mm; <2% ferro-manganiferous concretions <2mm; course roots common. Sampled 0.90 – 1.0.

Table 29 Chemical Parameters: Self-Mulching Brown Vertosol (Site 11)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	8.1	Moderately Alkaline	2.0	Non-Sodic	1.7	Non-Saline	2.8	Ca Low
B21	8.4	Moderately Alkaline	15.1	Strongly Sodic	8.9	Highly Saline	1.2	Ca Low
B22	8.0	Moderately Alkaline	25.3	Strongly Sodic	8.3	Highly Saline	0.7	Ca Deficient
B23	6.6	Neutral	33.6	Strongly Sodic	9.9	Highly Saline	0.6	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 30 Summary: Self-Mulching Brown Vertosol (Site 12)

Overview	
Landscape Site 12 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H12
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Rise-slope
Dominant Land Use	Pasture
Vegetation	Brigalow, Mountain Coolibah
Slope (%)	3-10
Aspect	Southwest

Table 31 Profile: Self-Mulching Brown Vertosol (Site 12)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Dark brown (7.5YR 3/3) light medium clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; <2% stone content 2-6mm; <2% ferro-manganiferous concretions <2mm; abundant fine roots; well drained; clear and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.30	Dark brown (7.5YR 3/4) medium clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 2-10% stone content 20-60m; <2% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and even boundary. Sampled 0.20 – 0.30.
	B22 0.30 – 0.80	Brown (7.5YR 4/4) medium clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 2-10% stone content 20-60m; 20-50% soft calcareous nodules 6-20mm; course roots common; gradual and even boundary. Sampled 0.50 – 0.60.
	BC +0.80	Weathered parent material. Not sampled.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 32 Summary: Self-Mulching Brown Vertosol (Site 13)

Overview	
Landscape Site 13 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H13
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	Nil

Table 33 Profile: Self-Mulching Brown Vertosol (Site 13)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Very dark greyish brown (10YR 3/2) Heavy clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 2-10% stone content 6-20mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Yellowish brown (10YR 5/4) Heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 2-10% stone content 20-60mm; <2% soft calcareous nodules <2mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Dark yellowish brown (10YR 4/4) Heavy clay, strong structure of 100-200m subangular blocky peds with a rough fabric and firm consistence. 20-50% orange distinct mottling; 2-10% stone content 20-60mm; <2% soft calcareous nodules <2mm; course roots common. Layer continues beyond sampling depth Sampled 0.50 – 0.60 and 0.90 – 1.0.

Table 34 Chemical Parameters: Self-Mulching Brown Vertosol (Site 13)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.3	Slightly Acidic	9.2	Marginally Sodic	8.6	Highly Saline	0.7	Ca Deficient
B21	8.3	Moderately Alkaline	31.1	Strongly Sodic	6.7	Moderately Saline	0.5	Ca Deficient
B22	8.0	Moderately Alkaline	41.3	Strongly Sodic	8.3	Highly Saline	0.3	Ca Deficient
	6.8	Neutral	45.2	Strongly Sodic	9.0	Highly Saline	0.2	Ca Deficient

Soil Unit 1A Sub-Dominant Soil Type

Eutrophic Red Dermosol

Table 35 Summary: Eutrophic Red Dermosol (Site 14)

Overview	
Landscape Site 14 	
ASC Name	Eutrophic Red Dermosol
Representative Site	H14
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Rise-slope
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	North

Table 36 Profile: Eutrophic Red Dermosol (Site 14)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Dark reddish brown (2.5YR 2.5/3) Light clay, weak structure of 20-50 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 2-10% stone content 6-20mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.40	Dark reddish brown (2.5YR 2.5/3) Clay loam, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 10-20% ferro-manganiferous concretions 6-20mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.40 – 0.80	Dark reddish brown (2.5YR 2.5/3) sandy clay, moderate structure of 20-50mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 20-50% ferro-manganiferous concretions 6-20mm; course roots common; gradual and wavy boundary. Sampled 0.50 – 0.60.
	B23 0.80 – 1.0	Dark reddish brown (5YR 3/4) Heavy clay, moderate structure of 20-50mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 20-50% stone content 60-200mm; 20-50% ferro-manganiferous concretions 20-60mm; course roots common. Layer continues beyond sampling depth. Sampled 0.90 – 1.0.

Table 37 Chemical Parameters: Eutrophic Red Dermosol (Site 14)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.2	Slightly Acidic	1.6	Non-Sodic	0.6	Non-Saline	1.6	Ca Low
B21	6.8	Neutral	4.4	Non-Sodic	0.3	Non-Saline	1.7	Ca Low
B22	7.2	Neutral	8.4	Marginally Sodic	0.7	Non-Saline	0.6	Ca Deficient
B23	8.4	Moderately Alkaline	33.5	Strongly Sodic	5.6	Moderately Saline	0.0	Ca Deficient

Soil Unit 1A Sub-Dominant Soil Type

Eutrophic Black Dermosol

Table 38 Summary: Eutrophic Black Dermosol (Site 15)

Overview	
Landscape Site 15 	
ASC Name	Eutrophic Black Dermosol
Representative Site	H15
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow, Carissa, Mountain Coolibah
Slope (%)	<1
Aspect	South

Table 39 Profile: Eutrophic Black Dermosol (Site 15)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Very dark brown (7.5YR 2.5/3) clay loam, moderate structure of 100-200mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 2-10% stone content 6-20mm; 20-50% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; clear and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.40	Very dark brown (7.5YR 2.5/2) light clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and weak consistence. 2-10% pale faint mottling; 2-10% ferro-manganiferous concretions 2-6mm; many fine roots; clear and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.40 – 0.80	Brown (7.5YR 5/4) heavy clay, strong structure of 100-200mm subangular blocky peds with a rough fabric and firm consistence. 10-20% pale faint mottling; Nil stone content; 10-20% soft calcareous nodules 20-60m; course roots common; gradual and wavy boundary. Sampled 0.50 – 0.60.
	B23 0.80 – 1.0	Yellowish brown (10YR 5/6) heavy clay, strong structure of 100-200mm subangular blocky peds with a rough fabric and very firm consistence. 2-10% grey faint mottling; Nil stone content; 2-10% soft calcareous nodules 2-6mm; course roots common. Layer continues beyond sampling depth. Sampled 0.90 – 1.0.

Table 40 Chemical Parameters: Eutrophic Black Dermosol (Site 15)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.7	Neutral	1.7	Non-Sodic	0.3	Non-Saline	2.5	Ca Low
B21	7.3	Neutral	2.1	Non-Sodic	0.5	Non-Saline	2.9	Ca Low
B22	9.1	Very Strongly Alkaline	22.0	Strongly Sodic	6.4	Moderately Saline	0.5	Ca Deficient
B23	8.5	Strongly Alkaline	36.9	Strongly Sodic	7.0	Moderately Saline	0.1	Ca Deficient

Soil Unit 1A Sub-Dominant Soil Type

Self-Mulching Red Vertosol

Table 41 Summary: Self-Mulching Red Vertosol (Site 16)

Overview	
Landscape Site 16 	
ASC Name	Self-Mulching Red Vertosol
Representative Site	H16
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Rise-slope
Dominant Land Use	Pasture
Vegetation	Brigalow, Carissa
Slope (%)	1-3
Aspect	Northeast

Table 42 Profile: Self-Mulching Red Vertosol (Site 16)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Dark reddish brown (2.5YR 2.5/3) light clay, moderate structure of 200-500 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 20-50% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.70	Dark reddish brown (2.5YR 2.5/4) silty clay loam, strong structure of 200-500 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 50-90% stone content 60-200mm; 10-20% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30 and 0.50 and 0.60.
	B22 0.70 – 1.0	Dark brown (7.5YR 3/4) heavy clay, strong structure of 200-500mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 2-10% stone content 6-20mm; 2-10% ferro-manganiferous concretions 2-6mm; course roots common. Layer continues beyond sampling depth. Sampled 0.90 – 1.0.

Table 43 Chemical Parameters: Self-Mulching Red Vertosol (Site 16)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.2	Slightly Acidic	2.4	Non-Sodic	0.5	Non-Saline	1.9	Ca Low
B21	6.6	Neutral	3.5	Non-Sodic	0.5	Non-Saline	2.0	Ca Low
	6.2	Slightly Acidic	17.6	Strongly Sodic	3.6	Slightly Saline	0.2	Ca Deficient
B22	6.4	Slightly Acidic	20.3	Strongly Sodic	4.7	Moderately Saline	0.2	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 44 Summary: Self-Mulching Brown Vertosol (Site 17)

Overview	
Landscape Site 17 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H17
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	Northeast

Table 45 Profile: Self-Mulching Brown Vertosol (Site 17)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Brown (7.5YR 4/2) light medium clay, moderate structure of 20-50mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 10-20% stone content 20-60mm; 2-10% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.50	Brown (7.5YR 4/3) light medium clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. 10-20% pale faint mottling; 10-20% stone content 20-60mm; 2-10% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Brown (7.5YR 4/3) light medium clay, strong structure of 100-200mm with a rough fabric and strong consistence. 10-20% red faint mottling; Nil stone content; 2-10% ferro-manganiferous concretions 2-6mm; course roots common. Layer continues beyond sample depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 46 Summary: Self-Mulching Black Vertosol (Site 18)

Overview	
Landscape Site 18 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H18
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Wilga
Slope (%)	1-3
Aspect	West

Table 47 Profile: Self-Mulching Black Vertosol (Site 18)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.30	Black (10YR 2/1) medium clay, moderate structure of 10-20 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 50-90% stone content 60-200mm; Nil segregations; abundant fine roots; well drained; clear and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.30 – 1.0	Black (10YR 2/1) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; Nil stone content; Nil segregations; many fine roots; clear and wavy boundary. Sampled 0.20 – 0.30, 0.50 – 0.60 and 0.90 – 1.0.
	BC +1.0	Weathered parent material. Not sampled.

Table 48 Chemical Parameters: Self-Mulching Black Vertosol (Site 18)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	8.3	Moderately Alkaline	0.4	Non-Sodic	0.8	Non-Saline	1.6	Ca Low
B2	8.5	Strongly Alkaline	0.7	Non-Sodic	0.8	Non-Saline	1.7	Ca Low
	8.2	Moderately Alkaline	1.7	Non-Sodic	0.7	Non-Saline	1.2	Ca Low
	8.4	Strongly Alkaline	2.1	Non-Sodic	0.7	Non-Saline	1.1	Ca Low

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 49 Summary: Self-Mulching Black Vertosol (Site 19)

Overview	
Landscape Site 19 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H19
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	1-3
Aspect	West

Table 50 Profile: Self-Mulching Black Vertosol (Site 19)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.05	Brown (7.5YR 4/3) light medium clay, moderate structure of 20-50 mm polyhedral peds with a rough fabric and weak consistence. Nil mottling; 2-10% stone content 60-200mm; 10-20% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; Abrupt and wavy boundary. Sampled 0.0 – 0.05.
	B21 0.05 – 0.90	Black (10YR 2/1) light clay, strong structure of 200-500 mm angular blocky peds with a rough fabric and very firm consistence. Nil mottling; <2% stone content 2-6mm; <2% ferro-manganiferous concretions 2-6mm; many fine roots; clear and wavy boundary. Sampled 0.20 – 0.30, 0.50 – 0.60 and 0.80 – 0.90.
	BC +0.90	Weathered parent material. Not sampled.

Soil Unit 1A: Sub-Dominant Soil Type

Eutrophic Brown Dermosol

Table 51 Summary: Eutrophic Brown Dermosol (Site 20)

Overview	
Landscape Site 20 	
ASC Name	Eutrophic Brown Dermosol
Representative Site	H20
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow, Carissa
Slope (%)	1-3
Aspect	North

Table 52 Profile: Eutrophic Brown Dermosol (Site 20)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Dark brown (10YR 3/3) clay loam, moderate structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 10-20% stone content 20-60mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.80	Yellowish brown (10YR 5/4) light clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. 10-20% pale faint; 10-20% grave 6-20mm; 50-90% soft calcareous nodules 6-20mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30 and 0.50 – 0.60.
	B22 0.80 – 1.0	Yellowish brown (10YR 5/4) light-medium clay, strong structure of 200-500 mm subangular blocky peds with a rough fabric and very firm consistence. 20-50% pale faint mottling; 2-10% ferro-manganiferous concretions 6-20mm; course roots common. Layer continues beyond sample depth. Sampled 0.90 – 1.0.

Table 53 Chemical Parameters: Eutrophic Brown Dermosol (Site 20)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.2	Neutral	5.8	Non-Sodic	0.5	Non-Saline	1.2	Ca Low
B21	9.0	Strongly Alkaline	8.7	Marginally Sodic	4.4	Moderately Saline	1.8	Ca Low
	9.1	Very Strongly Alkaline	14.4	Strongly Sodic	7.3	Moderately Saline	1.3	Ca Low
B22	8.8	Strongly Alkaline	28.8	Strongly Sodic	11.3	Highly Saline	0.4	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 54 Summary: Self-Mulching Brown Vertosol (Site 21)

Overview	
Landscape Site 21 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H21
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Rise-slope
Dominant Land Use	Pasture
Vegetation	Brigalow, Mountain Coolibah
Slope (%)	1-3
Aspect	North

Table 55 Profile: Self-Mulching Brown Vertosol (Site 21)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Dark brown (7.5YR 3/3) light clay, moderate structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 2-10% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.70	Yellowish brown (10YR 5/4) light clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and very firm consistence. 20-50% orange prominent mottling; 2-10% stone content 6-20mm; 2-10% soft calcareous nodules 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30 and 0.50 – 0.60.
	B22 0.70 – 1.0	Dark yellowish brown (10YR 4/4) light medium clay, strong structure of 50-100 mm subangular blocky with a rough fabric and very firm consistence. 10-20% yellow faint mottling; 2-10% stone content 6-20mm; 10-20% soft calcareous nodules 6-20mm; course roots common. Layer continues beyond sample depth. Sampled 0.90 – 1.0.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 56 Summary: Self-Mulching Brown Vertosol (Site 22)

Overview	
Landscape Site 22 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H22
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Rise-slope
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	3-10
Aspect	North

Table 57 Profile: Self-Mulching Brown Vertosol (Site 22)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Dark yellowish brown (10YR 4/4) medium clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; <2% ferro-manganiferous concretions <2mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.60	Dark yellowish brown (10YR 3/4) Heavy clay, strong structure of 100-200 mm lenticular peds with a rough fabric and firm consistence. 2-10% pale faint mottling; 10-20% stone content 6-20mm; 10-20% soft calcareous nodules 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30 and 0.50 – 0.60.
	B22 0.60 – 1.0	Brown (7.5YR 4/3) Silty clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. 10-20% orange faint mottling; 2-10% stone content 6-20mm; 2-10% soft calcareous nodules 2-6mm; course roots common. Sampled 0.90 – 1.0.

Table 58 Chemical Parameters: Self-Mulching Brown Vertosol (Site 22)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	8.6	Strongly Alkaline	4.7	Non-Sodic	2.5	Slightly Saline	1.4	Ca Low
B21	8.8	Strongly Alkaline	8.6	Marginally Sodic	3.0	Slightly Saline	1.4	Ca Low
	8.7	Strongly Alkaline	26.1	Strongly Sodic	8.1	Highly Saline	0.5	Ca Deficient
B22	8.6	Strongly Alkaline	26.3	Strongly Sodic	12.9	Highly Saline	0.6	Ca Deficient

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 59 Summary: Self-Mulching Brown Vertosol (Site 23)

Overview	
Landscape Site 23 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H23
Other Mapped Sites	H01 – H25
Survey Type	Detailed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow, Belah
Slope (%)	1-3
Aspect	North

Table 60 Profile: Self-Mulching Brown Vertosol (Site 23)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Very dark brown (7.5YR 2.5/2) light clay, moderate structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 10-20% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.50	Brown (7.5YR 4/4) light clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and very firm consistence. 10-20% orange faint; 2-10% stone content 20-60mm; 10-20% soft calcareous nodules 6-20mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Strong brown (7.5YR 4/6) light medium clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and strong consistence. 10-20% orange faint mottling; 10-20% stone content 200-600mm; 10-20% soft calcareous nodules 6-20mm; course roots common. Layer continues beyond sampling depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 61 Summary: Self-Mulching Black Vertosol (Site 24)

Overview	
Landscape Site 24 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H24
Other Mapped Sites	H01 – H25
Survey Type	Detailed Lab Analysed
Dominant Topography	Levee
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	

Table 62 Profile: Self-Mulching Black Vertosol (Site 24)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Black (5YR 2.5/1) Medium clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 2-10% stone content 20-60mm; 2-10% ferro-manganiferous concretions <2mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.60	Black (7.5YR 2.5/1) Medium clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 2-10% stone content 6-20mm; 2-10% soft calcareous nodules <2mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30 and 0.50 – 0.60.
	B22 0.60 – 1.0	Dark reddish grey (5YR 4/2) Medium clay, strong structure of 200-500 mm subangular blocky peds with a rough fabric and firm consistence. 20-50% grey faint mottling; 2-10% stone content 6-20mm; 2-10% soft calcareous nodules 2-6mm; course roots common. Layer continue beyond sampling depth. Sampled 0.90 – 1.0.

Table 63 Chemical Parameters: Self-Mulching Black Vertosol (Site 24)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	9.0	Strongly Alkaline	6.5	Marginally Sodic	1.5	Non-Saline	2.0	Ca Low
B21	9.2	Very Strongly Alkaline	8.2	Marginally Sodic	1.8	Non-Saline	1.9	Ca Low
	9.0	Very Strongly Alkaline	17.5	Strongly Sodic	5.6	Moderately Saline	1.5	Ca Low
B22	8.7	Strongly Alkaline	21.5	Strongly Sodic	11.5	Highly Saline	1.7	Ca Low

Soil Unit 1A: Self-Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 64 Summary: Self-Mulching Black Vertosol (Site 25)

Overview	
Landscape Site 25 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H25
Other Mapped Sites	H01 – H24
Survey Type	Detailed
Dominant Topography	Stream bank
Dominant Land Use	Pasture
Vegetation	Brigalow, Wilga, Caesalpinia, Red gum, Poplar box
Slope (%)	<1
Aspect	East

Table 65 Profile: Self-Mulching Black Vertosol (Site 25)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.25	Black (10YR 2/1) light clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; Nil stone content; Nil segregations; abundant fine roots; well drained; gradual boundary. Sampled 0.0 – 0.10.
	B21 0.25 – 0.70	Very dark greyish brown (10YR 3/2) silty clay, weak structure of 20-50 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; Nil stone content; Nil segregations; many fine roots; gradual boundary. Sampled 0.30 – 0.40.
	B224 0.70 – 1.2	Dark greyish brown (10YR 4/2) Sandy clay loam, weak structure of 10-20 mm subangular blocky peds with an earthy fabric and weak consistence. Nil mottling; Nil stone content; Nil segregations; course roots common; gradual boundary. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Soil Unit 2: Eutrophic Red-Brown Chromosol

Eutrophic Red Chromosol

Table 66 Summary: Eutrophic Red Chromosol (Site 26)

Overview	
Landscape Site 26 	
ASC Name	Eutrophic Red Chromosol
Representative Site	H26
Other Mapped Sites	H27, H28
Survey Type	Detailed Lab Analysed
Dominant Topography	Lower slope
Dominant Land Use	Pasture
Vegetation	Poplar box
Slope (%)	1-3
Aspect	Southeast

Table 67 Profile: Eutrophic Red Chromosol (Site 26)

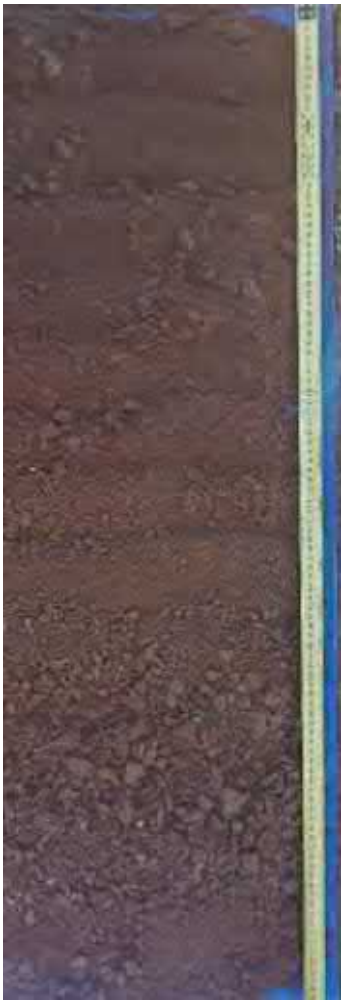
Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Dark brown (7.5YR 3/4) loam, weak structure of 10-20 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; Nil stone content; Nil segregations; abundant fine roots; well drained; clear and wavy boundary. Sampled 0.0 – 0.10.
	A2 0.10 – 0.30	Dark reddish brown (5YR 3/3) loam, weak structure of 10-20 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 20-60mm; 2-10% ferro-manganiferous concretions 2-6mm; many fine roots; well drained; clear and wavy boundary. Sampled 0.15 – 0.25.
	B21 0.30 – 0.60	Yellowish red (5YR 4/6) Light medium clay, weak structure of 20-50 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 2-10% stone content 6-20mm; 2-10% ferro-manganiferous concretions 20-60mm; many fine roots; gradual and wavy boundary. Sampled 0.30 – 0.40.
	B22 0.60 – 0.75	Strong brown (7.5YR 5/6) Medium clay, moderate structure of 20-50 mm angular blocky peds with a rough fabric and very firm consistence. 10-20% red distinct mottling; 2-10% stone content 6-20mm; 2-10% ferro-manganiferous concretions 6-20mm; course roots common; gradual and wavy boundary. Sampled 0.60 – 0.70.
	BC +0.75	Weathered parent material. Not sampled.

Table 68 Chemical Parameters: Eutrophic Red Chromosol (Site 26)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.4	Slightly Acidic	1.5	Non-Sodic	0.7	Non-Saline	2.8	Ca Low
A2	6.6	Neutral	0.7	Non-Sodic	0.5	Non-Saline	3.3	Ca Low
B21	7.1	Neutral	0.4	Non-Sodic	0.3	Non-Saline	1.5	Ca Low
B22	7.6	Mildly Alkaline	2.3	Non-Sodic	0.5	Non-Saline	1.0	Ca Deficient

Soil Unit 2: Eutrophic Red-Brown Chromosol

Brown Chromosol

Table 69 Summary: Brown Chromosol (Site 27)

Overview	
Landscape Site 27 	
ASC Name	Brown Chromosol
Representative Site	H27
Other Mapped Sites	H26, H28
Survey Type	Detailed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Poplar box, Eucalyptus, Carissa, Brigalow
Slope (%)	<1
Aspect	Southeast

Table 70 Profile: Brown Chromosol (Site 27)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Brown (7.5YR 4/2) sandy loam, weak structure of 10-20 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; <2% stone content 6-20mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	A2 0.10 – 0.35	Dark brown (7.5YR 3/3) sandy loam, weak structure of 5-10 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; <2% stone content 6-20mm; Nil segregations; many fine roots; clear and even boundary. Sampled 0-0.20 – 0.30.
	B21 0.35 – 0.55	Brown (10YR 4/3) light clay, moderate structure of 20-50 mm blocky peds with a rough fabric and firm consistence. 2-10% orange faint; <2% stone content 6-20mm; <2% ferro-manganiferous concretions <2mm; many fine roots; gradual and wavy boundary. Sampled 0.40 – 0.50.
	B22 0.55 – 1.0	Yellowish brown (10YR 5/6) light medium clay, moderate structure of 20-50 mm blocky peds with a rough fabric and very firm consistence. 20-50% orange faint; <2% stone content 6-20mm; <2% ferro-manganiferous concretions 2-6mm; course roots common. Sampled 0.90 – 1.0.

Soil Unit 2: Eutrophic Red-Brown Chromosol

Eutrophic Brown Chromosol

Table 71 Summary: Eutrophic Brown Chromosol (Site 28)

Overview	
Landscape Site 28 	
ASC Name	Eutrophic Brown Chromosol
Representative Site	H28
Other Mapped Sites	H26, H27
Survey Type	Detailed Lab Analysed
Dominant Topography	Backplain
Dominant Land Use	Pasture
Vegetation	Brigalow, Wilga, Caesalpinia
Slope (%)	1-3
Aspect	Southeast

Table 72 Profile: Eutrophic Brown Chromosol (Site 28)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Very dark brown (10YR 2/2) loam, moderate structure of 10-20 mm crumb peds with a rough fabric and firm consistence. Nil mottling; <2% stone content 6-20mm; 2-10% ferro-manganiferous concretions <2mm; abundant fine roots; well drained; clear and even boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.20	Brown (7.5YR 4/3) light clay, strong structure of 20-50 mm blocky peds with a rough fabric and very firm consistence. Nil mottling; <2% stone content 2-6mm; 2-10% ferro-manganiferous concretions <2mm; many fine roots; gradual and even boundary. Sampled 0.10 – 0.20.
	B22 0.20 – 0.60	Dark reddish brown (5YR 3/3) light medium clay, strong structure of 20-50 mm blocky peds with a rough fabric and very firm consistence. Nil mottling; <2% stone content 2-6mm; <2% ferro-manganiferous concretions 2-6mm; 2-10% soft calcareous nodules 20-60mm; many fine roots; gradual and even boundary. Sampled 0.30 – 0.40 and 0.60 – 0.70.
	B23 0.60 – 1.0	Dark brown (7.5YR 3/2) light medium clay, strong structure of 20-50 mm blocky peds with a rough fabric and very firm consistence. 2-10% pale faint mottling; <2% stone content 2-6mm; <2% ferro-manganiferous concretions 6-20mm; <2% soft calcareous nodules 2-6mm; common fine roots. Sampled 0.90 – 1.0.

Table 73 Chemical Parameters: Eutrophic Brown Chromosol (Site 28)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.0	Neutral	0.7	Non-Sodic	0.4	Non-Saline	2.2	Ca Low
B21	8.1	Moderately Alkaline	4.7	Non-Sodic	1.6	Non-Saline	1.5	Ca Low
B22	9.0	Strongly Alkaline	6.9	Marginally Sodic	3.4	Slightly Saline	1.7	Ca Low
B23	8.8	Strongly Alkaline	15.6	Strongly Sodic	9.6	Highly Saline	1.0	Ca Low

Soil Unit 1B: Self Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 74 Summary: Self-Mulching Black Vertosol (Site 29)

Overview	
Landscape Site 29 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H29
Other Mapped Sites	H30 – H36
Survey Type	Detailed Lab Analysed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow, Caesalpinia
Slope (%)	1-3
Aspect	Northeast

Table 75 Profile: Self-Mulching Black Vertosol (Site 29)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.20	Black (7.5YR 2.5/1) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; Nil stone content; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.20 – 0.90	Black (5YR 2.5/1) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; Nil stone content; <2% soft calcareous nodules 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30 and 0.50 – 0.60.
	B22 0.90 – 1.0	Black (7.5YR 2.5/1) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; <2% stone content 20-60mm; 2-10% soft calcareous nodules 2-6mm; course roots common. Sampled 0.90 – 1.0.

Table 76 Chemical Parameters: Self-Mulching Black Vertosol (Site 29)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.5	Mildly Alkaline	1.0	Non-Sodic	0.4	Non-Saline	3.9	Ca Low
B21	7.9	Moderately Alkaline	1.8	Non-Sodic	0.5	Non-Saline	4.2	Balanced
	8.4	Strongly Alkaline	2.8	Non-Sodic	0.8	Non-Saline	4.5	Balanced
B22	8.5	Strongly Alkaline	3.1	Non-Sodic	1.2	Non-Saline	4.9	Balanced

Soil Unit 1B: Self Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 77 Summary: Black Vertosol (Site 30)

Overview	
Landscape Site 30 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H30
Other Mapped Sites	H29 – H36
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow, Caesalpinia
Slope (%)	<1
Aspect	North

Table 78 Profile: Self-Mulching Black Vertosol (Site 30)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.15	Very dark greyish brown (10YR 3/2) light medium clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and strong consistence. Nil mottling; Nil stone content; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.15 – 0.30	Dark brown (7.5YR 3/2) heavy clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and strong consistence. Nil mottling; Nil stone content; 2-10% soft calcareous nodules 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.30 – 0.60	Brown (10YR 4/3) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and strong consistence. 10-20% pale faint mottling; Nil stone content; 10-20% soft calcareous nodules 6-20mm; many fine roots; gradual and wavy boundary. Sampled 0.50 – 0.60.
	B23 0.60 – 0.85	Dark yellowish brown (10YR 4/4) heavy clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and strong consistence. 20-50% dark distinct mottling; <2% stone content 200-600mm; 2-10% soft calcareous nodules 6-20mm; course roots common. Sampled 0.75 – 0.85.

Table 79 Chemical Parameters: Self-Mulching Black Vertosol (Site 30)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.3	Mildly Alkaline	2.1	Non-Sodic	0.5	Non-Saline	1.8	Ca Low
B21	8.4	Strongly Alkaline	3.1	Non-Sodic	1.4	Non-Saline	2.5	Ca Low
B22	8.7	Strongly Alkaline	13.3	Sodic	5.2	Moderately Saline	1.4	Ca Low
B23	8.6	Strongly Alkaline	21.2	Strongly Sodic	6.8	Moderately Saline	0.8	Ca Deficient

Soil Unit 1B: Self Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 80 Summary: Self-Mulching Brown Vertosol (Site 31)

Overview	
Landscape Site 31 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	H31
Other Mapped Sites	H29 – H36
Survey Type	Detailed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	North

Table 81 Profile: Self-Mulching Brown Vertosol (Site 31)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Very dark greyish brown (10YR 3/2) light medium clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and strong consistence. Nil mottling; 2-10% stone content 6-20mm; Nil segregations; abundant fine roots; well drained; clear and even boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Dark greyish brown (10YR 4/2) light medium clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and strong consistence. 2-10% orange distinct mottling; 2-10% stone content 20-60mm; 2-10% ferro-manganiferous concretions <2mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Yellowish brown (10YR 5/4) light medium clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and strong consistence. 10-20% brown distinct mottling; <2% stone content 2-6mm; Nil segregations; course roots common. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Soil Unit 1B: Self Mulching Brown-Black Vertosol

Self-Mulching Black Vertosol

Table 82 Summary: Self-Mulching Black Vertosol (Site 32)

Overview	
Landscape Site 32 	
ASC Name	Self-Mulching Black Vertosol
Representative Site	H32
Other Mapped Sites	H29 – H36
Survey Type	Detailed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow, Caesalpinia
Slope (%)	1-3
Aspect	East

Table 83 Profile: Self-Mulching Black Vertosol (Site 32)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Dark grey (10YR 4/1) Light medium clay, moderate structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 20-50% stone content 60-200mm; Nil segregations; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Very dark grey (10YR 3/1) light medium clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; 20-50% stone content 60-200mm; Nil segregations; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Very dark grey (10YR 3/1) light medium clay, strong structure 200-500 mm lenticular peds with a rough fabric and very firm consistence. 10-20% pale faint mottling mottling; 20-50% stone content 60-200mm; 10-20% soft calcareous nodules 2-6mm; course common roots. Layer continues beyond sampling depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Soil Unit 1B: Self Mulching Brown-Black Vertosol

Self-Mulching Brown Vertosol

Table 84 Summary: Self-Mulching Brown Vertosol (Site 33)

Overview	
Landscape Site 33 	
ASC Name	Self-Mulching Brown Vertosol
Representative Site	33
Other Mapped Sites	H29 – H36
Survey Type	Detailed Lab Analysed
Dominant Topography	Plain
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	<1
Aspect	Nil

Table 85 Profile: Self-Mulching Brown Vertosol (Site 33)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Very dark brown (7.5YR 2.5/2) medium clay, moderate structure of 50-100 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; 10-20% stone content 20-60mm; 2-10% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Very dark brown (7.5YR 2.5/3) medium clay, strong structure of 200-500 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 2-10% stone content 20-60mm; 2-10% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Brown (7.5YR 4/4) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and strong consistence. 2-10% pale faint mottling; 2-10% stone content 20-60mm; 10-20% ferro-manganiferous concretions 2-6mm; 2-10% soft calcareous nodules 2-6mm; course roots common. Layer continues beyond sampling depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Table 86 Chemical Parameters: Self-Mulching Brown Vertosol (Site 33)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.1	Neutral	2.6	Non-Sodic	0.4	Non-Saline	1.9	Ca Low
B21	7.7	Mildly Alkaline	6.6	Marginally Sodic	0.3	Non-Saline	2.0	Ca Low
B22	8.6	Strongly Alkaline	14.2	Strongly Sodic	1.3	Non-Saline	0.6	Ca Deficient
	9.2	Very Strongly Alkaline	12.5	Sodic	3.1	Slightly Saline	1.5	Ca Low

Soil Unit 1B: Sub-Dominant Soil Type

Self-Mulching Grey Vertosol

Table 87 Summary: Self-Mulching Grey Vertosol (Site 34)

Overview	
Landscape Site 34 	
ASC Name	Self-Mulching Grey Vertosol
Representative Site	H34
Other Mapped Sites	H29 – H36
Survey Type	Detailed Lab Analysed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow
Slope (%)	1-3
Aspect	East

Table 88 Profile: Self-Mulching Grey Vertosol (Site 34)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.15	Black (5YR 2.5/1) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. Nil mottling; <2% stone content 6-20mm; 10-20% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.15 – 0.50	Greyish brown (10YR 5/2) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. 10-20% pale faint mottling; 10-20% stone content 6-20mm; 2-10% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Brown (10YR 5/3) heavy clay, strong structure of 200-500 mm lenticular peds with a rough fabric and very firm consistence. 20-50% yellow distinct mottling; Nil stone content; <2% ferro-manganiferous concretions <2mm; course roots common. Layer continues beyond sampling depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Table 89 Chemical Parameters: Self-Mulching Grey Vertosol (Site 34)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	7.2	Neutral	11.1	Sodic	3.3	Slightly Saline	0.4	Ca Deficient
B21	8.4	Moderately Alkaline	34.2	Strongly Sodic	7.1	Moderately Saline	0.3	Ca Deficient
B22	8.2	Moderately Alkaline	39.8	Strongly Sodic	8.1	Highly Saline	0.2	Ca Deficient
	8.1	Moderately Alkaline	42.7	Strongly Sodic	8.6	Highly Saline	0.2	Ca Deficient

Soil Unit 1B: Sub-Dominant Soil Type

Eutrophic Brown Dermosol

Table 90 Summary: Eutrophic Brown Dermosol (Site 35)

Overview	
Landscape Site 35 	
ASC Name	Eutrophic Brown Dermosol
Representative Site	H35
Other Mapped Sites	H29 – H36
Survey Type	Detailed Lab Analysed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow, Eucalyptus, Carissa
Slope (%)	1-3
Aspect	East

Table 91 Profile: Eutrophic Brown Dermosol (Site 35)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Very dark brown (7.5YR 2.5/2) clay loam, moderate structure of 100-200 mm subangular blocky peds with a rough fabric and firm consistence. Nil mottling; 10-20% stone content 2-6mm; 10-20% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	B21 0.10 – 0.50	Dark brown (7.5YR 3/4) light clay, strong structure of 50-100 mm subangular blocky peds with a rough fabric and firm consistence. 2-10% pale faint mottling; 2-10% stone content 20-60mm; 20-50% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	B22 0.50 – 1.0	Brown (7.5YR 4/4) heavy clay, strong structure of 100-200 mm subangular blocky peds with a rough fabric and very firm consistence. 10-20% orange faint mottling; 20-50% stone content 20-60mm; 20-50% ferro-manganiferous concretions 2-6mm; 2-10% soft calcareous nodules 6-20mm; course roots common. Layer continues beyond sampling depth. Sampled 0.50 – 0.60 and 0.90 – 1.0.

Table 92 Chemical Parameters: Eutrophic Brown Dermosol (Site 35)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.6	Neutral	4.7	Non-Sodic	0.5	Non-Saline	2.1	Ca Low
B21	7.3	Neutral	8.8	Marginally Sodic	0.6	Non-Saline	1.5	Ca Low
B22	9.4	Very Strongly Alkaline	24.9	Strongly Sodic	4.3	Moderately Saline	1.2	Ca Low
	8.5	Strongly Alkaline	15.8	Strongly Sodic	0.6	Non-Saline	0.8	Ca Deficient

Soil Unit 1B: Sub-Dominant Soil Type

Eutrophic Brown Dermosol

Table 93 Summary: Eutrophic Brown Dermosol (Site 36)

Overview	
Landscape Site 36 	
ASC Name	Eutrophic Brown Dermosol
Representative Site	H36
Other Mapped Sites	H29 – H35
Survey Type	Detailed Lab Analysed
Dominant Topography	Pediment
Dominant Land Use	Pasture
Vegetation	Brigalow, Eucalyptus, Carissa
Slope (%)	1-3
Aspect	East

Table 94 Profile: Eutrophic Brown Dermosol (Site 36)

Profile	Horizon / Depth (m)	Description
	A1 0.0 – 0.10	Dark reddish brown (5YR 2.5/2) clay loam, weak structure of 50-100 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; Nil stone content; 2-10% ferro-manganiferous concretions 2-6mm; abundant fine roots; well drained; gradual and wavy boundary. Sampled 0.0 – 0.10.
	A21 0.10 – 0.40	Very dark brown (7.5YR 2.5/2) loam, weak structure of 50-100 mm subangular blocky peds with a rough fabric and weak consistence. Nil mottling; Nil stone content; 2-10% ferro-manganiferous concretions 2-6mm; many fine roots; gradual and wavy boundary. Sampled 0.20 – 0.30.
	A22 0.40 – 0.50	Brown (10YR 4/3) loam, weak structure of 10-20 mm subangular blocky peds with a rough fabric and weak consistence. 20%, yellow distinct mottling; Nil stone content; 2-10% ferro-manganiferous concretions 2-6mm; many fine roots; abrupt and wavy boundary. Sampled 0.50 – 0.60.
	B2 0.50 – 1.0	Brown (10YR 5/3) light medium clay, strong structure of 20-50 mm subangular blocky peds with a rough fabric and firm consistence. 20-50% orange distinct mottling; 2-10% stone content 20-60mm; 2-10% ferro-manganiferous concretions 2-6mm; course roots common. Layer continues beyond sampling depth. Sampled 0.90 – 1.0.

Table 95 Chemical Parameters: Eutrophic Brown Dermosol (Site 36)

Layer	pH (1:5 water)		ESP		ECe		Ca:Mg	
	Unit	Rating	%	Rating	dS/m	Rating	Ratio	Rating
A1	6.7	Neutral	1.6	Non-Sodic	0.8	Non-Saline	3.3	Balanced
A21	6.0	Slightly Acidic	3.2	Non-Sodic	0.3	Non-Saline	1.9	Ca Low
A22	5.5	Strongly Acidic	4.5	Non-Sodic	0.2	Non-Saline	0.9	Ca Deficient
B2	7.2	Neutral	15.8	Strongly Sodic	1.0	Non-Saline	0.1	Ca Deficient

APPENDIX C

Check Site Descriptions

Black Vertosol

Table 1 Summary: Black Vertosol (Check Site 1)

Overview		
ASC Name	Black Vertosol	
Representative Site	C01	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Drainage Depression	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Carissa, Caesalpinia	
Slope (%)	<1	
Slope Type	Open Depression	
Aspect	Nil	

Profile	Description
	A1 (0.0 - 0.10): Light medium clay, moderate structure subangular blocky peds, 6-20% stone content 10-20mm, gradual boundary; B21 (0.10 – 0.30): medium clay, strong structure subangular blocky peds, 10-20% stone content 10-20mm, gradual boundary; B22 (0.30+): medium clay, strong structure subangular blocky peds, 10-20% stone content 20-60mm.

Brown Vertosol

Table 2 Summary: Brown Vertosol (Check Site 2)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C02	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Stream bed	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Carissa, Belah	
Slope (%)	<1	
Slope Type	Open Depression	
Aspect	Southwest	

Profile	Description
	A1 (0.0 - 0.10): Medium clay, strong structure subangular blocky peds, gradual boundary; B21 (0.10+): Heavy clay, strong structure subangular blocky peds, 10-20% stone content 2-6mm.

Brown Vertosol

Table 3 Summary: Brown Vertosol (Check Site 3)

Overview		
ASC Name	Brown Vertosol	compre  
Representative Site	C03	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Drain Depression	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1%	
Slope Type	Crest	
Aspect	Southwest	

Profile	Description
	A1 (0.0 - 0.10): Heavy clay, strong structure subangular blocky peds, 2-10% stone content 10-20mm, gradual boundary; B21 (0.10+): Heavy clay, strong structure subangular blocky peds.

Black Vertosol

Table 4 Summary: Black Vertosol (Check Site 4)

Overview		
ASC Name	Black Vertosol	
Representative Site	C04	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Terrace Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	

Profile	Description
	A1 (0.0 - 0.20): Light medium clay, with moderate structure 20-50mm subangular blocky peds; <2% stone content 20-60mm; many fine roots; gradual boundary. B21 (0.20+): Medium clay, with strong structure 50-100mm subangular blocky peds; course roots common.

Black Vertosol

Table 5 Summary: Black Vertosol (Check Site 5)

Overview		
ASC Name	Black Vertosol	
Representative Site	C05	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Drainage Depression	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Southwest	

Profile	Description
	A1 (0.0 – 0.10): Light medium clay, with moderate structure 10-20mm subangular blocky peds; many fine roots. B21 (0.10+): Medium clay, with strong structure 50-100mm subangular blocky peds; course roots common.

Brown Dermosol

Table 6 Summary: Brown Dermosol (Check Site 6)

Overview		
ASC Name	Brown Dermosol	
Representative Site	C06	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Southeast	

Profile	Description
	A1 (0.0 – 0.10): Silty clay, with weak structure 20-50 mm subangular blocky peds; many fine roots; gradual boundary. B21 (0.10+): Light medium clay, with strong structure 50-100 mm subangular blocky peds.

Brown Vertosol

Table 7 Summary: Brown Vertosol (Check Site 7)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C07	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Rise-slope	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Mountain Coolibah	
Slope (%)	10-32	
Slope Type	Upper slope	
Aspect	Southeast	
Profile		**Description**
		A1 (0.0 - 0.10): Medium clay, strong structure subangular blocky peds, 2-10% stone content 20-40mm, gradual boundary; B2 (0.10+): Heavy clay, strong structure subangular blocky peds.

Brown Vertosol

Table 8 Summary: Brown Vertosol (Check Site 8)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C08	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Rise-slope	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Mountain Coolibah	
Slope (%)	3-10	
Slope Type	Mid-slope	
Aspect	Southeast	

Profile	Description
	A1 (0.0 - 0.10): Medium clay, strong structure subangular blocky peds, 10-20% stone content 20-60mm, gradual boundary; B2 (0.10+): Heavy clay, strong structure subangular blocky peds, 10-20% stone content 6-20mm.

Brown Vertosol

Table 9 Summary: Brown Vertosol (Check Site 9)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C09	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.10) Light medium clay, strong structure subangular blocky peds, 2-10% stone content 20-60mm, gradual boundary; B21 (0.10+): Heavy clay, strong structure subangular blocky peds, 10-20% stone content 20-60mm.

Brown Vertosol

Table 10 Summary: Brown Vertosol (Check Site 10)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C10	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Drainage Depression	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.10+): Medium clay, moderate structure subangular blocky peds.

Brown Vertosol

Table 11 Summary: Brown Vertosol (Check Site 11)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C11	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography		
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.10): Light medium clay, medium structure subangular blocky peds, 2-10% stone content 6-20mm.

Brown Vertosol

Table 12 Summary: Brown Vertosol (Check Site 12)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C12	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Pediment	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	1-3	
Slope Type	Mid-slope	
Aspect	Southwest	
Profile		**Description**
		A1 (0.0 – 0.10): Medium clay, strong structure subangular blocky peds, 2-10% stone content 6-20mm.

Brown Vertosol

Table 13 Summary: Brown Vertosol (Check Site 13)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C13	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Pediment	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.10): Heavy clay strong subangular blocky peds, 10-20% stone content 2-10mm.

Brown Vertosol

Table 14 Summary: Brown Vertosol (Check Site 14)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C14	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Drainage Depression	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Mountain Coolibah	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 - 0.20): Medium clay, moderate structure subangular blocky peds.

Brown Vertosol

Table 15 Summary: Brown Vertosol (Check Site 15)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C15	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Rise-slope	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Mountain Coolibah	
Slope (%)	3-10	
Slope Type	Upper slope	
Aspect	Northeast	
Profile		**Description**
		A1 (0.0 – 0.10): Light clay moderate structure subangular blocky peds, 2-10% stone content 2-6mm.

Brown Vertosol

Table 16 Summary: Brown Vertosol (Check Site 16)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C16	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Rise-slope	
Dominant Land Use	Pasture	
Vegetation	Mountain Coolibah	
Slope (%)	3-10	
Slope Type	Lower slope	
Aspect	North	
Profile		**Description**
		A1 (0.0 – 0.10): Light clay moderate structure subangular blocky peds, 2-10% stone content 2-6mm.

Black Vertosol

Table 17 Summary: Black Vertosol (Check Site 17)

Overview		
ASC Name	Black Vertosol	
Representative Site	C17	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Pediment	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	1-3	
Slope Type	Lower slope	
Aspect	West	
Profile		**Description**
		A1 (0.0 – 0.20): Medium clay, moderate subangular blocky peds; abundant fine roots; gradual boundary. B21 (0.20+): Heavy Clay, strong structure subangular blocky peds; course roots common.

Brown Vertosol

Table 18 Summary: Brown Vertosol (Check Site 18)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C18	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Pediment	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	1-3	
Slope Type	Simple slope	
Aspect	North	
Profile		**Description**
		A1 (0.0 – 0.10): Light clay, moderate structure 20-50 mm subangular blocky peds; 2-10% stone content 2-6 mm. B21 (0.10+): Medium clay, strong structure subangular blocky peds.

Brown Vertosol

Table 19 Summary: Brown Vertosol (Check Site 19)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C19	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.10): Medium clay, moderate structure subangular blocky peds; 2-10% stone content 6-20mm; gradual boundary.

Black Vertosol

Table 20 Summary: Black Vertosol (Check Site 20)

Overview		
ASC Name	Black Vertosol	
Representative Site	C20	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.20): Light medium clay, moderate structure subangular blocky peds; abundant fine roots; gradual boundary. B21 (0.20+): medium clay, strong structure subangular blocky peds.

Brown Vertosol

Table 21 Summary: Brown Vertosol (Check Site 21)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C21	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Pediment	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Carissa, Caesalpinia	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.10): Light clay, moderate structure subangular blocky peds. B21 (0.10+): Medium clay, strong structure subangular blocky peds; 2-10% stone content 2-6mm.

Brown Vertosol

Table 22 Summary: Brown Vertosol (Check Site 22)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C22	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Stream bed	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Carissa, Caesalpinia	
Slope (%)	<1	
Slope Type	Upper slope	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.20): Light clay, moderate structure subangular blocky peds; abundant fine roots; gradual boundary. B21 (0.20 – 0.50): Medium clay, strong structure subangular blocky peds; gradual boundary. B22 (0.50+): Medium clay, strong structure subangular blocky peds; 2-10% stone content 2-6mm.

Black Vertosol

Table 23 Summary: Black Vertosol (Check Site 23)

Overview		
ASC Name	Black Vertosol	
Representative Site	C23	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Drainage Depression	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Open Depression	
Aspect	Ni	
Profile		**Description**
		A1 (0.0 – 0.20): Medium clay, strong 20-50 mm subangular blocky peds; 2-10% stone content 2-6mm; gradual boundary. B21 (0.20+): Medium clay, strong structure subangular blocky peds.

Brown Vertosol

Table 24 Summary: Brown Vertosol (Check Site 24)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C24	
Soil Map Unit	1A	
Survey Type	Check Site	
Dominant Topography	Stream Channel	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Caesalpinia	
Slope (%)	<1	
Slope Type	Open Depression	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.10): Light clay, moderate structure; 10-20% stone content 6-20 mm; gradual boundary. B21 (0.10+): Medium clay, strong structure subangular blocky peds.

Brown Chromosol

Table 25 Summary: Brown Chromosol (Check Site 25)

Overview		
ASC Name	Brown Chromosol	
Representative Site	C25	
Soil Map Unit	2	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Mountain Coolibah, Carissa	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.10): Loam, weak structure; clear boundary. B21 (0.10+): medium clay, strong structure.

Brown Chromosol

Table 26 Summary: Brown Chromosol (Check Site 26)

Overview		
ASC Name	Brown Chromosol	
Representative Site	C26	
Soil Map Unit	2	
Survey Type	Check Site	
Dominant Topography	Drainage Depression	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Poplar Box, Eucalyptus, Carissa	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.10): Sandy loam, weak structure; 10-20% stone content 6-20 mm; clear boundary. B21 (0.10+): Medium clay, strong structure subangular blocky peds.

Brown Vertosol

Table 27 Summary: Brown Vertosol (Check Site 27)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C27	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Wilga	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.20): Medium clay, strong 20-50 mm subangular blocky peds; 2-10% stone content 2-6mm; gradual boundary. B21 (0.20+): Medium clay, strong structure subangular blocky peds.

Brown Vertosol

Table 28 Summary: Brown Vertosol (Check Site 28)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C28	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Mountain Coolibah	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.20): Light clay, moderate 20-50 mm subangular blocky peds; 2-10% stone content 2-6mm; gradual boundary. B21 (0.20+): Medium clay, strong structure subangular blocky peds.

Brown Vertosol

Table 29 Summary: Brown Vertosol (Check Site 29)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C29	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Carissa, Red gum	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.10): Light clay, moderate structure 10-20mm subangular blocky peds; abundant fine roots; gradual boundary. B21 (0.10+): heavy clay, strong structure 50-100mm subangular blocky peds.

Brown Vertosol

Table 30 Summary: Brown Vertosol (Check Site 30)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C30	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Stream Channel	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Caesalpinia	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.15): Light medium clay, moderate structure 20-50 mm subangular blocky peds; gradual boundary. B21 (0.15+): Medium clay, strong structure 50-100mm subangular blocky peds; 10-20% stone content 10-20 mm.

Brown Vertosol

Table 31 Summary: Brown Vertosol (Check Site 31)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C31	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Stream bed	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Caesalpinia, Red gum	
Slope (%)	<1	
Slope Type	Open Depression	
Aspect	Nil	

Profile	Description
	A1 (0.0 – 0.10): Light medium clay, moderate structure 20-50 mm subangular blocky peds; gradual boundary. B21 (0.10+): Light medium clay, strong structure 50-100mm subangular blocky peds.

Black Vertosol

Table 32 Summary: Black Vertosol (Check Site 32)

Overview		
ASC Name	Black Vertosol	
Representative Site	C32	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Pediment	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Caesalpinia	
Slope (%)	1-3	
Slope Type	Simple slope	
Aspect	Northeast	
Profile		**Description**
		A1 (0.0 – 0.20): Medium clay, strong structure 50-100 mm subangular blocky peds; 10-20% stone content 10-20mm; gradual boundary. B21 (0.20+): Heavy clay, strong structure 50-100 mm subangular blocky peds; 10-20% stone content 10-20mm.

Brown Vertosol

Table 33 Summary: Brown Vertosol (Check Site 33)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C33	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Rise-slope	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	1-3	
Slope Type	Simple slope	
Aspect	Northeast	
Profile		**Description**
		A1 (0.0 – 0.10): Light clay, moderate structure; 10-20% stone content 10-20 mm.

Black Vertosol

Table 34 Summary: Black Vertosol (Check Site 34)

Overview		
ASC Name	Black Vertosol	
Representative Site	C34	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Rise-slope	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Carissa	
Slope (%)	1-3	
Slope Type	Simple slope	
Aspect	Northeast	
Profile		**Description**
		A1 (0.0 – 0.20): Light clay, strong structure 20-50 mm subangular blocky peds; gradual boundary.

Brown Vertosol

Table 35 Summary: Brown Vertosol (Check Site 35)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C35	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow, Caesalpinia	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.10): Medium clay, strong structure 20-50 mm subangular blocky peds; gradual boundary

Brown Vertosol

Table 36 Summary: Brown Vertosol (Check Site 36)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C36	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	Nil	
Profile		**Description**
		A1 (0.0 – 0.10): Medium clay, strong structure 50-100 mm subangular blocky peds; 10-20% stone content 6-20mm; gradual boundary

Brown Vertosol

Table 37 Summary: Brown Vertosol (Check Site 37)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C37	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Pediment	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	1-3	
Slope Type	Simple slope	
Aspect	East	
Profile		**Description**
		A1 (0.0 – 0.10): Light clay, strong structure 10-20mm blocky peds; 10-20% stone content 2-6 mm; gradual boundary.

Brown Vertosol

Table 38 Summary: Brown Vertosol (Check Site 38)

Overview		
ASC Name	Brown Vertosol	
Representative Site	C38	
Soil Map Unit	1B	
Survey Type	Check Site	
Dominant Topography	Plain	
Dominant Land Use	Pasture	
Vegetation	Brigalow	
Slope (%)	<1	
Slope Type	Flat	
Aspect	East	
Profile		**Description**
		A1 (0.0 – 0.10): Light medium clay, strong structure 20-50mm subangular blocky peds; 10-20% stone content 2-6 mm; gradual boundary.

APPENDIX D

Emerson Aggregate Test Ratings

Sample	Layer	Depth (cm)	EAT Score	Rating
H01	A1	0-10	4	Negligible
	B21	20-30	3	Moderately High
	B22	40-50		
	B23	90-100		
H03	A1	0-10	3	Moderately High
	B21	20-30		
	B22	50-60	4	Negligible
		90-100		
H05	A1	0-10	3	Moderately High
	B21	20-30		
	B22	60-70	3	Moderately High
	B23	90-100	4	Negligible
H07	A1	0-10	3	Moderately High
	B21	20-30		
	B22	50-60		
		90-100		
H08	A1	0-10	3	Moderately High
	B21	30-40		
	B22	50-60		
		90-100	4	Negligible
H10	A1	0-10	3	Moderately High
	B21	20-30	2	High
	B22	50-60		
	B23	65-75		
H11	A1	0-10	4	Negligible
	B21	30-40		
	B22	50-60	2	High
	B23	90-100		
H13	A1	0-10	3	Moderately High
	B21	20-30	2	High
	B22	50-60		
		90-100		

Sample	Layer	Depth (cm)	EAT Score	Rating
H14	A1	0-10	3	Moderately High
	B21	20-30		
	B22	50-60	2	High
	B23	90-100		
H15	A1	0-10	3	Moderately High
	B21	20-30		
	B22	50-60	4	Negligible
	B23	90-100	2	High
H16	A1	0-10	3	Moderately High
	B21	20-30		
		50-60	2	High
	B22	90-100		
H18	A1	0-10	3	Moderately High
	B2	20-30	4	Negligible
		50-60	3	Moderately High
		90-100	4	Negligible
H20	A1	0-10	3	Moderately High
	B21	20-30	4	Negligible
		50-60	3	Moderately High
	B2	90-100	2	High
H22	A1	0-10	3	Moderately High
	B21	20-30		
		50-60		
	B2	90-100		
H24	A1	0-10	3	Moderately High
	B21	20-30		
		50-60		
	B2	90-100		
H26	A1	0-10	3	Moderately High
	A2	15-25		
	B21	30-40		
	B22	60-70	2	High
H28	A1	0-10	3	Moderately High
	B21	10-20		
	B22	30-40		
	B23	60-70		

Sample	Layer	Depth (cm)	EAT Score	Rating
H29	A1	0-10	4	Negligible
	B21	20-30		
		50-60		
	B22	90-100		
H30	A1	0-10	3	Moderately High
	B21	20-30		
	B22	50-60	4	Negligible
	B23	75-85	4	Negligible
H33	A1	0-10	3	Moderately High
	B21	20-30		
	B22	50-60	2	High
		90-100		
H34	A1	0-10	3	Moderately High
	B21	20-30	2	High
	B22	50-60		
		90-100		
H35	A1	0-10	3	Moderately High
	B21	20-30	2	High
	B22	50-60		
		90-100		
H36	A1	0-10	3	Moderately High
	B21	20-30		
	B22	50-60		
		90-100	2	High

APPENDIX E

Agricultural Land Classification

Table 1 Detailed Cropping Land Suitability Assessment

ASC Soil Type	SMU	E	Es	*M	*M	*M	Pm	Ps	*R	*R	Tm	W	Land Suitability Class
		Water Erosion	Erosion Hazard Subsoil Erodibility	Soil Water Availability (1)	Soil Water Availability (2)	Soil Water Availability (3)	Narrow Moisture Range	Surface Condition	Rockiness (1)	Rockiness (2)	Microrelief	Wetness	
Self-Mulching Brown-Black Vertosol	1A	3	1	3	3	4	3	4	4	4	2	5	**5**
Self-Mulching Brown-Black Vertosol	1B	3	1	4	5	5	2	2	1	1	2	4	**5**
Eutrophic Red-Brown Chromosol	2	3	1	3	3	4	3	4	3	3	2	4	**4**

*M Soil Water Availability: (1) Irrigated Cotton, (2) Summer Dryland Grain Cropping, (3) Winter Dryland Grain Cropping
*R Rockiness: (1) Dryland Grain Cropping, (2) Dryland Summer Pulse Cropping

Table 2 Detailed Land Capability Assessment

ASC Soil Type	SMU	E	Es	M	Pm	Ps	R	Tm	W	Land Capability Class
		Water Erosion	Erosion Hazard, Subsoil Erodibility	Soil Water Availability	Narrow Moisture Range	Surface Condition	Rockiness	Microrelief	Wetness	
Self-Mulching Brown-Black Vertosol	1A	3	6	5	2	6	4	2	3	**VI**
Self-Mulching Brown-Black Vertosol	1B	3	6	5	2	6	2	2	2	**VI**
Eutrophic Red-Brown Chromosol	2	3	5	4	2	5	1	2	2	**V**

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsit
Varsity Lakes QLD
Australia
M: +61 438 763 51

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503
Perth WA 6000
Australia
T: +61 8 9422 590
F: +61 8 9422 590

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628