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ABN: 35 000 689 216

Tomingley Gold Project

Soils and Land Capability Assessment

September 2011

Prepared by

Sustainable Soils Management Pty Ltd

Specialist Consultant Studies Compendium

Volume 2, Part 8

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Tomingley Gold Project

Soils and Land Capability Assessment

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September, 2011

CONTENTS

Page

CONTENTS

Page

APPENDICES

Please note the Appendices are provided in full and in colour on the Project CD

FIGURES

Please note all Figures are provided in colour on the Project CD

TABLES

CONTENTS

Page

BOX

Please note all Boxes are provided in colour on the Project CD

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EXECUTIVE SUMMARY

Approximately 900ha of land in and around the site of the proposed Tomingley Gold Project ("the Project") proposed by Alkane Resources Ltd ("Alkane") was surveyed and assessed to determine the current land capability and assess the suitability of the soil for use in site rehabilitation.

The assessment was undertaken in four phases:

1. Examination of existing data.
2. An EM 38 and EM 31 survey combined with real time kinematic (RTK) GPS survey.
3. Examination of soil in 15 soil pits and 3 cores.
4. Laboratory based chemical analysis of samples from 7 soil pits, and physical testing on 6 samples from 3 major soil types

The EM survey indicated that the majority of the material within 4m of the surface had moderately low salinity. There was a patch of high salinity in the area that has developed a gilgaied landform. These findings were supported by field and laboratory measurements. The EM survey and test drilling also indicated that the springs that occur in the northwestern corner of the area assessed appear to be a result of shallow hydrogeology. There appears to be a shallow (<4m) layer of permeable material over much less permeable material.

The assessment found that the majority of the land that is planned to be subject to Project-related disturbance, i.e. mining, development of processing infrastructure, waste management and ancillary activities, was classified as Red Dermosol. This soil consisted of red silty loam and silty clay loam topsoil over red light clay to medium clay subsoil. The topsoil was slightly acidic, and the pH increased rapidly with depth. It appears that the topsoil of the Red Dermosol has formed from parna or windblown clay, while the subsoil has derived from Obley Granite.

The Red Dermosol was classified as capable of withstanding the challenges of continuous cropping, and also suitable to be stripped and used for site rehabilitation.

The survey indicated that approximately 50cm of the Red Dermosol could be used for site rehabilitation. It was estimated that 30cm of this material could be topsoil, and the remainder subsoil. A more accurate indication of the relative depths of these layers could be obtained after more detailed sampling. The topsoil used for rehabilitation should be treated with extreme care as its' loamy texture and low organic carbon content renders it a relatively weak material.

The Grey and Brown Dermosol soil types had similar profile form to the Red Dermosol, but appeared to be less well drained. It is likely that these soil types have derived to some extent from parna, but the drab colours indicate that the soil has been waterlogged more often than the Red Dermosol. The poorer drainage was associated with less stable subsoil, so the topsoil, but not the subsoil of this soil type was rated as suitable for topsoiling.

The Sodic Gilgaied Dermosol had higher topsoil clay content than the other soil types tested. However, field observations and laboratory chemical and physical testing indicated that this soil is dispersive, consequently is unsuitable for topsoiling, and disturbed soil should be treated with care.

The Sodic Dermosol is likely to have derived from local siltstone and mudstone, with loamy topsoil over sodic clayey subsoil. The topsoil of the Sodic Dermosol is stable, but the subsoil is dispersive and should be exposed as little as possible.

1 BACKGROUND

1.1 SCOPE

Alkane Resources Ltd ("Alkane") plans to develop the Tomingley Gold Project ("the Project"). The Project would result in dramatic soil disturbance within the impact footprint of the proposed mining operations which would take the forms of excavation of four open cuts, and underground mine (developed from the base of one of the open cuts), construction of three waste rock emplacements, a Residue Storage Facility, a processing plant and associated infrastructure and various roads and embankments.

Sustainable Soils Management was commissioned by R.W. Corkery & Co. Pty Limited on behalf of Alkane to conduct a soil survey and land capability assessment over the site of the proposed mining and associated activities ("the Mine Site") to enable recommendations as to appropriate soil management during soil stripping, storage and rehabilitation phases to be developed.

1.2 OBJECTIVES AND SCOPE

Soil properties vary continuously across the landscape. The aim of soil assessment is to quantify variation in relevant soil properties across the area being assessed. The assessment described in this report was conducted to assist Alkane in developing appropriate topsoil and land management practices. This primary objective has been achieved through the completion of survey of the soil resources and an assessment of the pre-mining land capability in order to:

- describe the soil and land capability within the areas of potential mining impact;
- assess the susceptibility to water erosion of the land within the mine footprint;
- assess the suitability of the identified soil units for use as topsoil during rehabilitation of areas impacted during mining operations; and
- develop recommendations about soil management strategies during soil stripping and stockpiling.

The assessment was conducted in four phases.

1. Examination of existing landscape information, principally geology, regolith and soil surveys.
2. Electromagnetic induction surveys using Geonics EM 38 and EM 31 instruments to map the pattern of subsoil salinity and permeability.
3. Soil profile descriptions to describe soil physical and morphological properties.
4. Analyses to assess soil chemical properties and their variation.

1.3 LOCAL SETTING

The Project is located approximately 51km to the southwest of Dubbo and approximately 1.5km south of the village of Tomingley (**Figure 1**). All areas of Project-related disturbance would be confined to the Project Site, which is bisected by the Newell highway (**Figure 2**).

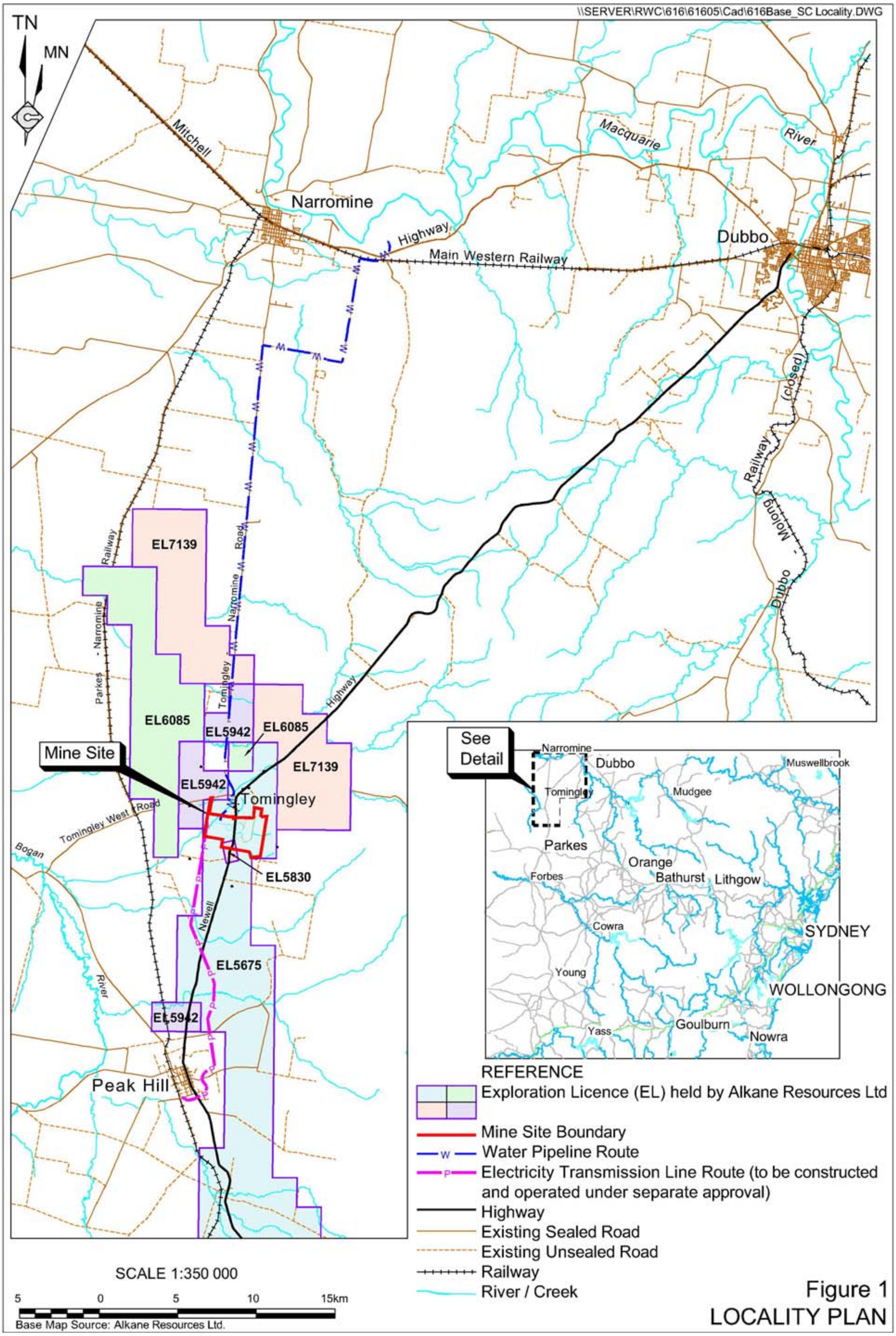

Figure 1
LOCALITY PLAN

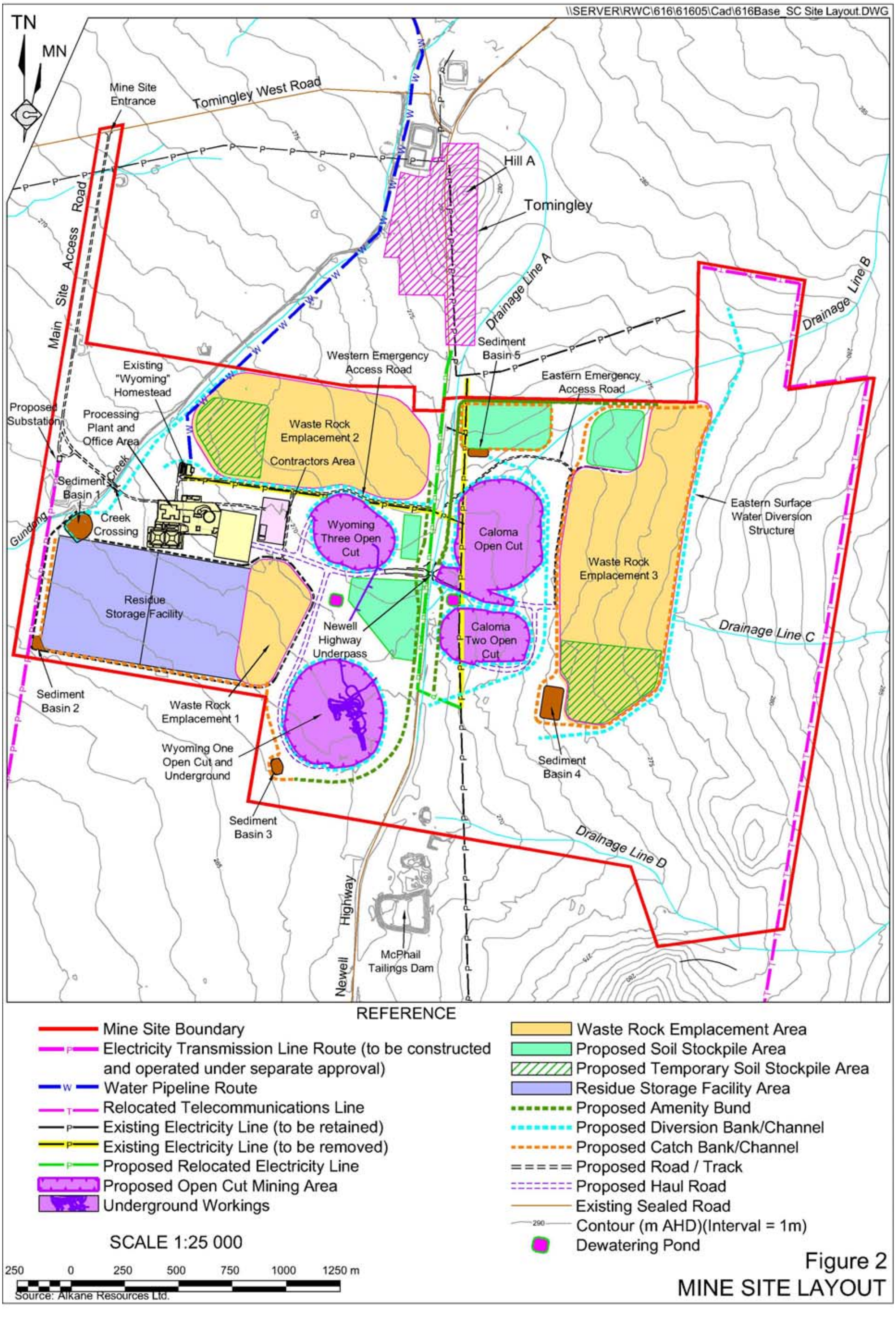

Figure 2
MINE SITE LAYOUT

The Soils Study Area comprises the majority of the Mine Site (excluding Lots 94 and 95, DP755110, onto which the Eastern Surface Water Diversion Structure would extend, and which were added to the Mine Site after the completion of the soil survey), as well as additional areas between the Main Site Access Road and village of Tomingley.

1.4 PROJECT OVERVIEW

The Project would include the following components (**Figure 2**).

- Establishment of infrastructure required for the Project, including a water supply pipeline, an underpass beneath the Newell Highway, and vegetated amenity bunds.
- Extraction of waste rock and ore material from four open cut areas, namely:
  - Caloma Open Cut (approximately 19ha);
  - Caloma Two Open Cut (indicative design approximately 9ha);
  - Wyoming Three Open Cut (approximately 10ha); and
  - Wyoming One Open Cut (approximately 19ha).
- Extraction of waste rock and ore material from the Wyoming One Underground.
- Construction of three waste rock emplacements covering a combined area of approximately 129ha.
- Construction and use of various haul roads, including an underpass under the Newell Highway, and a run-of-mine (ROM) pad.
- Construction and use of a processing plant and office area, incorporating a crushing and grinding circuit, a standard carbon-in-leach (CIL) processing plant, site offices, workshops, ablutions facilities, stores, car parking, and associated infrastructure.
- Construction and use of a residue storage facility (approximately 49ha).
- Construction and use of a transformer and electrical distribution network within the Mine Site (from the 20km of 66kV electricity transmission line from Peak Hill to the Mine Site to be constructed under separate approval).
- Construction and use of an approximately 46km water pipeline, from a licensed bore located approximately 7km to the east of Narromine, to the Mine Site.
- Relocation of existing items of infrastructure, including a 22kV power line which currently passes over the area of the Caloma and Caloma Two Open Cuts.
- Re-routing (node to node) of a 4.2km section of a Nextgen Network fibre optic cable (telecommunications line).
- Construction and use of ancillary infrastructure, including the Main Site Access Road and intersection with Tomingley West Road.
- Construction of soil stockpiles (for use in rehabilitation works).
- Construction of the Eastern Surface Water Diversion Structure to divert surface water flows to the east of mining and waste rock emplacement activities. Additional surface water management structures would be constructed within the Project Site to control surface water flows within the Mine Site.
- Construction and use of dewatering ponds to store water accumulating in and pumped from the open cuts.

Disturbance associated with the mining and associated activities would be progressively rehabilitated to create a geotechnically stable final landform, suitable for a final land use of nature conservation, agriculture, tourism and/or light industry.

It is noted that the design of the proposed Caloma Two Open Cut is an indicative design only, with additional drilling required to further define the mineralisation. As a result, the indicative design for the Caloma Two Open Cut presented (**Figure 2**) represents the maximum area that would be developed. The development of this maximum impact footprint has been taken into account in all other aspects of the Project, including the required capacity, layout and design of the waste rock emplacements and residue storage facility, and the life of the Project. Approval is sought for the proposed design, acknowledging that the final design of the open cut would be the same size or smaller than that displayed.

Full details of the Tomingley Gold Project are described in the Section 2 of the *Environmental Assessment*, prepared by R.W. Corkery & Co. Pty Limited.

1.5 REGIONAL SETTING

The landscape that includes the Project has been assessed against three existing mapping projects.

- Sherwin (1996) mapped the basement rocks and the surficial geology.
- Roach (2007) described the regolith, which includes the weathered rock and soil that sits on the basement rock.
- NSW Department of Water and Energy have prepared, but not published, a soil map at 1:250,000 scale.

The setting of the Mine Site against these three maps is presented in **Figure 3**.

The Soil Survey Area falls to the west and southwest from an outcrop of Mugincoble Chert approximately 1.5km to the east of the Soil Survey Area. The Sherwin (1996) geological map indicates that the majority of the Soil Survey Area is either older, slightly more consolidated red coloured alluvial sediment (Cz), or younger, greyer alluvial sediment with noticeable meanders (Cza). There is a small area of eluvium (in situ regolith) near the southeastern corner of the Soil Survey Area (Qr). The village of Tomingley sits on an outcrop of Mugincoble Chert.

The Roach (2007) Regolith Landforms map has split the landscape into numerous landforms, which are outlined in **Table 1**. The Soil Survey Area has been mapped as being alluvial sediments deposited either as a plain (A) or overbank flow (AO). This material has been mapped as having three parent material sources. The majority of the area has derived from Obley granite (suffix 6), while the southeastern corner of the Soil Survey Area is derived from Dulladerry Volcanics (5) and Mumbidgle Formation (mudstone and siltstone, 4). The majority of the resulting landform was mapped as depositional plain, either with drainage depressions (ap), or without them (pd), with small gilgaied areas (ag). The Soil Survey Area is dissected by a number of drainage depressions (ed).

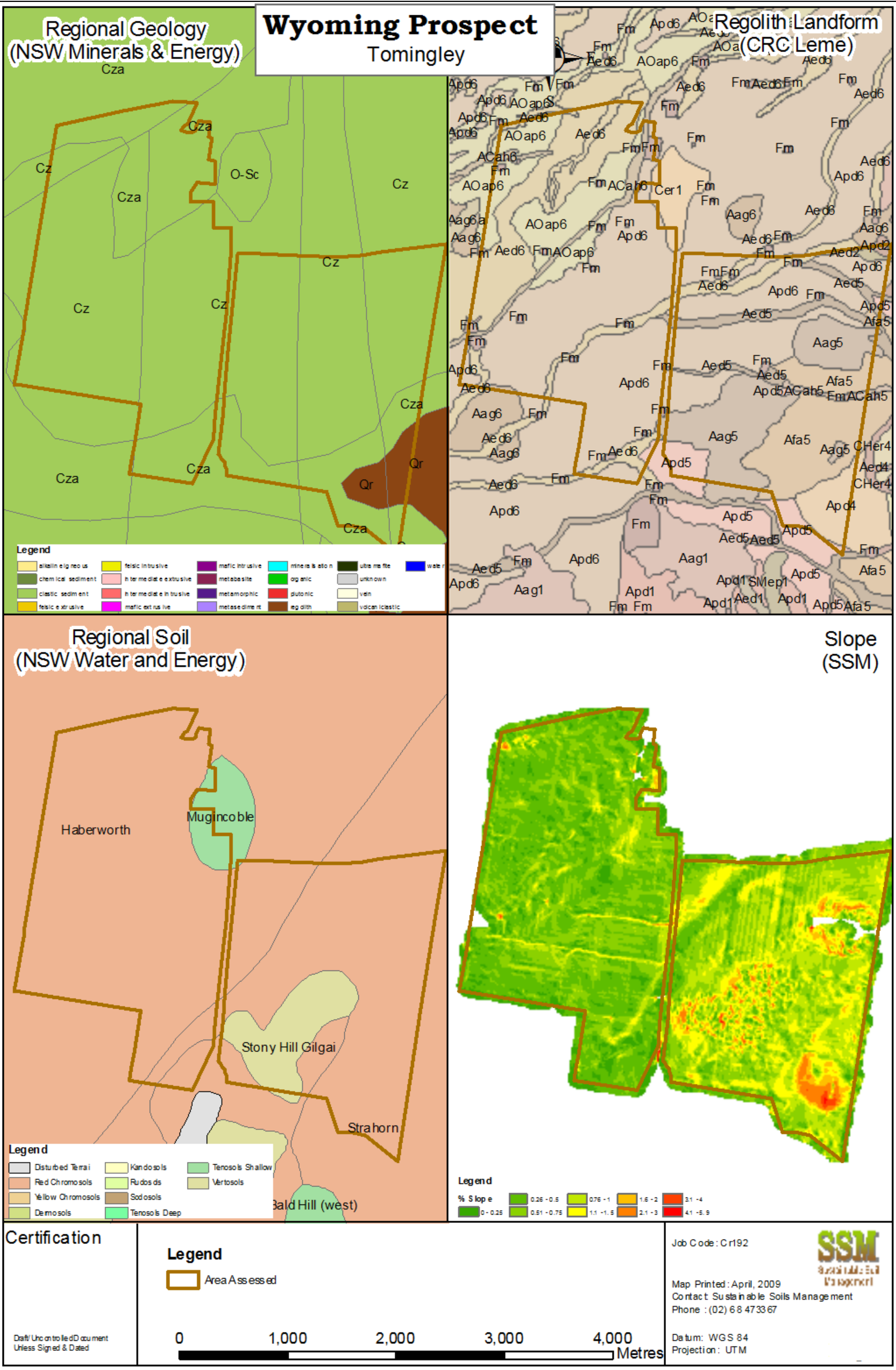

Figure 3
PREVIOUS SURVEY AND SLOPES

Table 1
Regolith Landform Unit (RLU) Codes (Roach, 2007)

RLU Codes for Regolith Materials	RLU Codes for Landforms	RLU Modifier Codes, Bedrock Lithologies or Regolith Material Sources
• A Alluvial sediments • AC Alluvial channel sediments • AO Alluvial overbank sediments • C Colluvial sediments • CH Colluvial sheetflow sediments • F Fill • SM Moderately weathered bedrock (saprolite) • SS Slightly weathered bedrock (saprock)	• ag alluvial plain with gilgai depressions • ah alluvial channel • ap alluvial plain (with numerous small drainage depressions) • aw alluvial swamp • ed erosional drainage depression • ep erosional plain (0-9m relief) • er erosional rise (9-30m relief) • el erosional low hill (30-90m relief) • fa alluvial fan • m man-made • pd depositional plain (with no significant drainage depressions)	1. Cotton Formation (O-Sc) Sandstones and Siltstones 2. Mugincoble Chert (Om) 3. Goonumbla Volcanics (Obv) 4. Mumbidgle Formation (Sfm, Sfv) 5. Dulladerry Volcanics (Dds, Ddr, Ddc) 6. Obley Granite (Dog) 7. Hervey Group (Dh)

Observation of surface features across the Soil Survey Area generally supports the Regolith Landform Units of Roach (2007), with the exception of a drainage line mapped by Roach (2007) in the northern section of the Soil Survey Area to the east of Newell Highway. On the ground, this drainage line appears to cross the Newell Highway further south, close to the northwestern boundary of an area shown as “Aag 5”.

The regional soil is mapped on a much broader scale (1:250,000) than the Tomingley Regolith Land map (1:25,000) and consequently divides the Soil Survey Area into only 4 units. There are two alluvial units; Haberworth, which has derived from Obley Granite, and Strahorn, which has derived from the Mumbidgle Formation. There are smaller areas of Stony Hill Gilgai, and an area of shallow soil beneath Tomingley that are mapped to extend into the area assessed.

Slope, which was derived from an elevation survey described later in this report, indicates that the area west of the Newell Highway is much flatter than the area east of the Newell highway (see **Figure 3**). The relief on the eastern side of the Newell highway takes three major forms. The drainage line that runs through the northwestern corner of the area east of the Newell Highway and the southeastern corner of the area west of the Newell Highway is bordered by two banks with a slope of 1% to 1.5%. The gilgaied land east of the Newell Highway is marked by large variation in slope. A small hill near the southeastern corner of the area assessed has a slope greater than 1.5%.

The four layers of background information described above indicate that the land west of the Newell Highway is a relatively uniform alluvial plain, with the exception of two drainage lines, namely Gundong Creek (which runs diagonally through the northwestern section of the Soil Survey Area) (Regolith Landform, **Figure 3**), and a poorly defined drainage line (through the southeastern corner of the Soil Survey Area) (Slope, **Figure 3**). The area east of the Newell Highway has a more complex landform, consisting of a plain, cut by a major drainage line in the northeast, some gilgaied land in the centre, and a small hill near the southeastern corner.

2 SOIL ASSESSMENT METHODOLOGY

2.1 EM 38 AND EM 31 SURVEYS

2.1.1 Introduction

Electromagnetic induction was used to overview variability of the soil within the Soil Survey Area. The results from this survey were then used to help choose locations of interest in the field for closer investigation.

The EM instruments are frequency domain electromagnetic devices with a transmitter and receiver that are separated by a distance that is fixed for each instrument. The transmitter coils transmit a continuous magnetic field with a sinusoidal wave form. This magnetic field induces an electric current in conductive material, which in turn induces a secondary magnetic field. The strength of the secondary magnetic field is influenced predominantly by the conductivity of the soil that is sensed. The receiver coils pick up changes in the primary magnetic fields from the transmitter coils and as well as the secondary magnetic fields induced from currents in the soil. The reported apparent electrical conductivity (ECa) is a measurement of the strength of the secondary magnetic field.

The depth sensed by the EM instruments varies with the separation of the coils and the orientation of the coils. Vertical coil orientation was used in this survey because the measured conductivity in the horizontal orientation is influenced strongly by near-surface properties, whereas the measured conductivity in the vertical orientation is most strongly influenced by properties near the centre of the depth range sensed. The EM 38 in the vertical orientation responds to properties of the surface 1.5m of soil. The EM 31 in the vertical orientation responds to properties of the surface 6m of soil.

The ECa measured in the EM survey is influenced most strongly by the electrical conductivity of the liquid phase, which is a measure of soil salinity. However, ECa is also influenced by soil moisture content, the surface charge of clay particles and bulk density. The magnitude of ECa is also influenced by soil temperature.

Variation in ECa across the surveyed area is used to identify soil types within a field, usually on the basis of drainage. The belief is that salts have been added to the landscape at a relatively uniform rate, but the current soil salt content can vary by more than one order of magnitude. The salt remaining in the soil is inversely proportional to the rate at which water has drained from the soil. The resulting ECa surface can also be used to map variation in other properties such as texture, which are correlated with soil conductivity.

2.1.2 EM Survey Methods

The Electromagnetic (EM) survey was conducted by Terrabyte Services using a Geonics EM 31 and EM 38. Readings were taken at approximately 5m spacings along 50 m transects giving approximately 40 readings per hectare.

Sampling locations were recorded using a Trimble Pro XL 12 channel Global Positioning System (GPS) receiver. The position was differentially corrected using a Fugro Omnistar system to give a position accuracy of 80cm to 120cm. The location of each reading is shown in **Figures 6** and **7** (pp. 8-23 and 8-25). Elevation was recorded at the same time as the EM survey with a real time kinematic (RTK) GPS receiver.

Contours of the readings of apparent conductivity were fitted using ArcGIS Spatial Analyst. The surfaces were presented with each 10mS/m interval allocated a different colour. To help identify the range of soil classes present in the study area, the apparent electrical conductivity (ECa) values were plotted onto frequency histogram charts that are presented with the EM surfaces.

2.2 SOIL PROFILE DESCRIPTIONS

Soil properties were assessed by examining soil profiles in sites identified from the EM Survey. The soil profiles were in backhoe pits excavated to a maximum of approximately 1.5 m deep. Locations of the pits were recorded using a handheld Garmin GPS, giving position accuracy of 5m radius.

Selected soil properties in each pit were described according to the '*Australian Soil and Land Field Survey Handbook'* (McDonald *et. al*. 1990). The soil properties described were:

- Depth of each horizon.
- Texture.
- Field pH using a kit based on the specifications of Raupach and Tucker.
- Field dispersion after 20 minutes in distilled water.
- Root density.
- Proportion of soil occupied by gravel.
- Main colour and degree of mottling.
- Grade and type of structure and primary ped size.
- Size and type of concretions.
- Effervescence as an indication of the proportion of soft carbonates.
- Permeability and drainage were assessed for the profile as a whole.
- Nature of surface 2cm of soil, i.e. whether or not soil was hard setting.

Additional measurements taken were as follows.

- Potential rooting depth for annual field crops was estimated from structure, texture and pH.
- Volume of Readily Available Water (RAW) was calculated from rooting depth and standard estimates of available water for each texture class.
- Salinity was estimated by measuring the electrical conductivity of a suspension of 1 volume of soil in 5 volumes of water.
- SOILpak score according to McKenzie (1998).

Each profile was classified according to the Australian Soil Classification of Isbell (1996).

Soil chemical analysis of selected properties from 0 to 20, 20 to 50, 50 to 100 and 100 to 150cm depths in selected pits was undertaken by Incitec/Pivot Laboratories. Properties measured for all depths were: pH, salinity, exchangeable cations, and Dispersion Index (a subset of the Emerson Class). Additional properties measured for the 0 to 20cm layer were: organic carbon, chloride and available concentrations of the nutrients of nitrogen, phosphorus, sulphur, manganese, iron and boron.

Soil physical properties of non-dispersed particle size analysis and dispersion percentage were tested at the Soil Conservation Service's Scone Laboratory.

2.3 SOIL BOUNDARIES

The soil units were determined from the background information described in Section 1.3, the EM survey, landform, and soil pit descriptions, supported by laboratory analysis. The position of unit boundaries was mapped in the field using observation of surface properties to determine the boundary location, and a hand held GPS to mark the location. Polygons were then generated from these GPS points.

2.4 LAND CAPABILITY ASSESSMENT

The land and soil capability was determined according to the Central West Catchment Management Authority's 2008 *Land and Soil Capability Guidelines*. Capability assessment is based on slope, wind hazard, soil pH, surface structural stability, salinity, rock outcrop, waterlogging potential, and existing erosion (Central West CMA, 2008). The appropriate land use for each Capability class is summarised in **Table 2**.

Table 2
Rural Land Capability Classification System

Land Class	Land Suitability	Land Definition
Class 1	Regular Cultivation	No erosion control requirements
Class 2	Regular Cultivation	Simple requirements such as crop rotation and minor strategic works
Class 3	Regular Cultivation	Intensive soil conservation measures required such contour banks and waterways
Class 4	Grazing, occasional cultivation	Simple practices such as stock control and fertiliser application
Class 5	Grazing, occasional cultivation	Intensive soil conservation measures required such contour ripping and banks
Class 6	Grazing only	Managed to ensure ground cover is maintained
Class 7	Unsuitable for rural production	Green timber maintained to control erosion
Class 8	Unsuitable for rural production	Should not be cleared, logged or grazed
Source: Cunningham *et al*., 1986		

2.5 SOIL STRIPPING SUITABILITY

The suitability of soil for use during rehabilitation was determined while assessing soil pits using the physical assessment method of Elliott and Veness (1981) as presented in NSW Minerals Council (2007) and shown in **Figure 4**.

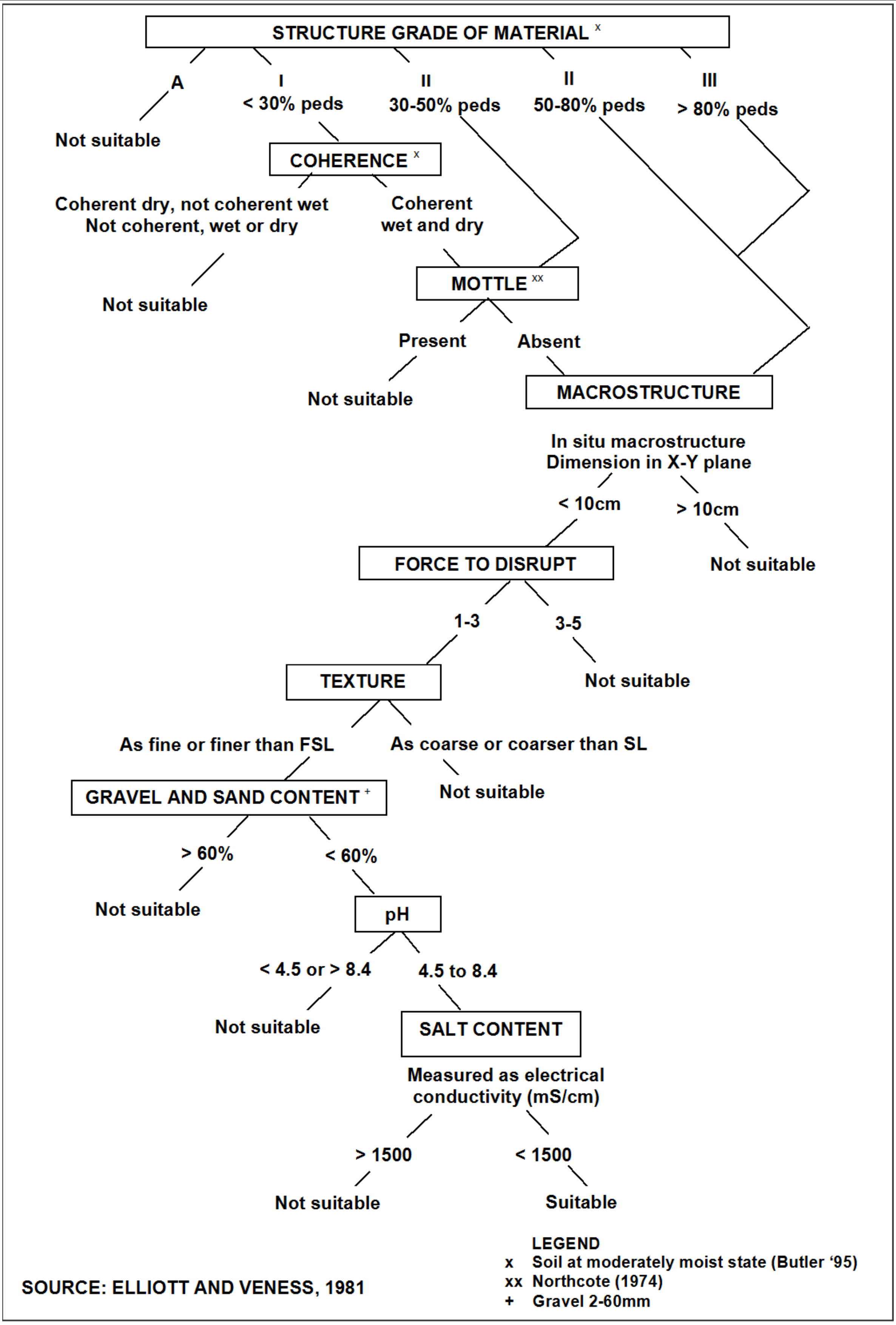

Figure 4
FLOWCHART FOR SELECTION OF TOPDRESSING MATERIAL

2.6 SUBSOIL SETTLING CLASS

The non-dispersed Particle Size Analysis and Dispersion Percentage were used to classify the tested soil into 3 Types according to Landcom (2004):

- “Type D” soil that is rated as dispersive because laboratory testing indicates that more than 10% of the material finer than 2 mm will disperse. The proportion of the soil that disperses is calculated by multiplying the Dispersion Percentage by the proportion of soil finer than 0.005 mm (clay content plus half silt content).
- “Type C” soil which has low dispersion and described as coarse because more than 67% of the material finer than 2 mm is sand (coarser than 0.02 mm).
- “Type F” soil which has low dispersion and is described as fine because more than 33% of the material finer than 2 mm is silt and clay (finer than 0.02 mm).

3 RESULTS AND DISCUSSION

3.1 EM SURVEY RESULTS

3.1.1 Site Conditions

Vegetation influences the EM survey by changing the soil moisture status, particularly beyond the 70 to 100cm depth that annual crops extract moisture. This is important to the EM survey, as soil moisture is one of the factors that influences apparent electrical conductivity (ECa) measured in the EM survey (**Appendix I**). The surveyed land assessed had four vegetation histories;

- rainfed annual cereal crops,
- a rotation of lucerne and annual cereal crops,
- naturalised pasture, and
- woodland (**Figure 5**).

The seasons prior to the survey had been drier than average, which would tend to exacerbate differences in soil moisture caused by plant water extraction.

It would be expected that the land with the driest soil would be beneath trees. Areas which have had continuous pasture or where lucerne has been grown in non-saline areas since prolonged wet periods would also be expected to have dry subsoil. The wettest subsoil would be expected beneath annual crops, as large rainfall events when there is no crop would be expected to cause some water to seep past the annual crop rootzone.

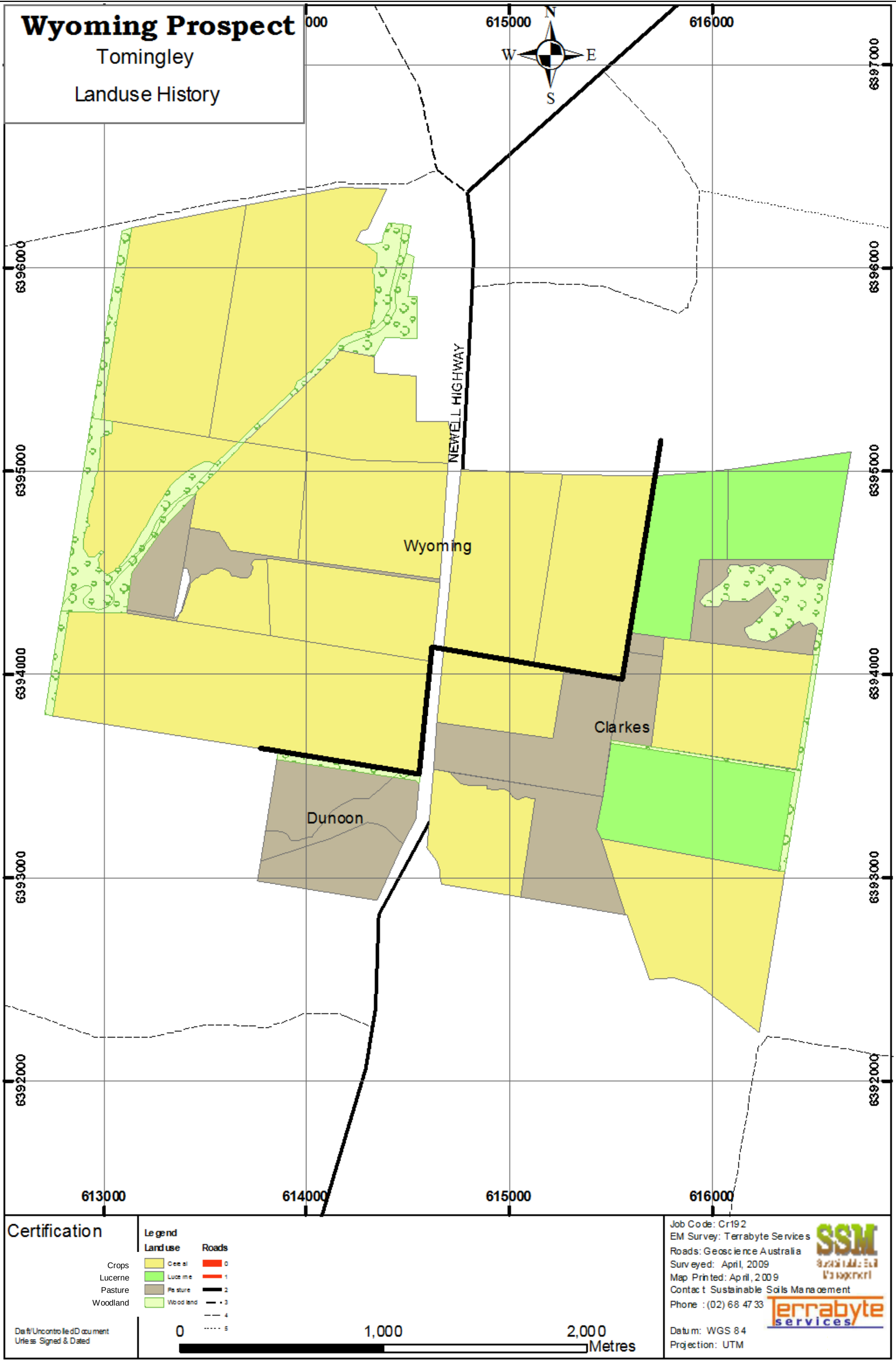

Figure 5
LAND USE HISTORY

3.1.2 EM38 Survey Results

Values of ECa from the EM38 ranged from very low (50% of readings <40mS/m), which is consistent with coarse textured, dry, non-saline material in the surface 1 m, through moderate values (47.5% of readings 40 to 90mS/m), which is correlated with soil that is a combination of finer textured, wetter and more saline, with a small number of slightly elevated values (2.5% of readings >90mS/m), which is associated with soil that is progressively finer textured, wetter and more saline (**Figure 6**).

The low EM38 ECa (<40mS/m) occurred in five main areas as follows.

- An area of woodland along the western boundary of the Soil Survey Area.
- Approximately 50ha in the northern section of the Soil Survey Area that is a mixture of cropped land and woodland.
- Approximately 50ha centred on the Wyoming homestead that has low ECa over 3 land use classes.
- The drainage line to the east of the Newell Highway in the vicinity of the proposed Caloma Open Cut.
- An arc around the eastern and southeastern boundary of the Soil Survey Area. There is a sharp boundary between moderate ECa in the easternmost paddock surveyed on Wyoming and low ECa in the adjoining paddock to the east indicating that it is likely that drying of the subsoil by lucerne has had a large impact on ECa in the northeastern section of the Project Site.

EM38 ECa was elevated when compared to surrounding land in 3 areas as follows.

- Approximately 25ha in the northwestern corner of the Soil Survey Area, which coincides with the area mapped by Roach (2007) as AOap6 (alluvial plain with numerous drainage lines deposited by overbank flow).
- An area in the southern central section of the Soil Survey Area.
- Approximately 70ha to the south of the proposed Caloma Open Cut has been mapped in the soil survey and regolith landform surveys as gilgai.

The remainder of the area assessed had moderate, relatively uniform EM 38 ECa.

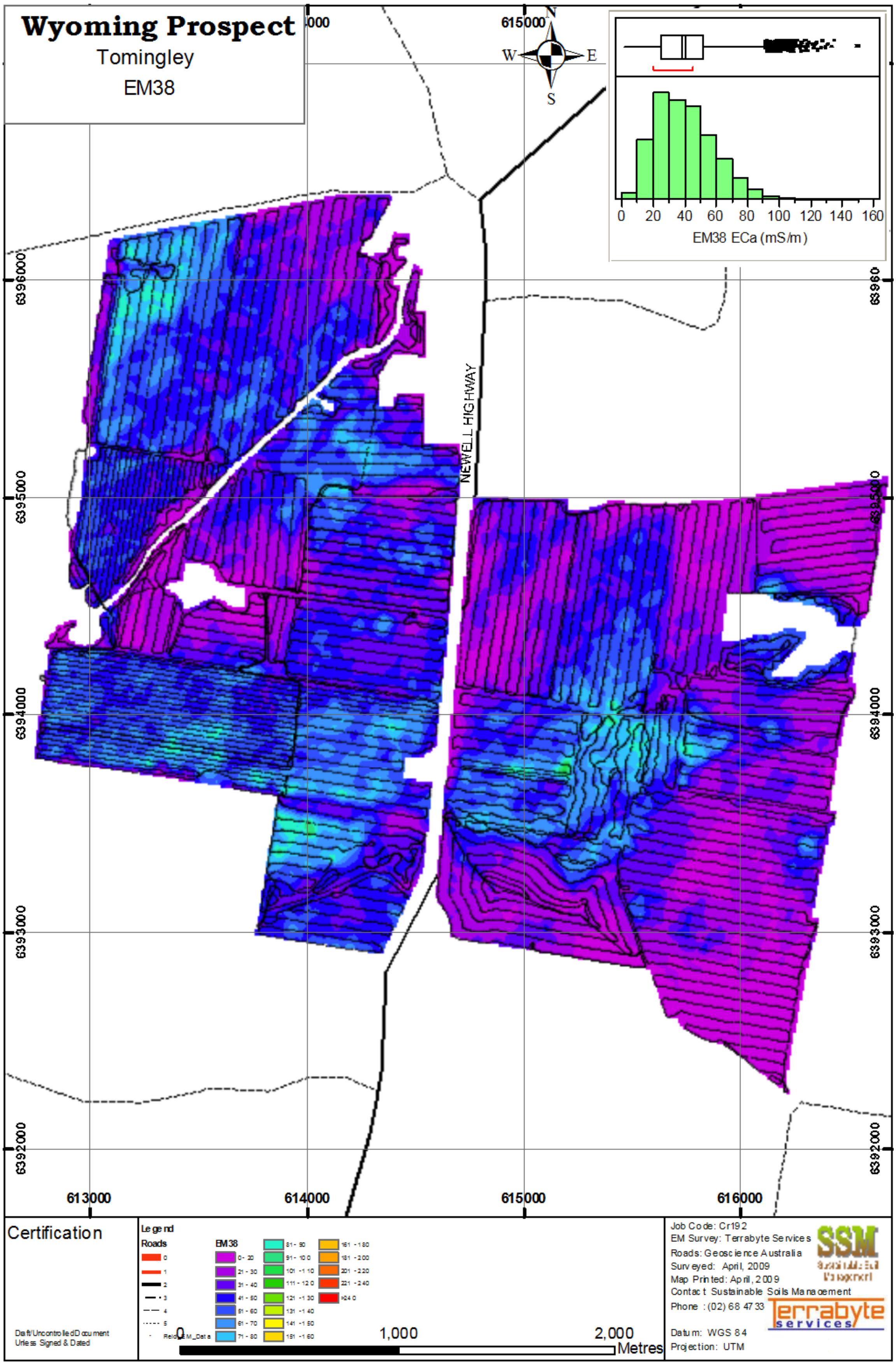

Figure 6
EM 38 RESULTS

3.1.3 EM31 Survey Results

There was a large increase of 47mS/m between the average EM38 ECa of 38mS/m and the average EM 31 ECa of 85mS/m. This reflects an increase in a combination of clay content, soil moisture and salinity between the 0 to 1 m depth range sensed by the EM 38 and the 0 to 6 m depth range sensed by the EM 31.

The EM 31 values followed a more statistically normal distribution than the EM 38 values (**Figures 6** and **7**). However, the EM31 ECa values also had a relatively large range that is associated with a range of subsoil types. The 10% of EM31 ECa values less than 60mS/m are generally associated with non-saline, relatively coarse textured soil, while the 10% of values greater than 120mS/m would be expected to be associated with moderately saline subsoil (DNR, 1997). The moderate EM31 ECa values of 80 to 120mS/m are generally associated with clayey subsoils (DNR, 1997).

There were 6 areas of low EM 31 ECa. Some of them were artefacts of land use despite the smaller effect of land use on EM 31 than EM 38 ECa, while others were caused by differences in soil properties. The patches of low ECa were:

- A strip of woodland along the western edge of the Soil Survey Area.
- Approximately 50ha in the northern section of the Soil Survey Area. The woodland area of this zone had lower EM31 ECa than the cropped area.
- Approximately 50ha centred on the Wyoming homestead that has low ECa over three land use classes.
- The drainage line that runs to the east of the Newell Highway in the vicinity of the proposed Caloma Open Cut.
- Approximately 40ha near the northeastern boundary of the Soil Survey Area.
- Approximately 70ha that covers three land use classes in the southeastern section of the Soil Survey Area.

The largest areas of high EM31 ECa (>120mS/m) were in the area east of the Newell Highway mapped as gilgaied land and some small patches on “Wyoming”, predominantly between the Newell Highway and Gundong Creek, and in the southern central section of the Soil Survey Area.

The elevated ECa that was evident in the EM38 ECa in the Northwestern corner of Wyoming did not occur in the EM31 ECa.

The predominant patterns of variation in both the EM31 and EM38 appeared to generally be close to parallel to Gundong Creek.

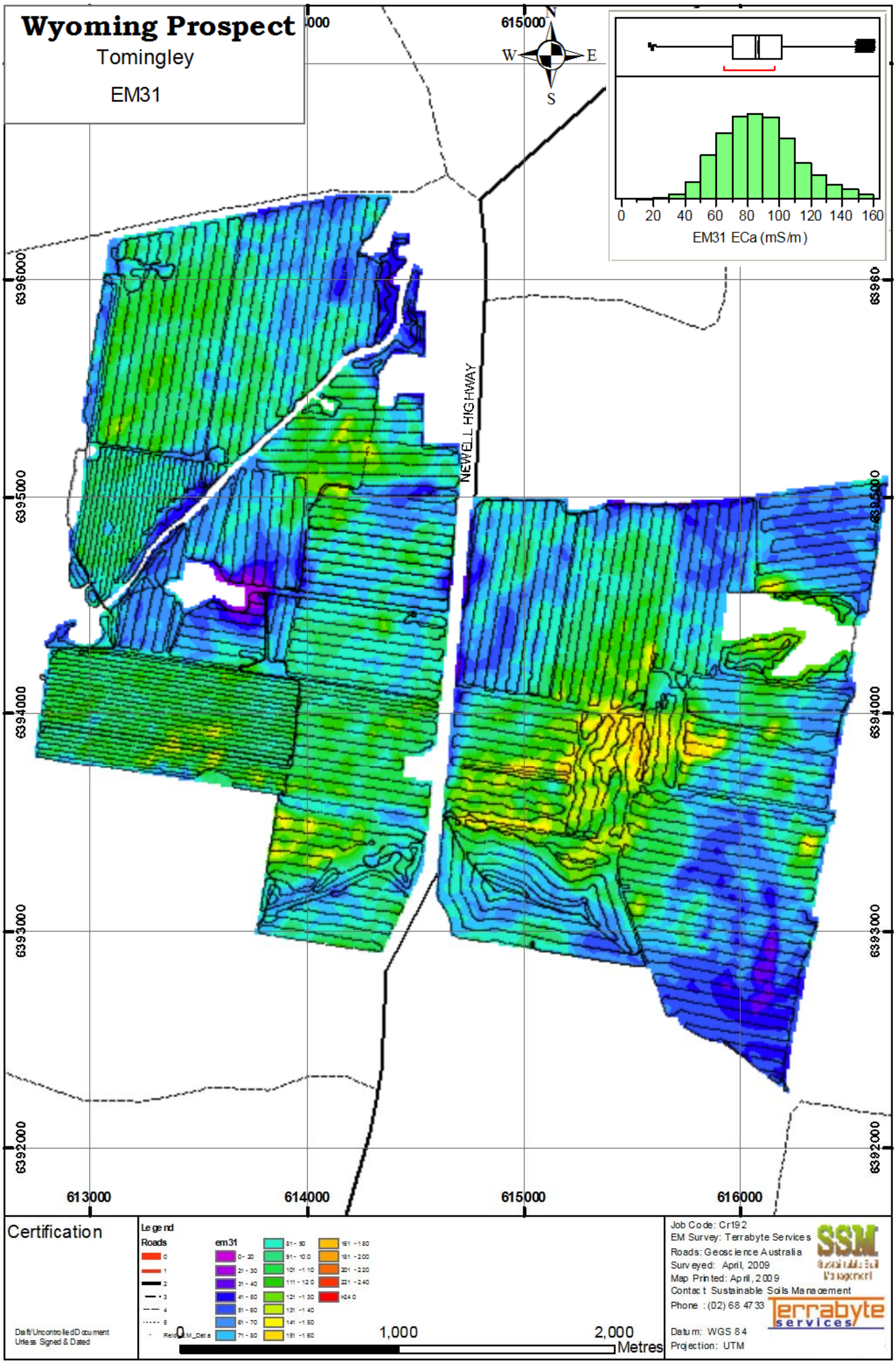

Figure 7
EM 31 RESULTS

3.1.4 EM38 Divided by EM31

The use of EM38 divided by EM31 gives an indication of the proportional increase in ECa between the two depths sensed. The difference between ECa from the EM 38, which senses properties in the surface 1.5m of soil and the EM 31, which sense the surface 6m, is an indication of the change in conductivity with increasing depth. A large increase in ECa gives a small value of EM38 divided by EM31, and occurred in the following areas (**Figure 8**).

- A large proportion of the eastern section of the Soil Survey Area, particularly where lucerne based pasture had effectively dried the soil in the crop rootzone.
- In the drainage line that passes through the Soil Survey Area in the vicinity of the Caloma Open Cut.
- The area of native pasture to the west of the Wyoming homestead.

There was a trend of smaller change between the EM 38 ECa and the EM31 ECa from east to west, with the smallest change in ECa (values close to 1) occurring in the northwest corner of "Wyoming" and cropped areas along Gundong Creek.

There was also relatively little change between EM38 ECa and EM31 ECa in the area mapped as gilgaied land.

3.1.5 Elevation Surface

The Soil Survey Area falls over 17m from the eastern boundary to the southwestern boundary of the Soil Survey Area (**Figure 9**). The flow path length from the highest to lowest points is about 3km, which gives an average slope of approximately 0.6%. This slope is flat enough to allow land to belong to Capability Class 1. The pattern of contours indicate that the majority of the land east of the Newell Highway falls from east to west, while the area west of the Newell Highway has a fall that is perpendicular to Gundong Creek.

The shape of the land surface can provide useful information about soil forming processes, consequently the distribution of soil. Generally, contour lines bend upslope in eroded areas, and bend downslope in areas where deposition has occurred. This pattern is illustrated clearly for the drainage to the east of the Newell Highway, where the drainage line is as much as 2 m deep. A similar pattern occurs along Gundong Creek, where the contours either side of the Creek bend upstream rather than downstream. This indicates that the area of Gundong Creek that flows through "Wyoming" appears to be erosional rather than depositional.

The elevation surface also identifies the extent of two other features. The gilgaied land to the east of the Newell highway is shown by irregular contours in **Figure 9**. A small hill near the southeastern corner of the Soil Survey Area is shown by closed contours with a maximum elevation of 278 m.

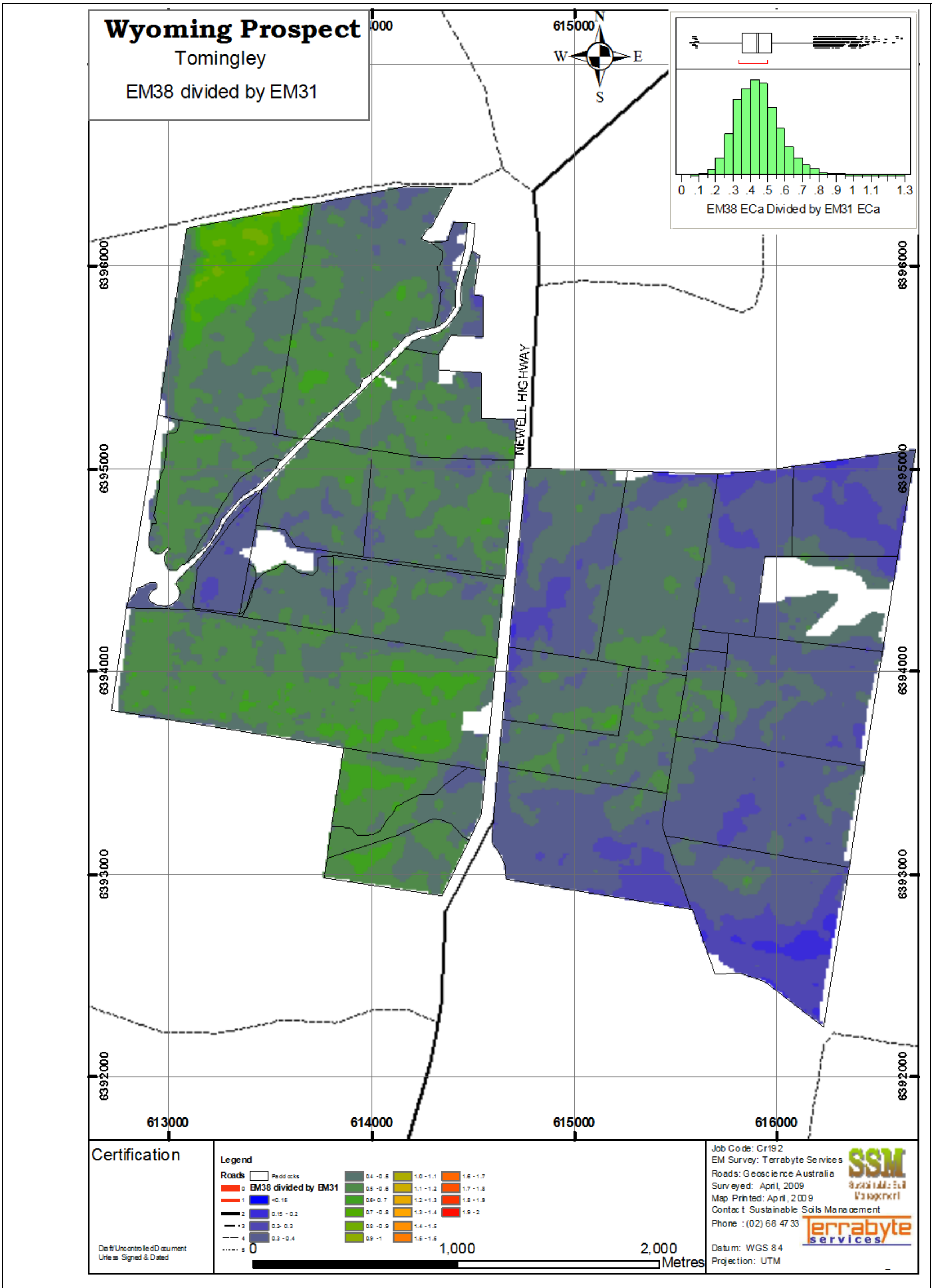

Figure 8
EM 38 DIVIDED BY EM 31

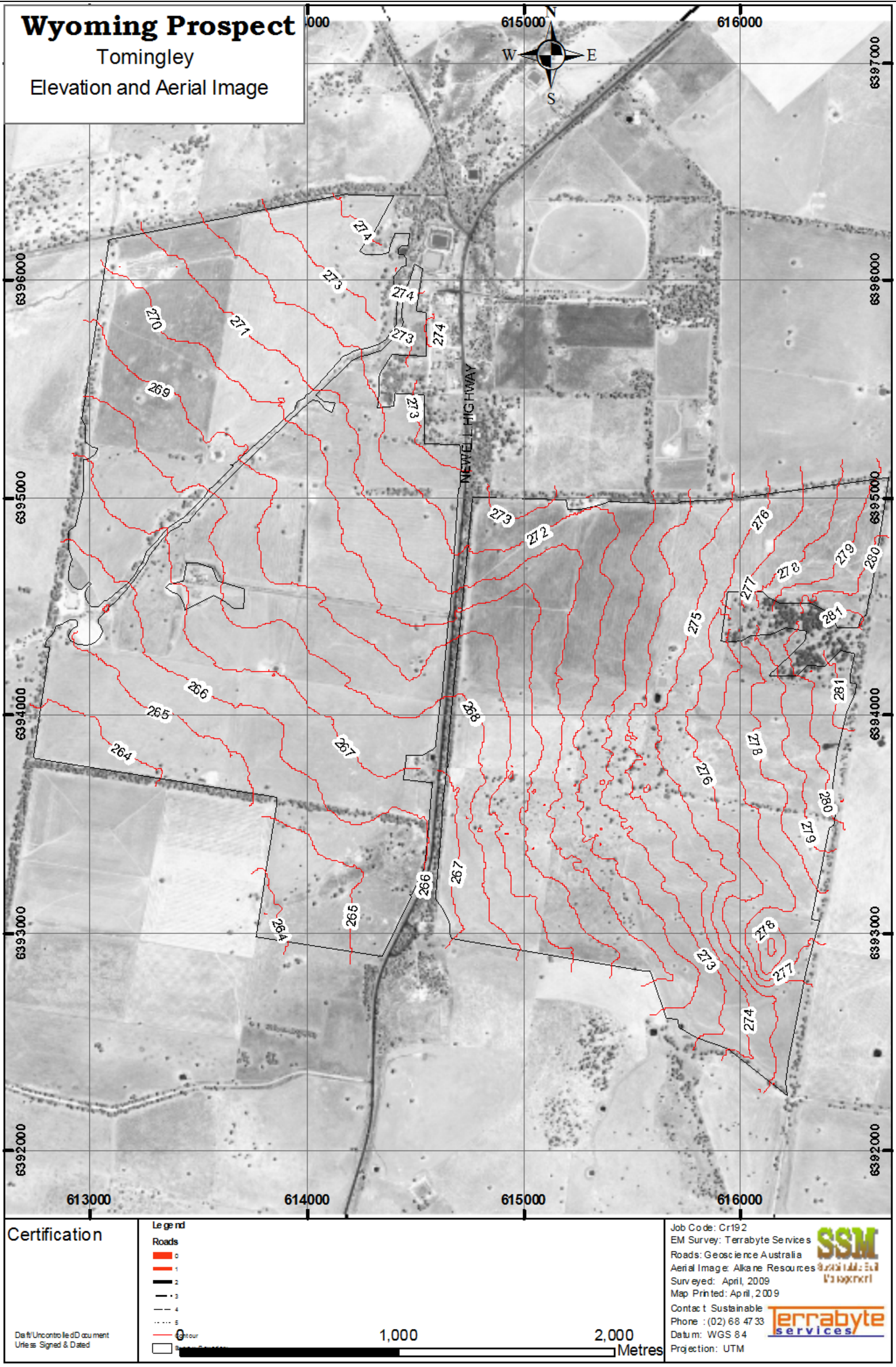

Figure 9
ELEVATION AND AERIAL PHOTOGRAPH

3.2 SOIL DESCRIPTION

3.2.1 Introduction

Fifteen soil test pits were excavated and three cores were pulled at locations indicated on **Figure 10**. These locations were selected to be representative of the soil types identified during the preliminary surveys described above. The fifteen soil profiles described were unusual in that there was generally more variation in subsoil properties than topsoil properties apart from Pits MW914 and MW915, which were in the gilgaied area. The general profile form was a red or brown medium textured topsoil of the loam or clay loam group that was generally 20 to 50cm thick, over a light clay to medium clay textured subsoil to approximately 1m depth (**Figure 11**). There was large variation in the texture deeper than 1m. In the majority of pits in the western two thirds of the Soil Survey Area, the soil became coarser with depth, whereas the soil tended to become more clayey in pits MW904, MW905, and MW907. This pattern supports the theory of Roach (2007) that the Tomingley landscape is covered by a veneer of red windblown (or aeolian) clay that is described by Australian soil scientists as parna.

The soil that develops from this material is influenced by the extent of mixing of the alluvial and windblown sediment, and the drainage after the material has been deposited. Parna deposits are typically pigmented red because of high hæmatite (Fe_2O_3) contents inherited from hot, dry, oxidised inland provenance areas (English *et al.*, 2002). Where parna is deposited in poorly drained areas, the soil tends to become yellow due to hydration and reduction of hæmatite to goethite (FeO.OH). The A-horizons in parna profiles may be further leached of soluble components to form an end-product of poorly-structured grey sodic soil (N. McKenzie, CSIRO, pers. comm., 2002, quoted by English *et al.*, 2002).

The majority of the Soil Survey Area was classified as Red Dermosol (Structured Soils, **Figure 9**), with an area of Grey Dermosol near the northwestern corner of the Soil Survey Area Sodic Brown Dermosol near the southeastern corner, some patches of Sodic Gilgaied Dermosol east of the Newell Highway, an area of Rudosol (Soil with Minimal Development) on the small hill east of the Newell Highway, and some Brown Dermosol around the Wyoming homestead.

3.2.2 Red Dermosol

Approximately 500ha of the Soil Survey Area may be classified as Red Dermosol (**Figure 11**). Dermosols have a structured B Horizon (horizon of illuvial concentration of silicate clay, iron, aluminium, humus, carbonates, gypsum, or silica, alone or in combination), but lacking strong texture contrast between A and B Horizons. The Red Dermosol occupied the central part of the Soil Survey Area and the majority of the locations that would undergo significant disturbance. The profile form was generally a silty clay loam topsoil over a light clay subsoil. This difference in clay content is not sufficient for the soil to be classified as a Chromosol. Chromosols have an abrupt textural change between the A and B Horizons.

The profiles examined had 50 to 100cm of material that was suitable for use as topsoil for rehabilitation. The depth suitable for rehabilitation is constrained by mottling and mangans (manganese ped coatings) that indicate that the soil has experienced long term waterlogging.

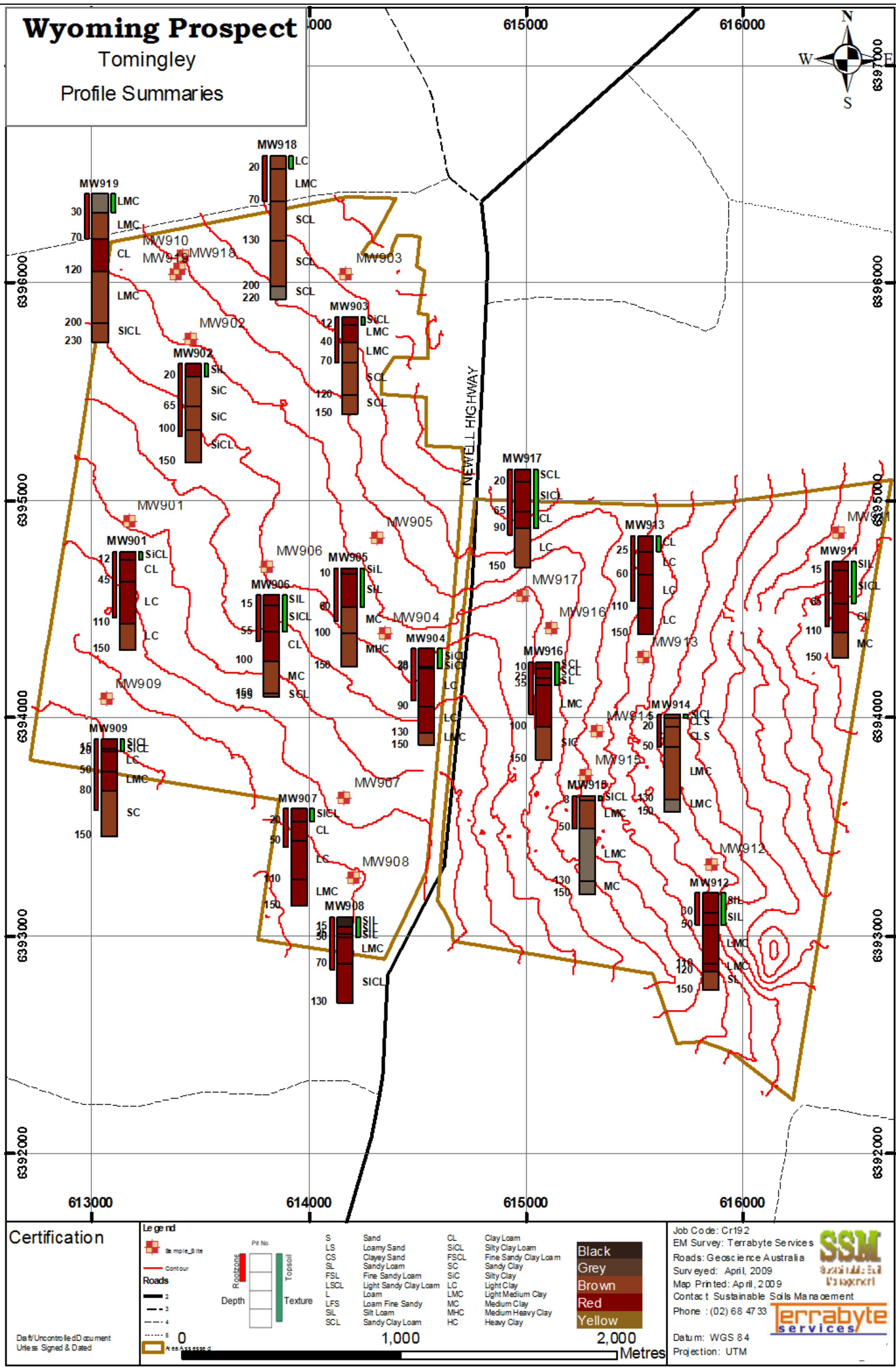

Figure 10
SOIL TEST PITS AND PROFILE SUMMARIES

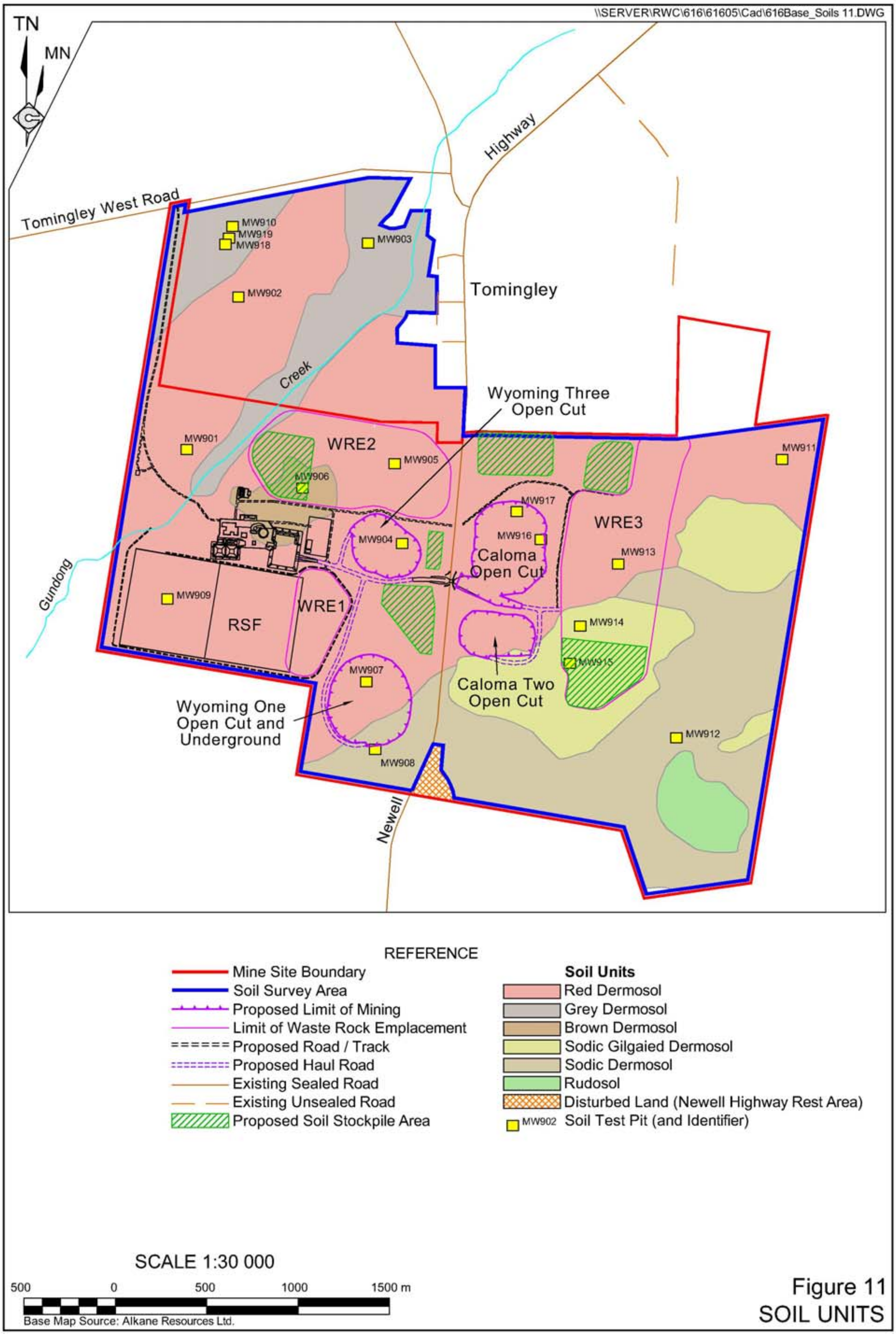

Figure 11
SOIL UNITS

Pit MW904, typical of the Red Dermosol, is described in Box 1.

0 to 28 cm

Red silty clay loam with weak grade of subangular blocky structure and ped size of 3cm breaking to 1 cm. Soil did not disperse in field, completely slakes, has a moderate to good SOILpak score and has an average number of roots present.

28 to 30 cm

Red silty clay loam with weak grade of subangular blocky structure and ped size of 2cm breaking to 1 cm. Soil did not disperse in field, completely slakes, has a moderate SOILpak score and has few roots present.

30 to 90 cm

Red light clay with strong grade of polyhedral structure and ped size of 5cm breaking to 1 cm. Soil did not disperse in field, completely slakes, has a moderate SOILpak score and has an average number of roots present.

90 to 130cm

Red light clay with strong grade of polyhedral structure and ped size of 5cm breaking to 0.5 cm. Soil is slightly dispersive, completely slakes, has a moderate SOILpak score and has no roots present.

130 to 150 cm

Brown light medium clay with strong grade of angular blocky structure and ped size of 3cm breaking to 0.5 cm. Soil is slightly dispersive, completely slakes, has a moderate to good SOILpak score and has no roots present.

Box 1 Red Dermosol – Test Pit MW904

Note: A colour version of this box can be viewed on the Project CD

The soil tested showed a trend of moderately acidic topsoil over alkaline subsoil. It was moderately fertile, with very low to moderate nitrogen and phosphorus levels, low sulphate sulphur, and moderate levels of the tested micronutrients of manganese, iron and boron (**Table 3**).

The capacity of the soil to store nutrients as measured by the cation exchange capacity increased from very low in the surface 50cm, and increased to adequate levels in the 50 to 100cm layer. There was large variation in the cation exchange capacity of the 100 to 150cm layer, which is consistent with the variation in subsoil texture that was observed. The cation ratios showed a consistent trend that the Exchangeable Sodium Percentage (ESP) increased from acceptable levels in the 0 to 20cm layer, through variable ESP in the 20 to 100cm layer to undesirably high in the 100 to 150cm layer. Salinity was desirably low for all samples except the 100 to 150cm layer in MW904. The dispersion index was higher than desirable for all samples tested. This indicates that the tested soil is susceptible to breakdown of structure, and that it is likely that structural stability of the material that is to be used for rehabilitation would be improved by application of lime or gypsum.

Table 3
Red Dermosol Laboratory Results

RATING	Very Low	Low	Moderately low	OK	Moderately high	High

Pit	MW901	MW901	MW901	MW901	MW904	MW904	MW904	MW904	MW909	MW909	MW909	MW909	MW916	MW916	MW916
Depth (cm)	0 to 20	20 to 50	50 to 100	100 to 150	0 to 20	20 to 50	50 to 100	100 to 150	0 to 20	20 to 50	50 to 100	100 to 150	0 to 20	20 to 50	50 to 100
Colour	Red	Red	Red	Orange /Yellow	Red	Red	Orange /Yellow	Orange /Yellow	Red	Orange /Yellow	Orange /Yellow	Orange /Yellow	Red	Orange /Yellow	Orange /Yellow
Texture	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam
CEC (meq/100g)	4.9	6.9	13.7	20.7	5.3	14.0	22.3	34.6	6.7	28.7	24.4	14.6	7.1	14.2	24.9
pH water	5.5	6.1	7.3	8.7	5.3	8.4	9.1	9.5	5.7	8.5	8.7	8.9	5.9	8.2	9.1
pH $CaCl_2$	4.4	4.7	5.9	7.4	4.4	7	8	8.9	4.7	7.9	8.1	8.2	5	7	8.2
Organic C (%)	0.54				0.6				0.52				0.99		
Nitrate N (mg/kg)	4.3				21				5.8				26		
Phosphorus Colwell (mg/kg)	12				48				12				17		
Sulphate S-KCl (mg/kg)	4.7				6.1				3.6				6.5		
Sulphate S-MCP (mg/kg)															
Potassium (meq/100 g)	0.77	0.46	0.7	1.1	0.9	0.86	1.2	1.1	0.57	0.71	0.91	0.91	1.3	1.4	1.7
Calcium (meq/100 g)	2.6	3.2	7	11	2.8	4.5	4.7	15	4.8	23	16	6.5	4.5	7	10
Magnesium (meq/100 g)	0.99	2.7	5	6.7	1.1	6.7	12	12	1.2	4.9	7.3	6.4	1.2	5.3	11
Aluminium (meq/100 g)	0.52	0.19			0.33				0.12				0.1		
Sodium (meq/100 g)	0.06	0.34	0.96	1.9	0.17	1.9	4.4	6.5	0.04	0.13	0.23	0.74	0.04	0.48	2.2
Chloride (mg/kg)	11				16				13				13		
Electrical Conductivity ($_{1:5}$)	0.04	0.03	0.04	0.08	0.08	0.07	0.11	0.42	0.04	0.14	0.14	0.13	0.09	0.05	0.2
Electrical Conductivity$_{se}$ (dS/m)	0.21				0.39				0.22				0.403392		
Copper (mg/kg)	0.58				0.67				0.64				0.59		
Zinc (mg/kg)															
Manganese (mg/kg)	38				51				29				45		
Iron (mg/kg)	34				37				24				28		
Boron (mg/kg)	0.52				0.59				0.35				0.57		
Percentages of Exchangeable Cations															
ECaP (Calcium)	52.6%	46.4%	51.2%	53.1%	52.8%	32.2%	21.1%	43.4%	71.3%	80.0%	65.5%	44.7%	63.0%	49.4%	40.2%
EMgP (Magnesium)	20.0%	39.2%	36.6%	32.4%	20.8%	48.0%	53.8%	34.7%	17.8%	17.0%	29.9%	44.0%	16.8%	37.4%	44.2%
EKP (Potassium)	15.6%	6.7%	5.1%	5.3%	17.0%	6.2%	5.4%	3.2%	8.5%	2.5%	3.7%	6.3%	18.2%	9.9%	6.8%
ESP (Sodium)	1.2%	4.9%	7.0%	9.2%	3.2%	13.6%	19.7%	18.8%	0.6%	0.5%	0.9%	5.1%	0.6%	3.4%	8.8%
EAlP (Aluminium)	10.5%	2.8%			6.2%				1.8%				1.4%		
Ca/Mg ratio	2.6	1.2	1.4	1.6	2.5	0.7	0.4	1.3	4.0	4.7	2.2	1.0	3.8	1.3	0.9
K/Mg ratio	0.8	0.2	0.1	0.2	0.8	0.1	0.1	0.1	0.5	0.1	0.1	0.1	1.1	0.3	0.2
ESI	0.03	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.07	0.31	0.15	0.03	0.16	0.01	0.02
Dispersion Index	4	6	12	12	4	12	12	9	5	2	2	4	4	7	9
Slaking	Considerabl	Considerabl	Considerabl	Water Stable	Partial	Water Stabl	Considerabl	Partial	Partial	Considerabl	Considerabl	Considerable	Considerabl	Considerabl	Considerabl

3.2.3 Grey Dermosol

Grey Dermosol occupied approximately 85 ha near the northwestern corner of the Soil Survey Area. This soil tended to have a harder surface than the Red Dermosol. The profile and cores sampled in this soil type consisted of layers less than 30cm thick of sandy and silty material in random order, which indicates that they have been deposited in an alluvial environment. This is consistent with the Regolith Landform Unit of Alluvial Overbank (AO) that was allocated to this area by Roach (2007).

Pit MW903, the one Grey Dermosol pit sampled, is described in **Box 2**.

0 to 12 cm
Red silty clay loam with moderate grade of granular structure and ped size of 0.5 cm. Soil did not disperse in field, completely slakes, has a moderate to good SOILpak score and has abundant roots present.

12 to 40 cm
Red light medium clay with strong grade of subangular blocky structure and ped size of 3cm breaking to 1 cm. Soil did not disperse in field, completely slakes, has a moderate to good SOILpak score and has many roots present.

40 to 70 cm
Brown light medium clay with strong grade of polyhedral structure and ped size of 3cm breaking to 1 cm. Soil did not disperse in field, completely slakes, has a moderate SOILpak score and has an average number of roots present.

70 to 120 cm
Brown sandy clay loam with moderate grade of polyhedral structure and ped size of 5cm breaking to 1 cm. Soil did not disperse in field, completely slakes, has a poor to moderate SOILpak score and has no roots present.

120 to 150 cm
Brown sandy clay loam with weak grade of polyhedral structure and ped size of 10cm breaking to 1 cm. Soil did not disperse in field, completely slakes, has a moderate SOILpak score and has no roots present.

Box 2 Grey Dermosol – Test Pit MW903

Note: A colour version of this box can be viewed on the Project CD

The hard-set nature of this soil limits the soil depth that may be used for rehabilitation to 20 cm.

As this soil type would not be disturbed by the Project, no samples were collected for analysis.

3.2.4 Brown Dermosol

Approximately 20ha of the Soil Survey Area was classified as Brown Dermosol. The Brown Dermosol occurs principally around the Wyoming homestead. It was mapped separately because of the very low conductivity in the EM surveys. The profile examined had some hard ironstone mottle, which indicates that it is likely that the soil has undergone little change for many thousands of years.

Profile MW906 had 50cm of material that is suitable for use as topsoil for rehabilitation. The depth suitable for rehabilitation is constrained by mottling and mangans (manganese ped coatings) that indicate that the soil has experienced long term waterlogging.
Pit MW906, typical of the Brown Dermosol, is described in **Box 3**.

0 to 15 cm
: Red silt loam with weak grade of subangular blocky structure and ped size of 3cm breaking to 1 cm. Soil did not disperse in field, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has an average number of roots present.

15 to 55 cm
: Red silty clay loam with moderate grade of polyhedral structure and ped size of 7cm breaking to 2 cm. Soil did not disperse in field, completely slakes, has a moderate to good SOILpak score and has few roots present.

55 to 100 cm
: Red clay loam with moderate grade of polyhedral structure and ped size of 5cm breaking to 2 cm. Soil did not disperse in field, partially slakes, has a moderate SOILpak score and has few roots present.

100 to 150 cm
: Brown medium clay with strong grade of polyhedral structure and ped size of 10cm breaking to 1 cm. Soil did not disperse in field, partially slakes, has a moderate SOILpak score and has no roots present.

Box 3 Brown Dermosol – Test Pit MW906

Note: A colour version of this box can be viewed on the Project CD

The soil tested was neutral, but pH increased with depth. It had low fertility, with very low nitrogen and phosphorus levels, low sulphate sulphur, and adequate levels of the tested micronutrients of manganese, iron and boron (**Table 4**).

The capacity of the soil to store nutrients as measured by the cation exchange capacity was low for all layers sampled. The cation ratios showed a consistent trend that the Exchangeable Sodium Percentage (ESP) increased from acceptable levels to undesirably high in the 100 to 150cm layer. Salinity was desirably low for all samples. The dispersion index was higher than desirable for all samples tested.

3.2.5 Sodic Dermosol

Approximately 180ha of the Soil Survey Area was classified as Sodic Dermosol. The Sodic Dermosol occupied the southeastern corner of the Soil Survey Area, but little of the footprint of the locations that will undergo significant disturbance. The Sodic Dermosol was mapped by Roach (2007) as being derived from siltstone and mudstone. The profile form was similar to the Red Dermosol in that it was generally a silty clay loam topsoil over a light clay subsoil. This difference in clay content is not sufficient for the soil to be classified as a Chromosol.

Profile MW908 had 70cm of material that was suitable for use as topsoil for rehabilitation, but MW912 was regarded as unsuitable for use as topsoil. The depth in MW908 suitable for rehabilitation was constrained by mottling and mangans (manganese ped coatings) that indicate that the soil has experienced long term waterlogging. The suitability of MW912 for rehabilitation was limited by its' coarse surface structure.

Table 4
Results of soil tests performed by Incitec/Pivot on samples collected from Brown Dermosol in Tomingley Gold Project, April 2009

RATING	Very Low	Low	Moderately low	OK	Moderately high	High

Pit	**MW906**	**MW906**	**MW906**
Depth (cm)	**0 to 20**	**50 to 100**	**100 to**
Colour	Red	Orange /Yellow	Orange /Yellow
Texture	Clay Loam	Clay Loam	Clay Loam
CEC (meq/100g)	4.5	8.0	11.8
pH water	5.7	6.8	7.5
pH $CaCl_2$	4.7	5.7	6.1
Organic C (%)	0.43		
Nitrate N (mg/kg)	7.6		
Phosphorus Colwell (mg/kg)	16		
Sulphate S-KCl (mg/kg)	3.2		
Sulphate S-MCP (mg/kg)			
Potassium (meq/100 g)	0.71	0.59	0.71
Calcium (meq/100 g)	2.6	2.2	2.5
Magnesium (meq/100 g)	0.99	4.3	6.8
Aluminium (meq/100 g)	0.17		
Sodium (meq/100 g)	0.04	0.87	1.8
Chloride (mg/kg)	10		
Electrical Conductivity ($_{1:5}$)	0.04	0.06	0.08
Electrical Conductivity$_{se}$ (dS/m)	0.20		
Copper (mg/kg)	0.49		
Zinc (mg/kg)			
Manganese (mg/kg)	22		
Iron (mg/kg)	18		
Boron (mg/kg)	0.42		
Percentages of Exchangeable Cations			
ECaP (Calcium)	57.6%	27.6%	21.2%
EMgP (Magnesium)	22.0%	54.0%	57.6%
EKP (Potassium)	15.7%	7.4%	6.0%
ESP (Sodium)	0.9%	10.9%	15.2%
EAlP (Aluminium)	3.8%		
Ca/Mg ratio	2.6	0.5	0.4
K/Mg ratio	0.7	0.1	0.1
ESI	0.05	0.01	0.01
Dispersion Index	4	4	10
Slaking	:onsiderabl	:onsiderabl	:onsiderable

The soil tested showed a trend of neutral topsoil over alkaline subsoil. It had low fertility, with very low nitrogen and phosphorus levels, low sulphate sulphur, and adequate levels of the tested micronutrients of manganese, iron and boron (**Table 5**).

Table 5
Results of soil tests performed by Incitec/Pivot on samples collected from Sodic Dermosol in Tomingley Gold Project, April, 2009

RATING	Very Low	Low	Moderately low	OK	Moderately high	High

Pit	**MW908**	**MW908**	**MW908**	**MW908**
Depth (cm)	**0 to 20**	**20 to 50**	**50 to 100**	**100 to**
Colour	Red	Red	Orange /Yellow	Orange /Yellow
Texture	Clay	Clay	Clay Loam	Clay Loam
CEC (meq/100g)	7.4	10.7	17.0	16.9
pH water	6.2	7.6	8.9	9.1
pH $CaCl_2$	5.4	6.4	7.8	7.6
Organic C (%)	0.68			
Nitrate N (mg/kg)	9.7			
Phosphorus Colwell (mg/kg)	7			
Sulphate S-KCl (mg/kg)	4.4			
Sulphate S-MCP (mg/kg)				
Potassium (meq/100 g)	0.94	0.65	0.63	0.73
Calcium (meq/100 g)	4.4	3.5	4.4	4.1
Magnesium (meq/100 g)	1.6	4.4	7.2	7.7
Aluminium (meq/100 g)	0.1			
Sodium (meq/100 g)	0.31	2.1	4.8	4.4
Chloride (mg/kg)	44			
Electrical Conductivity ($_{1:5}$)	0.08	0.13	0.25	0.11
Electrical Conductivity$_{se}$ (dS/m)	0.52			
Copper (mg/kg)	0.92			
Zinc (mg/kg)				
Manganese (mg/kg)	42			
Iron (mg/kg)	34			
Boron (mg/kg)	0.7			
Percentages of Exchangeable Cations				
ECaP (Calcium)	59.9%	32.9%	25.8%	24.2%
EMgP (Magnesium)	21.8%	41.3%	42.3%	45.5%
EKP (Potassium)	12.8%	6.1%	3.7%	4.3%
ESP (Sodium)	4.2%	19.7%	28.2%	26.0%
EAlP (Aluminium)	1.4%			
Ca/Mg ratio	2.8	0.8	0.6	0.5
K/Mg ratio	0.6	0.1	0.1	0.1
ESI	0.02	0.01	0.01	0.00
Dispersion Index	4	9	5	7
Slaking	No Aggregati	:onsiderabl	:onsiderabl	Partial

The capacity of the soil to store nutrients as measured by the cation exchange capacity increased from very low in the surface 50cm and increased to adequate levels in the 50 to 150cm layer. The cation ratios showed a consistent trend that the Exchangeable Sodium Percentage (ESP) increased from acceptable levels to undesirably high in the 100 to 150cm layer. Salinity was desirably low for all samples. The dispersion index was higher than desirable for all samples tested.

Pit MW912, typical of the Sodic Dermosol, is described in **Box 4**.

0 to 30 cm
Red silt loam with weak grade of angular blocky structure and ped size of 10cm breaking to 1 cm. Soil did not disperse in field, stable (i.e. doesn't disperse or slake), has a poor to moderate SOILpak score and has an average number of roots present.

30 to 50 cm
Red silt loam with weak grade of angular blocky structure and ped size of 20cm breaking to 2 cm. Soil did not disperse in field, partially slakes, has a poor to moderate SOILpak score and has few roots present.

50 to 110 cm
Red light medium clay with strong grade of polyhedral structure and ped size of 20cm breaking to 5 cm. Soil did not disperse in field, stable (i.e. doesn't disperse or slake), has a poor SOILpak score and has few roots present.

110 to 120 cm
Red light medium clay with strong grade of polyhedral structure and ped size of 20cm breaking to 5 cm. Soil did not disperse in field, stable (i.e. doesn't disperse or slake), has a poor SOILpak score and has no roots present.

120 to 150 cm
Brown sandy loam with moderate grade of polyhedral structure and ped size of 20cm breaking to 1 cm. Soil is strongly dispersive, partially slakes, has a poor SOILpak score and has no roots present.

Box 4 Sodic Dermosol – Test Pit MW 909

Note: A colour version of this box can be viewed on the Project CD

3.2.6 Sodic Gilgaied Dermosol

Approximately 100ha of the Soil Survey Area was classified as Sodic Gilgaied Dermosol. The Sodic Gilgaied Dermosol occupied land between the Red Dermosol and the Sodic Dermosol. Roach (2007) mapped this soil as being derived from acidic Rhyolite. This soil was strongly different to the remainder of the area assessed as the surface was strongly gilgaied, the soil conductivity was greater than 110mS/m as indicated by the EM survey, and the profile texture more uniform than the remainder of the sites assessed.

The profiles examined were classed as unsuitable for use during rehabilitation as field tests indicated that the soil was dispersive and moderately saline.

Pit MW914, typical of the Sodic Gilgaied Dermosol, is described in **Box 5**.

The soil tested was alkaline throughout, increasing from moderately alkaline in the 0 to 20cm layer, to strongly alkaline for 100 to 150cm. The soil tested had low nitrogen, phosphorus and sulphate sulphur, and adequate levels of the tested micronutrients of manganese, iron and boron (**Table 6**).

0 to 5cm

Brown silty clay loam with weak grade of subangular blocky structure and ped size of 3cm breaking to 1 cm. Soil did not disperse in field, stable (i.e. doesn't disperse or slake), has a moderate SOILpak score and has an average number of roots present.

5 to 20cm

Brown clay loam, sandy with strong grade of columnar structure and ped size of 20cm breaking to 1 cm. Soil did not disperse in field, stable (i.e. doesn't disperse or slake), has a poor to moderate SOILpak score and has an average number of roots present.

20 to 50cm

Brown clay loam, sandy with strong grade of polyhedral structure and ped size of 10cm breaking to 1 cm. Soil did not disperse in field, partially slakes, has a poor to moderate SOILpak score and has few roots present.

50 to 130cm

Brown light medium clay with strong grade of polyhedral structure and ped size of 10cm breaking to 1 cm. Soil did not disperse in field, partially slakes, has a poor to moderate SOILpak score and has no roots present.

130 to 150cm

Grey light medium clay with moderate grade of polyhedral structure and ped size of 20cm breaking to 2 cm. Soil did not disperse in field, partially slakes, has a poor SOILpak score and has no roots present.

Box 5 Sodic Gilgaied Dermosol – Test Pit MW914

Note: A colour version of this box can be viewed on the Project CD

The capacity of the soil to store nutrients as measured by the cation exchange capacity was adequate for all depths tested. The soil tested was sodic for all depths tested. Salinity was desirably low for the 0 to 20cm layer, but undesirably high for the 50 to 150cm layers. The dispersion index was higher than desirable for all samples tested.

3.2.7 Rudosol

Approximately 18 ha of the Soil Survey Area was classified as Rudosol, which is a shallow soil with minimal profile development. The Rudosol covered a small hill near the southeastern corner of the area assessed, but none of the footprint that will undergo significant disturbance. The Rudosol was mapped by Roach (2007) as being derived from mudstone and siltstone.

The Rudosol was not sampled as it was small in extent and in an area where no disturbance is planned.

Observations of surface soil indicated that properties of the surface soil were similar to those of the Sodic Dermosol in the surrounding land in that it had a loamy texture and appeared moderately hard-setting. There was some gravel in the surface soil. There is good surface drainage around the Rudosol soil type, but it is more vulnerable to surface erosion than the remaining soil types as it is in a steeper part of the landscape.

Table 6
Results of soil tests performed by Incitec/Pivot on samples collected from Sodic, Gilgaied Dermosol in Tomingley Gold Project, April, 2009

RATING	Very Low	Low	Moderately low	OK	Moderately high	High

Pit	**MW914**	**MW914**	**MW914**	**MW914**
Depth (cm)	**0 to 20**	**20 to 50**	**50 to 100**	**100 to**
Colour	Brown	Brown	Brown	Brown
Texture	Clay Loam	Clay Loam	Clay Loam	Clay Loam
CEC (meq/100g)	17.9	33.7	39.6	40.7
pH water	7.5	9.2	9.2	9
pH $CaCl_2$	6.4	8.5	8.6	8.5
Organic C (%)	0.97			
Nitrate N (mg/kg)	9.3			
Phosphorus Colwell (mg/kg)	10			
Sulphate S-KCl (mg/kg)	4.6			
Sulphate S-MCP (mg/kg)				
Potassium (meq/100 g)	1.2	0.7	0.62	0.73
Calcium (meq/100 g)	6.5	10	16	15
Magnesium (meq/100 g)	7.5	12	11	12
Aluminium (meq/100 g)				
Sodium (meq/100 g)	2.7	11	12	13
Chloride (mg/kg)	37			
Electrical Conductivity ($_{1:5}$)	0.14	1.07	1.63	1.84
Electrical Conductivity$_{se}$ (dS/m)	0.727058			
Copper (mg/kg)	1.8			
Zinc (mg/kg)				
Manganese (mg/kg)	53			
Iron (mg/kg)	34			
Boron (mg/kg)	1.2			
Percentages of Exchangeable Cations				
ECaP (Calcium)	36.3%	29.7%	40.4%	36.8%
EMgP (Magnesium)	41.9%	35.6%	27.8%	29.5%
EKP (Potassium)	6.7%	2.1%	1.6%	1.8%
ESP (Sodium)	15.1%	32.6%	30.3%	31.9%
EAlP (Aluminium)				
Ca/Mg ratio	0.9	0.8	1.5	1.3
K/Mg ratio	0.2	0.1	0.1	0.1
ESI	0.01	0.03	0.05	0.06
Dispersion Index	11	5	2	2
Slaking	Partial	Considerable	Considerable	Considerable

3.3 LAND CAPABILITY

The land across the Wyoming Prospect has been used for annual crops and improved pasture, and data collected for this assessment indicates that this land use is appropriate for the Red and Brown Dermosol soil units (**Table 7**). The Sodic Dermosol and Grey Dermosol have poorer surface structural stability, and require a higher standard of management to withstand the disturbance associated with cropping. The Sodic Gilgaied Dermosol is generally poorly suited to cropping because of uneven surface, moderate salinity, and high surface exchangeable sodium percentage (ESP).

Table 7
Land Capability Assessment

Soil	Slope	Wind Hazard	Soil Acidity	Soil Structural Stability	Salinity	Rock Outcrop	Water logging	Existing Erosion	Class
Red Dermosol	< 1%	Low	Slightly acid, low buffering capacity	Moderate	Low	No outcrop	Well drained	Nil erosion	2
Grey Dermosol	< 1%	Very low	Slightly acid, low buffering capacity	Low	Low	No outcrop	Well drained	Nil erosion	2 to 3
Brown Dermosol	< 1%	Low	Slightly acid, low buffering capacity	Moderate	Low	No outcrop	Well drained	Nil erosion	2
Sodic Dermosol	< 1%	Low	Slightly acid, low buffering capacity	Low to moderate	Low	No outcrop	Well drained	Nil erosion	3
Sodic Gilgaied Dermosol	< 1%	Low	Alkaline, moderate buffering capacity	Moderate	Moderate	No outcrop	Poorly drained	Nil erosion	5
Rudosol	>2%	Low	Slightly acid, low buffering capacity	Low to moderate	Low	Rock subcrop, very shallow	Well drained	Nil erosion	6

3.4 STRIPPING SUITABILITY AND SOIL INVENTORY

3.4.1 Topsoil

The topsoil of the soil classified as suitable for rehabilitation (Red, Grey and Brown Dermosol) varied in depth from 20cm to 65 cm. It had silty loam, silty clay loam, sandy clay loam and clay loam texture (**Figure 8**, **Appendix 2**), and was slightly acidic. The boundary between the topsoil and subsoil was marked by the presence of a sporadic A2 or pale layer.

This material is suitable for topsoiling on the basis of the Elliott and Veness key. It contains some seed and organic matter, and is likely to contain more nutrients than the underlying subsoil. It had desirably low ESP where tested, so would benefit from remediation with lime (to increase pH and stabilise disturbed soil) rather than gypsum. This material should be stockpiled and used for rehabilitation of the final landscape.

The topsoil of the Red, Grey and Brown Dermosol had moderate coherence, and is consequently very susceptible to breakdown of structure. It should be treated with great care.

The Sodic Dermosol, and Sodic Gilgaied Dermosol were assessed as consisting of material that could only be used for rehabilitation with difficulty

Recommendation – All of the topsoil of the Red, Brown and Grey Dermosol to the bottom of the pale A2 layer appears to be suitable for use in site rehabilitation with some amelioration. More intensive sampling would be required if a more detailed indication of the topsoil depth is required.

3.4.2 Subsoil

The subsoil of the soil classified as suitable for rehabilitation (Red Dermosol) had clay loam, light clay, light medium clay and medium clay texture with neutral to alkaline pH.
This material is also suitable for use in site rehabilitation according to the Elliott and Veness key, but laboratory tests indicated that it was more sodic than the overlying topsoil. The subsoil was generally classified as suitable for site rehabilitation to a depth of 50cm where mottling and manganese ped coatings were encountered.

The subsoil had greater coherence than the topsoil, so can withstand more vigorous handling, and higher stockpile thickness. **Table 8** presents recommended depths of stripping for each soil type.

Table 8
Recommended Maximum Stripping Thickness

Soil Type	**Average topsoil thickness suitable for stripping (cm)**	**Average bottom depth of subsoil suitable for stripping (cm)**	**Constraint**
Red Dermosol	30	50 to 100	Waterlogging associated mottling
Grey Dermosol	20	unsuitable	Waterlogging associated mottling
Brown Dermosol	50	unsuitable	Waterlogging associated mottling
Sodic Dermosol	unsuitable	unsuitable	Coarse surface structure
Sodic Gilgaied Dermosol	unsuitable	unsuitable	Sodic and saline soil

Recommendation – The subsoil can be stripped to a depth of approximately 50 cm. If mottled soil is encountered at depths of less than 50cm below the existing surface, then subsoil stripping should cease on that area.

3.4.3 Soil Stability Rating

The surface 20cm of both the Sodic Dermosol and Red Dermosol soil types was rated as having low dispersion (**Table 9**). The bulked subsoil samples from the 2 soil types as well as both layers tested in the Sodic Gilgai Dermosol were rated as Dispersive (Type D). Both samples with acceptably low dispersion were classified as fine (Type F), although they were at the coarse end of fine soil.

Table 9
Soil Stability Rating

Soil Type	Pits	Depth	Dispersible % *	Silt and Clay (%)	Soil Class
Sodic Dermosol	MW908, MW912	0-20cm	4	33	Type F
		20-150cm	15	32	Type D
Red Dermosol	MW902, MW917, MW907	0-20cm	9	35	Type F
		20-150cm	27	44	Type D
Sodic Gilgai Dermosol	MW914, MW915	0-20cm	14	53	Type D
		20-150cm	37	53	Type D

* Calculated as the clay content plus half the silt content multiplied by the Dispersion Percentage

Recommendation – Settling ponds that capture runoff from the Red Dermosol and Sodic Dermosol soil types can be designed for Type F soil provided there is minimal exposed subsoil (deeper than 30 cm) in the catchment. Runoff from Sodic Gilgaied Dermosol should be captured in basins that satisfy the requirements for Type D soil.

4 DISTURBANCE MANAGEMENT

4.1 TOPSOIL STRIPPING AND HANDLING

The following topsoil stripping and stockpiling techniques are appropriate to minimise soil deterioration:

- Strip material to the maximum depths stated in **Table 8**. These depths are considered the maximum depth of material that is suitable for use in rehabilitation.
- Strip both topsoil and subsoil in open cut, waste rock and tailings dam areas and topsoil only in areas of roads, processing plants and subsoil stockpiles.
- Topsoil should be maintained in a slightly moist condition during stripping. Material should not be stripped in either an excessively dry or wet condition.
- Strip soil by grading or pushing soil into windrows with graders or dozers for later collection by elevating scrapers, or for loading into rear dump trucks by front-end loaders. This minimises compression effects of the heavy equipment that is often necessary for economical transport of soil material.
- Soil transported by dump trucks may be placed directly into storage. Soil transported by bottom dumping scrapers is best pushed to form stockpiles by other equipment (e.g. dozer or excavator) to avoid tracking over previously laid soil by the scraper. If the material is deposited directly by scrapers it should be deposited in thick “lifts” to minimise compaction.
- Driving of machinery on stockpiles, other than scrapers during unloading should be kept to an absolute minimum to minimise compaction.

- As a general rule, maintain a maximum stockpile depth of 3m. Ideally, topsoil stockpiles should be less than 2m high. Clayey soil should be stored in lower stockpiles for shorter periods of time than sandy soil. This applies to the subsoil, but not the topsoil in this project. The aim in managing soil stockpiles is to minimise the volume and duration of waterlogging, which causes reduced conditions that cause unwanted chemical changes in the soil.
- Stockpile surfaces should generally be even, but with a rough surface condition to assist in runoff control and seed germination and emergence.
- If long term storage (>3 months) is planned, fertilise stockpiles as soon as possible and seed with stabilising species. The aim should be to establish a healthy sward that provides sufficient competition to minimise the establishment of undesirable weed species.
- Prior to re-spreading stockpiled topsoil (particularly onto designated tree seeding areas), an assessment of weed infestation on stockpiles should be undertaken to determine if individual stockpiles require herbicide application and / or “scalping” of soil infested with weed seeds prior to respreading.

4.2 TOPSOIL RESPREADING

Where topsoil resources allow, topsoil should be spread to a minimum depth of 200mm on all areas to be rehabilitated. Topsoil should be spread, treated and seeded in one consecutive operation. To prevent loss of topsoil to wind and water erosion, topsoil should not be left spread and untreated/unseeded, where possible.

The soil assessed on Wyoming Development would benefit from application of gypsum at 10t/ha. This should be applied across the surface of stockpiles and across all topsoil that is respread. Appropriate nutrients should also be added to the topsoil that is respread. Larger nutrient application will be needed if it is planned to grow introduced grasses on the rehabilitated sites than if native trees, shrubs or grasses are grown.

4.3 SOIL INVENTORY

Table 10 presents an indicative soils inventory based on the above recommendations and the proposed areas of disturbance.

Table 10
Indicative Soil Inventory

	Area (ha)	Topsoil		Subsoil	
		Depth	Volume (m^3)	Depth	Volume (m^3)[1]
Red Dermosol	142	30cm	426 000	20cm to 70cm	639 000
Grey Dermosol	0.4	20cm	800	-	-
Brown Dermosol	16.0	50cm	80 000	-	-
Sodic Dermosol	20.0	-	-	-	-
Sodic Gilgaied Dermosol	2.7	-	-	-	-
Rudosol	0	-	-	-	-
Note 1: Assumes average depth to mottling is 45cm					

5 CONCLUSIONS

1. The majority of soils within the Soil Survey Area are classified as Dermosol or structured soil. This was subdivided into four soil types based on variation in topsoil and subsoil properties. There was a small area of gilgaied soil.
2. The majority of the land that is planned to be disturbed may be classified as Red Dermosol. This soil consisted of red silty loam and silty clay loam topsoil over red light clay to medium clay subsoil. The topsoil was slightly acidic, and the pH increased rapidly with depth.
3. The Red Dermosol was classified as capable of withstanding the challenges of continuous cropping, and also suitable to be stripped and used for site rehabilitation.

6 LIMITATIONS

The investigations described in this report identified actual conditions only at those locations where sampling occurred. This data has been interpreted and an opinion given regarding the overall physical and chemical conditions at the site.

Although the information in this report has been used to interpret conditions at the site, actual conditions may vary from those inferred, especially between sampling locations. Consequently, this report should be read with the understanding that it is a professional interpretation of conditions at the site based on a set of data. Although the data were considered representative of the site they cannot fully define the conditions across the site.

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APPENDICES

(No. of pages including blank pages = 30)

Note: Appendix 2 is only provided on the Project CD

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Appendix 1

EM Operation

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(*Adapted from report by J Lucas, Terrabyte Services, Wagga Wagga*).

The EM 31 instrument does not come into direct physical contact with the soil. It uses induced electromagnetic fields to collect information about the soil.

These electromagnetic fields are induced as a result of electromagnetic fields that are generated by the EM 31. The EM 31 instrument generates a primary magnetic field (**Figure A1**). This field induces an electric current to flow through the soil. The current produced in the soil as a result of the EM 31 primary field creates secondary magnetic field. The intensity of the secondary field is proportional to the strength of the induced soil current. Because the primary field is of constant intensity the strength of the induced current will fluctuate only as a result of varying conductivity of the soil profile.

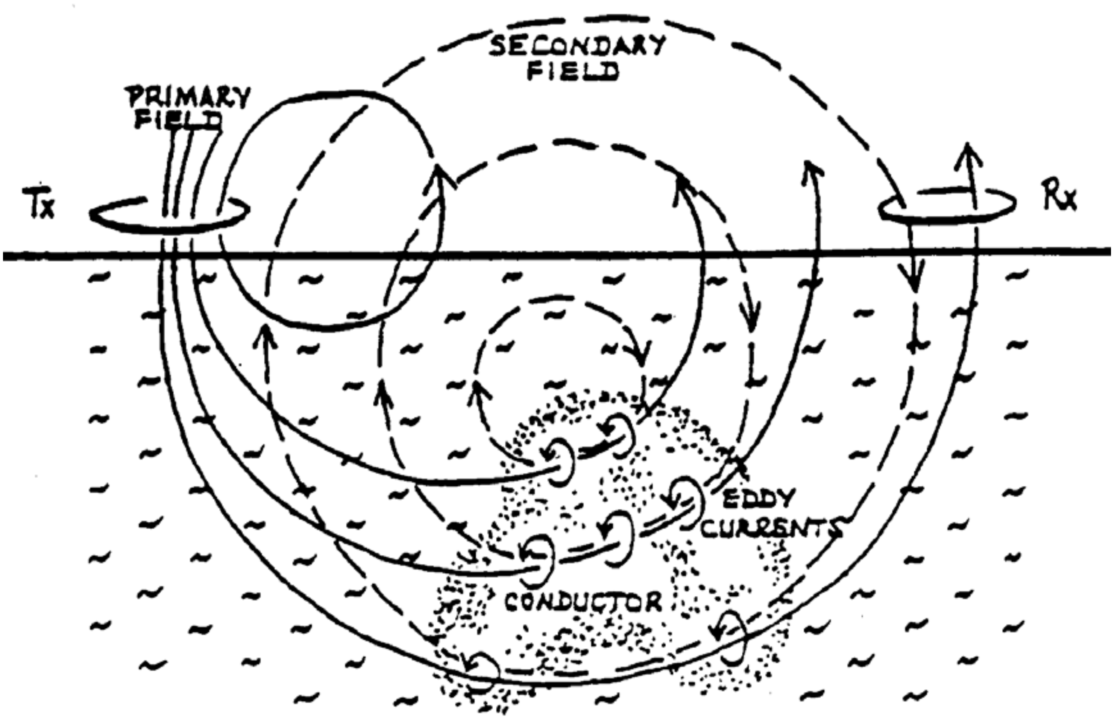

Figure A1. Electromagnetic induction in the earth

In summary the EM 31 instrument produces the primary field, detects the secondary field and then assigns a value to the strength of this secondary field. This value has been calibrated to reflect the conductivity of the soil profile.

Cultural Anomalies

Cultural anomalies are man-made objects that interfere with the readings produced by the EM 31. These objects are usually metal or encased metal such as reinforced concrete. When they are close to the meter they produce a negative response bordered by very high responses. In the case of this survey the most common anomalies were fences. Where possible these features were avoided.

Most agricultural soils are made up of layers of soil within the profile. The EM 31 does not directly measure any one of these layers. Instead the EM 31 measures the average conductivity of the soil to a depth of 6 metres. This reading is known as the **"apparent conductivity**" (ECa).

Interpretation of EM 31 data

Six factors influence conductivity recorded by the EM 31. These are:

- The amount of space between the soil particles in the ground (the spaces are called pores, and the total amount of pores is called porosity).
- The amount of groundwater in the pores.
- The salinity of the groundwater in the pores.
- Temperature
- The type and amount of clay in the soil and rock.
- The type and amount of organic matter.

These six factors combine in a way that is unique to each site and determines the TRUE conductivity of the soil under the instrument.

Because each value of apparent conductivity represents a combination of the six factors described above, further information must be collected from the site to correlate the EM 31 data to soil types. Once the soil data has been collected from a number of areas within a survey site it should be possible to correlate each soil type with a range of values of apparent conductivity.

It is important to take geology, geomorphology, and prior land use into account when interpreting the generated during the EM 31 survey.

Appendix 2

Soil Pit Logs

(No. of pages including blank pages = 20)

(A copy of this Appendix is available on the Project CD)

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TEST PIT MW901

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	100	Plant Available Water (mm):	148
Landscape position:	Levee	Surface condition:	Firm	Vegetation:	Wheat Stubble
Estimated Permeability:	5 to 50 mm/day	Drainage:	Imperfectly drained	Datum	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	613175
Equipment:		Surface Elevation(m):		Northing:	6394903

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red silty clay loam with weak grade of subangular blocky structure and ped size of 3 cm breaking to 0.5 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate SOILpak score and has an average number of roots present.	5	Nil			
	B1		Red clay loam with moderate grade of subangular blocky structure and ped size of 5 cm breaking to 0.5 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has an average number of roots present.	5	Nil		0	
50	B21		Red light clay with strong grade of subangular blocky structure and ped size of 10 cm breaking to 0.5 cm Soil is strongly dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has few roots present.	6	Nil			
100	B22		Brown light clay with strong grade of subangular blocky structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has no roots present.	6.5	Nil	0.02% Lime	0	
150			COMMENTS: Plough pan in A1 , Macropores common to 1m, Mangans common in B Horizon, Appears that underlying soil much , less leaky than top metre, Sporadic A2 OK to 1m mottled below Bottom of hole at 150					
200								

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TEST PIT MW902

Australian Soil Class:	Brown Dermosol	Annual Crop Rootzone (cm):	110	Plant Available Water (mm):	163
Landscape position:	Slightly elevated	Surface condition:	Firm	Vegetation:	Wheat Stubble
Estimated Permeability:	5 to 50 mm/day	Drainage:	Well drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	613459
Equipment:		Surface Elevation(m):		Northing:	6395740

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	2A1		Red silt loam with moderate grade of subangular blocky structure and ped size of 2 cm breaking to 0.5 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has many roots present.	5	Nil			
50	B1		Brown silty clay with strong grade of polyhedral structure and ped size of 5 cm breaking to 0.5 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has many roots present.	6	Nil		0	
	B2		Brown silty clay with strong grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has many roots present.	7.5	Nil	1% Lime		
100	B3		Brown silty clay loam with moderate grade of polyhedral structure and ped size of 20 cm breaking to 2 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate SOILpak score and has few roots present.	7.5	Nil		0.5	
150			COMMENTS: Carbonate common below 40cm, at end of pit. Caused by tree, Vertical macropores common to 1 m, OK for rehab to 1m. Bottom of hole at 150					
200								

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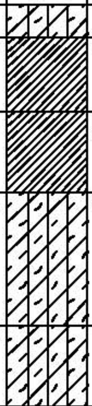
TEST PIT MW903

Australian Soil Class:	Brown Dermosol	Annual Crop Rootzone (cm):	70	Plant Available Water (mm):	104
Landscape position:	Level	Surface condition:	Hardset	Vegetation:	Wheat Stubble
Estimated Permeability:	<5 mm/day	Drainage:	Moderately well drained	Datum	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	614177
Equipment:		Surface Elevation (m):		Northing:	6396045



DEPTH (centimetres)	Horizon	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1	Red silty clay loam with moderate grade of granular structure and ped size of 0.5	5.5	Nil			
	B11	Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has abundant roots present.	5.5	Nil			
		Red light medium clay with strong grade of subangular blocky structure and ped size of 3 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has many roots present.					
50	B2	Brown light medium clay with strong grade of polyhedral structure and ped size of 3 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has an average number of roots present.	5.5	Nil		0	
	2B1	Brown sandy clay loam with moderate grade of polyhedral structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a poor to moderate SOILpak score and has no roots present.	6	Nil	3% Lime		
100							
	2B2	Brown sandy clay loam with weak grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has no roots present.	7	Nil		0.5	
150		COMMENTS: Soil OK, but many fewer macropores, than 901 & 902. Soil relatively young, , pockets of lighter textured soil - , most apparent @ 70cm Some gravel , above this level. Tree roots common, 60 to 70cm 20cm OK for rehab Bottom of hole at 150					
200							

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TEST PIT MW904

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	80	Plant Available Water (mm):	117
Landscape position:	Level	Surface condition:	Loose	Vegetation:	Wheat Stubble
Estimated Permeability:	<5 mm/day	Drainage:	Moderately well drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	614350
Equipment:		Surface Elevation (m):		Northing:	6394388

DEPTH (centimetres)	Horizon	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)
	A1	Red silty clay loam with weak grade of subangular blocky structure and ped size of 3 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has an average number of roots present.	5	Nil		
	A2	Red silty clay loam with weak grade of subangular blocky structure and ped size of 2 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has few roots present.	6	Nil		0
50	B1	Red light clay with strong grade of polyhedral structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has an average number of roots present.	7	Nil		
100	B2	Red light clay with strong grade of polyhedral structure and ped size of 5 cm breaking to 0.5 cm Soil is slightly dispersive, completely slakes, has a moderate SOILpak score and has no roots present.	9	Nil		
150	C	Brown light medium clay with strong grade of angular blocky structure and ped size of 3 cm breaking to 0.5 cm Soil is slightly dispersive, completely slakes, has a moderate to good SOILpak score and has no roots present.	9	Nil	2% Lime	1
200		COMMENTS: Mangans common in B2 , Appear to be ferruginsed zones in C, Little silt in C , Lime around fragments granite in C, Use 80cm for topsoil mangans, v common below. Bottom of hole at 150				

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Tomingley Gold Project
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TEST PIT MW905

Australian Soil Class:	Red Sodosol	Annual Crop Rootzone (cm):	80	Plant Available Water (mm):	119
Landscape position:	Level	Surface condition:	Firm	Vegetation:	Wheat Stubble
Estimated Permeability:	<5 mm/day	Drainage:	Moderately well drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	614318
Equipment:		Surface Elevation(m):		Northing:	6394827

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red silt loam with moderate grade of subangular blocky structure and ped size of 3 cm breaking to 0.5 cm Soil is not dispersive, partially slakes, has a good SOILpak score and has an average number of roots present.	5	Nil			
50	A3		Red silt loam with moderate grade of polyhedral structure and ped size of 3 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has an average number of roots present.	5	Nil		0	
	B1		Brown medium clay with strong grade of polyhedral structure and ped size of 20 cm breaking to 2 cm Soil is moderately dispersive, partially slakes, has a poor to moderate SOILpak score and has few roots present.	6.5	Nil			
100	B2		Brown medium heavy clay with strong grade of polyhedral structure and ped size of 20 cm breaking to 5 cm Soil is moderately dispersive, partially slakes, has a poor to moderate SOILpak score and has no roots present.	8	Nil		0	
150			COMMENTS: Large texture change @ 60cm, B horizon v stiff clay, Rehab 60cm mottle Bottom of hole at 150					
200								

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TEST PIT MW906

Australian Soil Class:	Brown Dermosol	Annual Crop Rootzone (cm):	70	Plant Available Water (mm):	101
Landscape position:	Mid Slope	Surface condition:	Firm	Vegetation:	Wheat Stubble
Estimated Permeability:	5 to 50 mm/day	Drainage:	Moderately well drained	Datum	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	613811
Equipment:		Surface Elevation(m):		Northing:	6394696

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red silt loamwith weak grade of subangular blocky structure and ped size of 3 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has an average number of roots present.	5	Nil			
	A3		Red silty clay loamwith moderate grade of polyhedral structure and ped size of 7 cmbreaking to 2 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has few roots present.	6	Nil		0	
50	B1		Red clay loamwith moderate grade of polyhedral structure and ped size of 5 cm breaking to 2 cm Soil is not dispersive, partially slakes, has a moderate SOILpak score and has few roots present.	5.5	Nil			
100	B2		Brown mediumclay with strong grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, partially slakes, has a moderate SOILpak score and has no roots present.	6.5	Nil		0	
150	CL		Brown sandy clay loam					
200								

COMMENTS:
Macropores very common in B1 , Red ironstone mottle common in B2 , Trace mediumangular gravel in B2 , Rehab 50cmmottle
Bottom of hole at 155

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TEST PIT MW907

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	60	Plant Available Water (mm):	88
Landscape position:	Level	Surface condition:	Firm	Vegetation:	Wheat Stubble
Estimated Permeability:	5 to 50 mm/day	Drainage:	Moderately well drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	614169
Equipment:		Surface Elevation(m):		Northing:	6393626

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red silty clay loam with weak grade of angular blocky structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, partially slakes, has a poor to moderate SOILpak score and has few roots present.	4.5	Nil			
	B1		Red clay loam with strong grade of subangular blocky structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, partially slakes, has a moderate SOILpak score and has an average number of roots present.	6	Nil		1	
50	B2		Red light clay with strong grade of subangular blocky structure and ped size of 10 cm breaking to 0.5 cm Soil is not dispersive, completely slakes, has a poor to moderate SOILpak score and has few roots present.	7	Nil			
100	B3		Red light medium clay with strong grade of subangular blocky structure and ped size of 10 cm breaking to 1 cm Soil is moderately dispersive, partially slakes, has a poor to moderate SOILpak score and has no roots present.	7	Nil	2% Lime	3.8	
150			COMMENTS: Mangans common in B2 , Rehab 80cm but not fertile Bottom of hole at 150					
200								

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TEST PIT MW908

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	80	Plant Available Water (mm):	118
Landscape position:	Drainage line	Surface condition:	Hardset	Vegetation:	Naturalised pasture
Estimated Permeability:	5 to 50 mm/day	Drainage:	Imperfectly drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	614212
Equipment:		Surface Elevation(m):		Northing:	6393264

Horizon	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)
A11	6.5	Nil		
A12	6.5	Nil		
A2	6.5	Nil		
B2	7	Nil		0
B31	7.5	Nil		
B32	7.5	Nil		0

DEPTH (centimetres): 50, 100, 150, 200

PROFILE DESCRIPTION

Black silt loam with moderate grade of subangular blocky structure and ped size of 5 cm breaking to 0.5 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has many roots present.

Red silt loam with moderate grade of subangular blocky structure and ped size of 7 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has an average number of roots present.

Red silt loam with weak grade of subangular blocky structure and ped size of 0.5 cm breaking to 1 cm Soil is slightly dispersive, completely slakes, has a moderate SOILpak score and has an average number of roots present.

Red light medium clay with strong grade of angular blocky structure and ped size of 15 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has few roots present.

Red silty clay loam with moderate grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a poor to moderate SOILpak score and has no roots present.

Brown light clay with moderate grade of angular blocky structure and ped size of 20 cm breaking to 1 cm Soil is slightly dispersive, partially slakes, has a moderate SOILpak score and has no roots present.

COMMENTS:
Mangans very common in B31, Sand lens 125/130, Rehab 70 cm mottle
Bottom of hole at 150

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TEST PIT MW909

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	110	Plant Available Water (mm):	162
Landscape position:	Level	Surface condition:	Firm	Vegetation:	Wheat Stubble
Estimated Permeability:	5 to 50 mm/day	Drainage:	Well drained	Datum	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	613072
Equipment:		Surface Elevation(m):		Northing:	6394079

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red silty clay loam with weak grade of subangular blocky structure and ped size of 3 cm breaking to 0.5 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has many roots present.	5	Nil			
	A2			5	Nil			
	B1		Red silty clay loam with weak grade of angular blocky structure and ped size of 2 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has an average number of roots present.	7	Nil		0	
50	B2		Red light clay with strong grade of polyhedral structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has an average number of roots present.	8	Slight	2% Lime		
100	B3		Red light medium clay with strong grade of polyhedral structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has an average number of roots present.	8	Nil			
			Brown sandy clay with moderate grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has no roots present.					
150			COMMENTS: Very sandy at bottom of hole, Rehab 50 lime & sodic. Bottom of hole at 150					
200								

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TEST PIT MW911

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	100	Plant Available Water (mm):	144
Landscape position:	Midslope	Surface condition:	Loose	Vegetation:	Lucerne
Estimated Permeability:	50 to 500 mm/day	Drainage:	Well drained	Datum	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	616449
Equipment:		Surface Elevation(m):		Northing:	6394848

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red silt loam with moderate grade of granular structure and ped size of .5	5.5	Nil			
50	A3		Red silty clay loam with moderate grade of subangular blocky structure and ped size of 10 cm breaking to 1 cm	5.5	Nil		0	
100	B2		Red clay loam with strong grade of subangular blocky structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has few roots present.	5.5	Slight	2% Lime		
150	B3		Brown medium clay with strong grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is strongly dispersive, completely slakes, has a moderate SOILpak score and has no roots present.	6	Nil		0	
200			COMMENTS: Good Soil , Trace gravel in B2 , Good rehab to 65 gravelly below Bottom of hole at 150					

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TEST PIT MW912

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	50	Plant Available Water (mm):	74
Landscape position:	Crest	Surface condition:	Hardset	Vegetation:	Poor lucerne pasture
Estimated Permeability:	<5 mm/day	Drainage:	Moderately well drained	Datum	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	615857
Equipment:		Surface Elevation(m):		Northing:	6393320

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red silt loam with weak grade of angular blocky structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a poor to moderate SOILpak score and has an average number of roots present.	5.5	Nil			
	A2		Red silt loam with weak grade of angular blocky structure and ped size of 20 cm breaking to 2 cm Soil is not dispersive, partially slakes, has a poor to moderate SOILpak score and has few roots present.	6.5	Nil		0	
50	B22		Red light medium clay with strong grade of polyhedral structure and ped size of 20 cm breaking to 5 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a poor SOILpak score and has few roots present.	8	Nil			
100								
	B23		Red light medium clay with strong grade of polyhedral structure and ped size of 20 cm breaking to 5 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a poor SOILpak score and has no roots present.	8	Nil			
	B3		Brown sandy loam with moderate grade of polyhedral structure and ped size of 20 cm breaking to 1 cm Soil is strongly dispersive, partially slakes, has a poor SOILpak score and has no roots present.	8.5	Nil		0	
150			COMMENTS: Gravel seam 110 to 120 cm, V hard set soil, Poor soil for rehab v coarse, weak structure					
			Bottom of hole at 150					
200								

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TEST PIT MW913

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	100	Plant Available Water (mm):	149
Landscape position:	Midslope	Surface condition:	Firm	Vegetation:	Wheat Stubble
Estimated Permeability:	5 to 50 mm/day	Drainage:	Well drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	615544
Equipment:		Surface Elevation(m):		Northing:	6394278

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red clay loam with weak grade of subangular blocky structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has many roots present.	5.5	Nil			
50	B1		Red light clay with moderate grade of subangular blocky structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has an average number of roots present.	6	Nil			
100	B2		Red light clay with strong grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has few roots present.	8	Nil			
150	B33		Red light clay with strong grade of polyhedral structure and ped size of 10 cm breaking to 0.5 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has no roots present.	9	Slight	2% Lime		
200			COMMENTS: Mangans common in B2, Large carbonate modules common, 160 to 180cm texture changes, to MC at this depth, 50cm rehab mottle. Bottom of hole at 150					

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TEST PIT MW914

Australian Soil Class:	Sodic Brown Dermosol	Annual Crop Rootzone (cm):	50	Plant Available Water (mm):	61
Landscape position:	Midslope	Surface condition:	Hardset	Vegetation:	Naturalised pasture rolypoly/belah
Estimated Permeability:	<5 mm/day	Drainage:	Imperfectly drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	615332
Equipment:		Surface Elevation(m):		Northing:	6393931

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Brown silty clay loam with weak grade of subangular blocky structure and ped size of 3 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate SOILpak score and has an average number of roots present.	5	Nil			
	B1			6	Nil			
	B2		Brown clay loam, sandy with strong grade of columnar structure and ped size of 20 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a poor to moderate SOILpak score and has an average number of roots present.	7.5	Nil	2% Lime	4	
50	B31		Brown clay loam, sandy with strong grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, partially slakes, has a poor to moderate SOILpak score and has few roots present.	9	Slight	5% Lime		
100			Brown light medium clay with strong grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, partially slakes, has a poor to moderate SOILpak score and has no roots present.					
	B32		Grey light medium clay with moderate grade of polyhedral structure and ped size of 20 cm breaking to 2 cm Soil is not dispersive, partially slakes, has a poor SOILpak score and has no roots present.	9	Slight	2% Lime	4.2	
150			COMMENTS: Deeply gilgaied land unsuitable, for rehab variable/dispersive. Bottom of hole at 150					
200								

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TEST PIT MW915

Australian Soil Class: Sodic Brown Dermosol
Landscape position: Crest
Estimated Permeability: <5 mm/day
Date Excavated: 30/4/09
Equipment:

Annual Crop Rootzone (cm): 50
Surface condition: Hardset
Drainage: Moderately well drained
Logged by: PJH
Surface Elevation (m):

Plant Available Water (mm): 69
Vegetation: Naturalised pasture/soldier bush
Datum: WGS84
Easting: 615280
Northing: 6393736

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Brown silty clay loam with weak grade of angular blocky structure and ped size of 3 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a poor to moderate SOILpak score and has abundant roots present.	5.5	Nil			
	B1		Brown light medium clay with strong grade of angular blocky structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has an average number of roots present.	7	Nil	5% Lime	3.1	
50	B2		Grey light medium clay with strong grade of polyhedral structure and ped size of 20 cm breaking to 5 cm Soil is not dispersive, completely slakes, has a poor to moderate SOILpak score and has few roots present.	9	Slight	10% Lime		
100								
150	B3		Grey medium clay with strong grade of polyhedral structure and ped size of 10 cm breaking to 2 cm Soil is not dispersive, completely slakes, has a poor to moderate SOILpak score and has no roots present.	9	Slight	5% Lime	3.8	
200			COMMENTS: v poor soil unsuitable for rehab, very sodic variable. Bottom of hole at 150					

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TEST PIT MW916

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	80	Plant Available Water (mm):	111
Landscape position:	Lower Slope	Surface condition:	Firm	Vegetation:	Wheat stubble
Estimated Permeability:	5 to 50 mm/day	Drainage:	Well drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	614989
Equipment:		Surface Elevation(m):		Northing:	6394559

DEPTH (centimetres)	Horizon	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)
	A11	Red sandy clay loam with moderate grade of subangular blocky structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has many roots present.	5	Nil		0.5
	A12		6	Nil		
	A2	Red sandy clay loam with moderate grade of subangular blocky structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, partially slakes, has a moderate to good SOILpak score and has many roots present.	7	Nil		
50	B2	Red sandy loam with weak grade of subangular blocky structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a poor to moderate SOILpak score and has an average number of roots present. Red light medium clay with strong grade of polyhedral structure and ped size of 20 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate SOILpak score and has few roots present.	8.5	Slight	5% Lime	0
100	B3	Brown silty clay with moderate grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is slightly dispersive, partially slakes, has a moderate SOILpak score and has no roots present.	9	Nil		
150		COMMENTS: A2 strongly visible , ok for rehab to 70 cm except, A2 (25 to 35 cm) Bottom of hole at 150				
200						

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TEST PIT MW917

Australian Soil Class:	Red Dermosol	Annual Crop Rootzone (cm):	100	Plant Available Water (mm):	145
Landscape position:	Open depression	Surface condition:	Firm	Vegetation:	Wheat stubble
Estimated Permeability:	<5 mm/day	Drainage:	Well drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	614989
Equipment:		Surface Elevation(m):		Northing:	6394559

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A1		Red sandy clay loam with moderate grade of subangular blocky structure and ped size of 5 cm breaking to 2 cm Soil is slightly dispersive, stable (i.e. doesn't disperse or slake), has a moderate SOILpak score and has an average number of roots present.	5	Nil			
	A31		Red silty clay loam with moderate grade of subangular blocky structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, stable (i.e. doesn't disperse or slake), has a moderate to good SOILpak score and has an average number of roots present.	6	Nil		0	
50								
	A32		Red clay loam with moderate grade of polyhedral structure and ped size of 5 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate to good SOILpak score and has few roots present.	7.5	Nil			
100	B2		Brown light clay with strong grade of polyhedral structure and ped size of 10 cm breaking to 1 cm Soil is not dispersive, completely slakes, has a moderate SOILpak score and has no roots present.	8	Nil		0	
150			COMMENTS: Very well drained soil for, drainage line, Rehab to 1m mottle. Bottom of hole at 150					
200								

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TEST PIT MW918

Australian Soil Class:	Brown Dermosol	Annual Crop Rootzone (cm):	70	Plant Available Water (mm):	104
Landscape position:	Level	Surface condition:	Firm	Vegetation:	Wheat stubble
Estimated Permeability:	<5 mm/day	Drainage:	Imperfectly drained	Datum:	WGS84
Date Excavated:	30/4/09	Logged by:	PJH	Easting:	613409
Equipment:		Surface Elevation(m):		Northing:	6396063

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A		Brown light clay	6.5	Nil			
50	B2		Brown light medium clay	7.5	Nil		0.3	
100	B31		Brown sandy clay loam	7.5	Nil	1% Lime	5.5	
150	B21		Brown sandy clay loam	8	Nil	1% Lime		
200	B33		Grey sandy clay loam	7.5	Nil			
			COMMENTS: Bottom of hole at 220					

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TEST PIT MW919

Australian Soil Class: Brown Dermosol
Annual Crop Rootzone (cm): 70
Plant Available Water (mm): 104
Landscape position: Level
Surface condition: Firm
Vegetation: Wheat stubble
Estimated Permeability: <5 mm/day
Drainage: Imperfectly drained
Datum: WGS84
Date Excavated: 30/4/09
Logged by: PJH
Easting: 613390
Equipment:
Surface Elevation(m):
Northing: 6396041

DEPTH (centimetres)	Horizon	GRAPHIC LOG	PROFILE DESCRIPTION	Field pH	Effervescence	Approximate Concretions	Field ECe (dS/m)	SAMPLE
	A		Grey light medium clay	6.5	Nil			
50	B2		Brown light medium clay	8	Nil		1.7	
100	B31		Red clay loam	7.5	Nil		8	
150	B32		Brown light medium clay	8	Nil			
200	B33		Brown silty clay loam	8.5	Nil	10% Lime		
			COMMENTS: Bottom of hole at 230					

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Appendix 3

Particle Size Analysis Results

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Land and Property
Management Authority

Soil Conservation Service

SOIL TEST REPORT

Page 1 of 2

Scone Research Centre

REPORT NO:	SCO09/358R1
REPORT TO:	Brent Forbes Sustainable Soils Management PO Box 130 Warren NSW 2824
REPORT ON:	Six soil samples
PRELIMINARY RESULTS ISSUED:	Not issued
REPORT STATUS:	Final
DATE REPORTED:	21 December 2009
METHODS:	Information on test procedures can be obtained from Scone Research Centre

TESTING CARRIED OUT ON SAMPLE AS RECEIVED
THIS DOCUMENT MAY NOT BE REPRODUCED EXCEPT IN FULL

SR Young

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(Laboratory Manager)

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SOIL AND WATER TESTING LABORATORY
Scone Research Service Centre

Report No: SCO09/358R1
Client Reference: Brent Forbes
Sustainable Soils Management
PO Box 130
Warren NSW 2824

Lab No	Method	P7B/1 Particle Size Analysis (%)					P8A/2
	Sample Id	clay	silt	f sand	c sand	gravel	D%
1	Sodic Derm 0-20cm	19	14	54	13	<1	17
2	Sodic Derm 20-150cm	21	11	55	12	1	56
3	Red Derm 0-20cm	18	17	44	20	1	33
4	Red Derm 20-150cm	30	14	36	19	1	73
5	Sodic Gilgai Dermosol 0-20cm	40	6	26	14	14	27
6	Sodic Gilgai Dermosol 20-150cm	32	9	21	15	23	78

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END OF TEST REPORT