YTC RESOURCES LIMITED

Hera Project, via Nymagee

Soils Assessment

Prepared by

SEEC

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Hera Project, via Nymagee

Soils Assessment

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EXECUTIVE SUMMARY

A detailed assessment of the soils at the Hera Project (via Nymagee) has been conducted by SEEC. This process included an interpretation of the Land System units as described by Walker. 1991. Two land system units (Yackerboon and Kopyje Land Systems) were identified on “The Peak” property, the location of the Project, although one of the land system units (Kopyje) was only present in the far southwest of the property. The latter land system unit will have no mining infrastructure on it but it will have an enlarged dam (Pete’s Tank) with a surface area of 1.7 ha. The two land systems have very similar soil characteristics, and comprise of Lithosols and Red Earth soils.

This study includes an assessment of the soils’ inherent physical and chemical properties, an investigation into how the Project might impact those soils, and their potential for use in rehabilitation activities.

A total of 18 test pits were excavated as part of this soils assessment. Thirteen test pits were dug in the Surface Facilities Area and showed the soils are consistently Lithosols in this location. They contain a significant proportion (>60%) of coarse fragments of the parent rock (angular quartzite and schists). Occasionally there are pockets of deeper, finer, soil but, equally, there are local areas where bedrock is exposed. Bedrock depth in the Surface Facilities Area is consistently less than 1.0 m.

Soils are much better formed on the surrounding slopes and plains away from the Surface Facilities Area . In these areas the soil profile generally consists of red brown silty loam grading gradually to silty clay loam (“Red Earths”). Bedrock is consistently 1 to 1.5 m deep.

Despite their gravely nature the Lithosols were found to be sodic and Type D (dispersive) in accordance with definitions of Landcom, 2004. The Red Earths are Type F (fine) and not dispersible. Given the predominance of the Lithosols across the Surface Facilities Area, and their significantly dispersive nature, wet-type sediment basins should be installed at appropriate locations to capture dirty water.

Both soil types are highly erodible by wind and water and so would require erosion and sediment controls in accordance with recognised industry best practice.

The Lithosols can be moderately saline and this would affect plant choice for revegetation. The soils have low fertility but are close to their nutrient saturation. They have low cation exchange capacity so the use of chemical fertilisers should be minimised. The addition of organic matter to the soils should be the preferred option to increase fertility. The Lithosols are pH neutral but the Red Earths are strongly acidic.

Soil stripping, handling, stockpiling and rehabilitation recommendations are included in Section 4 of this report. The two soil types should be used only to rehabilitate similar topographic landscapes to their source.

Given the Project Site is in far western NSW there is no Agricultural Land Classification mapping available for the Project Site and the surrounding areas. However, the dry and irregular climate the classifications are Class IV (Red Earths) or Class V (Lithosols) (NSW Agriculture (2002))

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1. INTRODUCTION

SEEC has been commissioned by RW Corkery & Co Pty Limited on behalf of YTC Resources Limited to prepare this Soils Assessment. It forms part of an *Environmental Assessment* being prepared in support of a project application for the proposed Hera Project (the Project). The Project Site lies wholly within "The Peak" property (Lot 664, DP761702) located approximately 4 km south of Nymagee, NSW. "The Peak" property is held by YTC Resources Limited under Western Lands Lease No. WLL2455.

The Soils Assessment describes the existing soils, their properties and management implications for the Project. It also identifies the potential impacts of the Project on the soils within the Project Site, including the suitability of their use in land rehabilitation to be undertaken within the Project Site upon cessation of mining activities. The engineering and geochemical properties of the soils are described elsewhere in two separate reports (Coffey, 2010a; Coffey, 2010b) and summarised in Section 2 of the *Environmental Assessment*.

For the purposes of this report, the following definitions apply (see also **Figure 1**):

- The "property" refers to "The Peak" property noted above.
- The "Project Site" refers to an area identified within the property that will be developed and will encompass Project-related disturbance.
- Surface Facilities Area refers to a location within the Project Site that will accommodate the ore processing plant, contractor offices, laydown and workshop areas, car park, power station, fuel tank and refuelling area, run-of-mine (ROM) pad, the temporary waste rock emplacement, and a portal leading to the underground mine via a box cut and a decline.
- Pete's Tank is an existing dam in the far southwest corner of the property. The Hera Project proposes to expand Pete's Tank to a total water holding capacity of 20 ML. Back Tank West is an existing dam located approximately central to the southern half of the property.
- Back Tank East is a proposed new surface water storage dam to be constructed to hold 90 ML of water and which will, together with Pete's Tank, meet part operational water requirements of the Project.
- The Tailings Storage Facility will be used for the storage of the tailings from the ore processing plant located within the Surface Facilities Area.

SEEC acknowledge receipt of the Director General's requirements for the Hera Project (reference 10_0191) and DECCW's requirements given in their letter dated 23 November 2010. Neither the DGRs or the DECCW's Environmental Assessment Requirements mention soils as a key environmental issue. Nevertheless, the soils assessment has been undertaken to better understand the properties of the soils within the Project Site and to provide strategies for their appropriate handling during the establishment, operational and rehabilitation phases. Both those documents require investigations on surface water and that is the subject of a Surface Water Assessment also undertaken by SEEC and reported separately from this document.

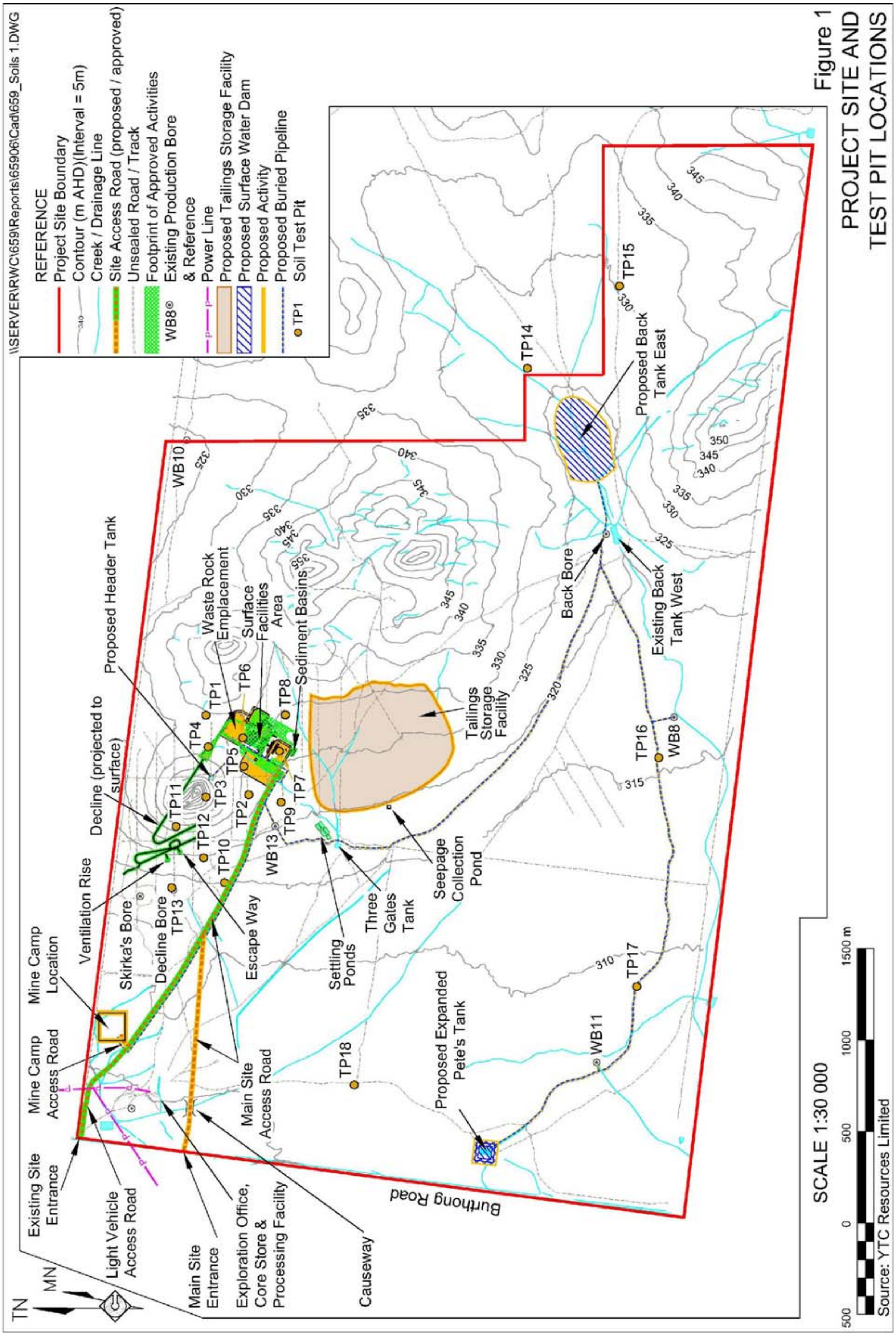

Figure 1
PROJECT SITE AND TEST PIT LOCATIONS

2. PROJECT DESCRIPTION

As identified in Section 1.7 of the *Environmental Assessment*, a number of components of the Hera Project have been previously approved. These include the following (**Figure 1**).

- Construction and use of infrastructure required for an underground mine including a box cut, portal and decline, magazine and ventilation rises.
- Construction and use an integrated ore stockpile area and temporary Waste Rock Emplacement.
- Installation and use of one or more diesel generators within the power station and the associated Fuel Storage and Recycling Area.
- Construction and use of site offices, ablutions facilities, vehicle parking, workshop, laydown area and associated infrastructure.
- Establishment of on-site communications facilities.
- Construction and use of water management structures.
- Construction and use of an access road (referred to in this document as the Light Vehicle Access Road). For the purposes of this application, the Light Vehicle Access Road would be used by light vehicles only.

The Project would include the following activities which would require approval (**Figure 1**).

- Extraction of waste rock and ore material, using underground sublevel open-stope mining methods at the maximum rate of material would be approximately 350 000t per year for approximately 5.5 years.
- Construction and use of a Surface Facilities Area that would incorporate a range of approved infrastructure, including expanded site offices for the Proponent and Contractors, ablutions facilities, vehicle parking, power station, fuel storage, refuelling area, workshop and laydown areas.
- Construction and use of a Processing Plant within the Surface Facilities Area comprising crushing and grinding, gravity separation, flotation, leach and gold recovery circuits and ancillary infrastructure to produce approximately 33 000oz of gold, 74 000oz of silver, 10 000t of lead and 10 000t of zinc per year.
- Construction and use of a temporary Waste Rock Emplacement, incorporating an acid rock drainage encapsulation area and an associated Leachate Management Pond.
- Construction and use of a Tailings Storage Facility with the associated Seepage Collection Pond.
- Construction of a Mine Camp and Mine Camp Access Road for mine personnel.

- Construction and use of a surface water harvesting system, including expansion of Pete's Tank and construction of Back Tank East and associated water reticulation system.
- Construction and use of the Main Site Access Road and the associated intersection to allow site access from Burthong Road by light and heavy vehicles.
- Transportation of concentrate from the Project Site to the Proponent's customers via public roads surrounding the Project Site.
- Construction and use of ancillary infrastructure, including soil stockpiles, core storage yards, internal roads and tracks, and sediment and erosion management structures not already approved.
- Construction and rehabilitation of a final landform that would be geotechnically stable and suitable for an end land use of agriculture or nature conservation.

3. MAPPING

Broad-scale land system mapping for the general geographic area was conducted by Walker (1991). It shows the Project Site lies on two land systems (**Figure 2)**

- the Yackerboon Land System; and
- the Kopyje Land System.
- By far the most dominant is the Yackerboon Land System. It is mapped as occurring over the whole property, except the far southwest and southeast corners. It underlies all of the Surface Facilities Area and the existing Back Tank but not Pete's Tank (**Figure 2**).

Walker (1991) identifies the Yackerboon Land System as occurring on slightly undulating country on Silurian and Siluro-Devonian siltstones and sandstone. It comprises Red Earths and some Lithosols. Three soil units have been identified within the Yackerboon Land System as follows.

- Unit 1 – Ridge Crests: Acid Red Earths[1] with areas of loamy Lithosols[2]. Abundant quartz and other gravel.
- Unit 2 – Ridge Slopes: Neutral (pH) Red Earths and areas of calcareous red earths.
- Unit 3 – Drainage Tracts: Calcareous Red Earths with pockets of deep sandy alluvial soil.

[1] Generally fine grained, 'earthy' soils.
[2] A shallow soil showing minimal profile development and dominated by the presence of weathering rock and fragments there-from.

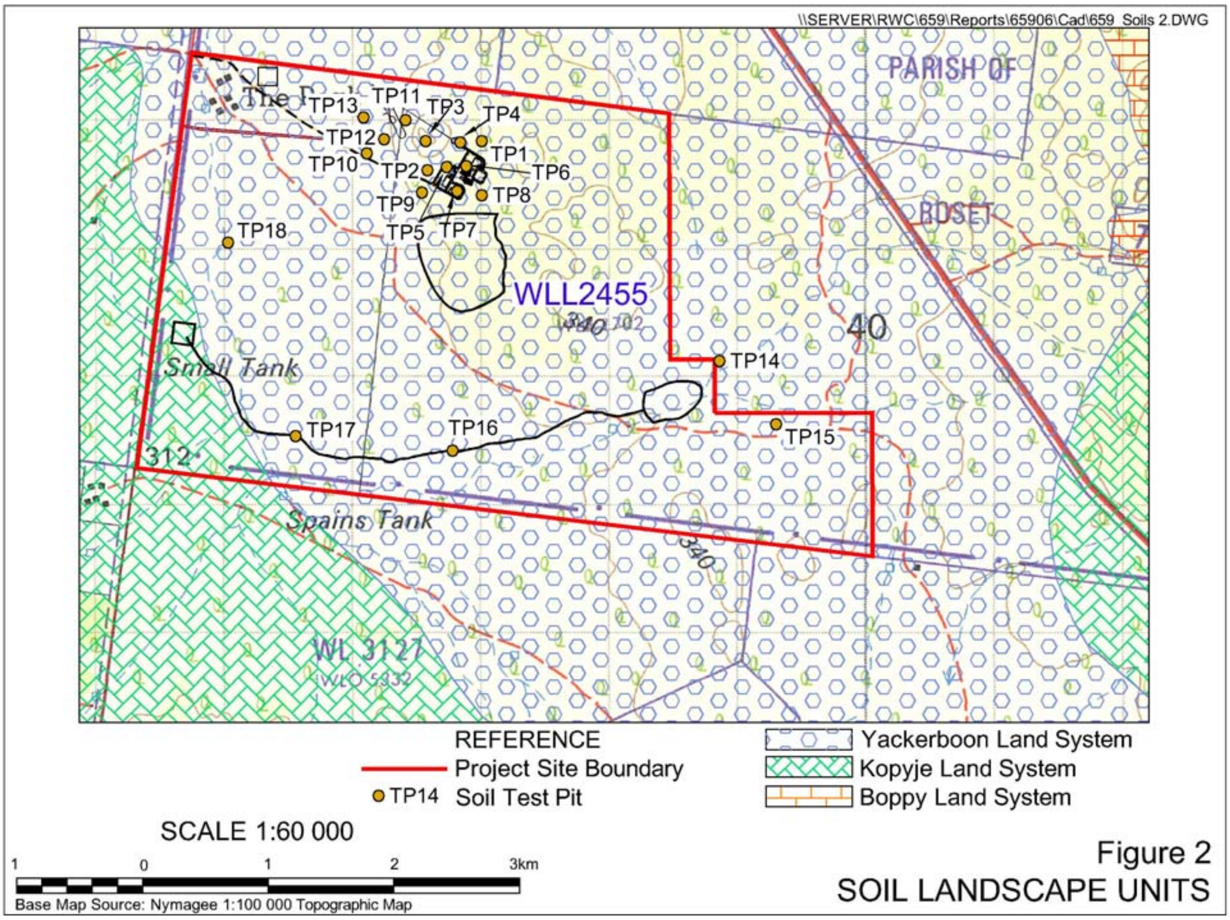

Figure 2
SOIL LANDSCAPE UNITS

The Kopyje Land System also occurs on slightly undulating country. It is formed on Ordovician quartzite, sandstone and slate and also comprises red earths and Lithosols. Three soil units have been identified within the Kopyje Land System as follows.

- Unit 1 – Mallee Crests: Loamy and sandy Lithosols. Abundant quartz and other gravel.
- Unit 2 – Open crests and slopes: Loamy Lithosols and neutral (pH) Red Earths. Variable quartz and gravel.
- Unit 3 – Drainage Lines: Deep neutral calcareous Red Earths with hardpans.

4. SITE – SPECIFIC INVESTIGATION

Soils were investigated by excavating a series of test pits (labelled TP1 – TP18 in Figure 1) with a backhoe across the property. Thirteen test pits (TP1 – TP13) were dug on a grid pattern in and near to the proposed Surface Infrastructure Area and a further five were dug in the surrounding slopes and plains to gauge the soil properties in the water catchments (**Figure 1**). The individual test pit logs are given in **Appendix 1**.

Our investigations showed the soils conform to the expectations of the Soil Land System Mapping. Very gravelly, quartz-rich, shallow soils (Lithosols) were encountered over most of the Surface Facilities Area and deeper uniform Red Earths without coarse fragments were encountered on the surrounding slopes and plains.

Across the proposed Surface Facilities Area the soils are consistently Lithosols, with a thin, poorly formed, topsoil. They contain a significant proportion (>60%) of coarse fragments of the parent rock (angular quartzite and schists). Occasionally there are pockets of deeper, finer soil but, equally, there are local areas where bedrock is exposed. Bedrock depth is consistently less than 1.0 m.

Soils are much better formed on the surrounding slopes and plains away from the Surface Facilities Area. In these areas the soil profile generally consists of red brown silty loam grading gradually to silty clay loam. Bedrock is consistently 1 to 1.5 m deep.

Soil samples from test pits TP3 and TP5 (Lithosols) and TP8 (Red Earth) were sent to NSW Department of Land's Soil Laboratory in Scone for chemical and mechanical / physical tests as described in **Table 1** and **Appendix 2**. The following sub-sections provide interpretations of the results obtained from the laboratory testing.

Table 1
Laboratory Testing Schedule

Test Pit	Soil Type	Physical Tests	Chemical Tests
3	Lithosol	PSA, D%, EAT, OC%, LL%, PL%,LS%	pH, EC, CEC, Exch Cations
5	Lithosol	PSA, D%, EAT, OC%, LL%, PL%,LS%	pH, EC, CEC, Exch Cations
8	Red Earth	PSA, D%, EAT, OC%, LL%, PL%,LS%	pH, EC, CEC, Exch Cations

Key to Abbreviations:
PSA = Particle size analysis; D% = Dispersion percentage; EAT = Emerson aggregate test
OC% = Organic carbon percentage; EC = Electrical conductivity; CEC = Cation exchange capacity
Exch Cations = Exchangeable cations (sodium, potassium, calcium, magnesium)
LL% = Liquid Limit; PL% = Plastic Limit; LS% = Linear Shrinkage

4.1 SOIL ERODIBILITY

4.1.1 K-Factor (Soil Erodibility)

Table 2 contains the results of K-Factor analyses on the three soil samples, derived using the method described in Rosewell (1993). Soil erodibility (K-factor) ranges from 0.029 (moderate) for the Red Earths to 0.053 (high) for the Lithosols.

Table 2
Soil Erodibility (from Rosewell, 1993 and Rosewell and Edwards, 1988)

Test Pit	Soil Type	K-Factor	Relative Erodibility
3	Lithosol	0.041	High
5	Lithosol	0.053	High
8	Red Earth	0.029	Moderate

4.1.2 Wind Erosion

Table 3 summarises the key laboratory test results as they relate to the soils' susceptibility to wind erosion. All soils have high susceptibility to wind erosion.

Table 3
Summary of Laboratory Test Results for Susceptibility to Wind Erosion

Test Pit	Soil Type	Relative Fine Sand Content (%)	Relative Coarse Sand Content (%)	Profile Drainage	Wind Erodibility Rating
3	Lithosol	37	10	Moderate	High
5	Lithosol	25	16	Moderate	High
8	Red Earth	45	15	Moderate	Very high
(Adapted from Wells and King, 1989 as described in Hazelton and Murphy, 1992).					

4.1.3 Soil Loss and Erosion Hazard

The annual soil loss was calculated using SOILOSS 5.3 (Rosewell, 2005), which is based on the Revised Universal Soil Loss Equation (RUSLE). For the purposes of this analysis, the following inputs were used (as recommended in Landcom, 2004).

- R-factor (rainfall factor): 1,150 in Rainfall Zone 9.
- Maximum K-factors for each soil landscape (from Table 2).
- Typical slope gradients for each landscape unit, plus a slope length of 80 m.
- A rill:interill ratio of 3:1.
- P-factor (Conservation practice) of 1.3 (i.e. assuming no specific conservation practices).
- C-factor (Ground cover factor) of 1.0 (i.e. assuming bare soils).

The results of this analysis are contained in **Table 4**.

Table 4
Soil Loss Calculations Using the RUSLE and SOILOSS 5.3 (Rosewell, 2005)

Soil Type	Maximum K-factor (from Table 3)	Typical Slope Gradient	Calculated Soil Loss (t/ha/yr)	Soil Loss Class (from Landcom, 2004)
Lithosol	0.051	6%	112	Class 1 – Very Low
Red Earth	0.029	2%	18	Class 1 – Very Low

Under the guidelines and recommendations contained in Landcom (2004), construction activities in rainfall zone 9 can occur at any time of year using the standard suite of Best Management Practices (BMPs) for erosion and sediment control if the soil loss class is 4 or less (which it is).

4.1.4 Soil Dispersibility

Emerson Aggregate Test (EAT) testing was done to identify potential dispersibility. The results are presented in **Table 5**.

Table 5
Emerson Aggregate Test Results and Analysis (from Charman, 1978)

Test Pit	Soil Type	EAT Result	Dispersibility
3	Lithosol	2(3)	Dispersible
5	Lithosol	3(2)	Not dispersible
8	Red Earth	3(2)	Not dispersible

Further to the EAT results presented in **Table 5**, results of an analysis of dispersibility is presented in **Table 6** using the method outlined in Landcom (2004) to identify whether soils are "significantly dispersible".

Table 6
Soil Dispersion Laboratory Results and Particle Size Analysis (PSA) Results

Test Pit	Layer	Dispersion Percentage (%)	PSA Clay %	PSA Silt %	Dispersion Significance*	Soil Type
3	Lithosol	82	11	14	15	Type D (dispersible)
5	Lithosol	29	9	24	6	Type C (coarse) but borders Type F
8	Red Earth	19	18	11	4	Type F (fine)

Note: The percentage of the whole soil dispersible is calculated from the mechanically-dispersed PSA and the dispersion percentage as (Clay % + Half of the silt %) x Dispersion %. If this value exceeds 10%, the soil is considered to be "significantly dispersible" – i.e. it is a Type D (dispersible) soil according to Landcom (2004).

One of the Lithosols, from TP3, was found to be significantly dispersible (Type D Soil), the other was Type C (coarse) but bordered Type F (fine). The Red Earth was found to be Type F (Fine) but not dispersible.

The Exchangeable Sodium Percentage (ESP) was also calculated to determine the sodicity of the soils, which can also have a bearing on potential soil dispersion (see **Table 7**).

Table 7
Exchangeable Sodium Percentage (ESP)

Test Pit	Layer	Na (me/100g)	CEC	ESP %	Sodicity
3	Lithosol	2.5	8.5	29	Strongly sodic
5	Lithosol	0.8	13.6	6	Sodic (just)
8	Red Earth	0.1	8.4	1	Non-sodic

4.2 ANALYSIS OF CHEMICAL TEST RESULTS

4.2.1 Salinity

The results of electrical conductivity measurements of representative soil samples are included in **Table 8**, along with an analysis of their salinity levels. Testing shows that the Lithosols can be moderately saline but the Red Earths are not.

Table 8
Electrical Conductivity (EC) and Salinity

Test Pit	Soil Type	EC (dS/m)	Soil texture	Multiplier factor	ECe	Salinity
3	Lithosol	0.35	Loamy Sand	17	6	Moderately saline
5	Lithosol	0.02	Loamy Sand	17	0.34	Non-saline
8	Red Earth	0.01	Sandy loam	11	0.1	Non-saline

4.2.2 Cation Exchange Capacity

Cation exchange capacity (CEC) is the capacity of the soil to hold and exchange cations. It is a major controlling agent of the soil's structure, nutrient availability for plant growth and its ability to hold onto nutrients in fertilizers. The results are given in **Table 9** and show that, in general, the soils have a generally low CEC.

Table 9
Cation Exchange Capacities

Test Pit	Soil Type	CEC (me/100g)	Classification
3	Lithosol	8.5	Low
5	Lithosol	13.6	Moderate
8	Red Earth	8.4	Low

4.2.3 Base Saturation

Base saturation is determined by the sum of potassium, calcium, magnesium and sodium ion concentrations, expressed as a percentage of the total CEC. It provides an indication of how closely nutrient status approaches potential fertility and the extent of leaching that has occurred of base cations from the soil (Hazelton and Murphy, 1992). **Table 10** shows the results of base saturation analysis for the soils from TP3, TP5 and TP8. , showing that:

- Despite their relative infertility, nutrient status is good in all samples (Lithosol and Red Earth), and
- Only minimal leaching of nutrients has occurred in the past from the soil units analysed.

Table 10
Base Saturation Percentage

Test Pit	Soil Type	Base Saturation (%)	Classification
3	Lithosol	96	Very High
5	Lithosol	82	Very High
8	Red Earth	77	High

4.2.4 pH

The results of pH testing are shown in **Table 11**. The Lithosols are essentially neutral but the Red Earth is strongly acidic.

Table 11
pH Testing Results

Test Pit	Soil Type	pH	Classification
3	Lithosol	7.7	Slightly alkaline
5	Lithosol	7	Neutral
8	Red Earth	5.4	Strongly Acidic

4.2.5 Organic Matter

Organic matter is largely responsible for the physical and chemical fertility of a soil. The results (**Table 12**) show that soils across the site have consistently very low organic matter content. This is reflected in the weak soil structure. An addition of organic material into the soils when using them for rehabilitation works would improve soil structure and, therefore, the success of any seeding program.

Table 12
Organic Matter Results and Analysis

Test Pit	Soil Type	Organic Matter (g/100g)	Rating
3	Lithosol	0.25	Extremely Low
5	Lithosol	0.53	Very Low
8	Red Earth	0.85	Very Low

4.3 SOIL STRUCTURE

The Lithosols are massive with little structure, so would not require any specific management techniques when stripping or stockpiling to minimise potential damage to soil structure. Poorly-structured, massive soils tend to perform poorly in revegetation unless appropriate amelioration or management is undertaken to improve seedbed conditions.

The Red Earths have a moderate structure, particularly the subsoils. Stripping these soils could damage their structure if it was carried out when they were too wet or too dry. Maintaining the natural structure of these soils would assist with rehabilitation activities, as these soils tend to provide an adequate seedbed for germination.

4.4 ENGINEERING CLASSIFICATION

Results of the engineering properties of the soils from TP3, TP5 and TP8, as measured by their Liquid Limit, Plastic Limit and Linear Shrinkage values, are presented in **Table 13**.

Table 13
Engineering Properties

Test Pit	Soil Type	Liquid Limit (%)	Plastic Limit (%)	Linear Shrinkage (%)	Engineering Classification AS 1726 (1993)
3	Lithosol	20	13	3	GS Fine Sandy Gravel
5	Lithosol	28	14	6.5	GS Fine Sandy Gravel
8	Red Earth	21	14	3.5	SM Silty Sand

The results indicate the following engineering classification for the soils analysed:

- the Lithosol soils fall under the GS Fine Sandy Gravel engineering classification, while
- the Red Earth soil falls under the SM Silty Sand engineering classification.

4.5 SOIL DRAINAGE

4.5.1 Lithosols

The Lithosols are moderately permeable due to their high gravel and sand content. However, that permeability would be affected by the potentially dispersive soil matrix and the shallow bedrock. Considering that up to two-thirds of the soil mass consists of rock fragments, the water–holding capacity of these soils is not high. They are classified as Hydrological Group C (Landcom, 2004) as, although they are permeable, they are shallow and the bedrock will affect infiltration.

4.5.2 Red Earths

The Red Earths are moderately well to imperfectly drained over the entire soil profile. They are relatively sandy and this promotes fairly rapid infiltration of initial rainfall. They are slightly more clayey at depth and this, together with the underlying bedrock, will impede the movement of water to deep groundwater. They also tend to crust when dry. They are classified as Hydrological Group B (Landcom, 2004).

4.6 SOILS SUMMARY

4.6.1 The Lithosols

These soils underlie the entire proposed Surface Infrastructure Area. For the purposes of this assessment, we have characterised them as follows:

- Type D (dispersive) for the purpose of sediment basin design
- Sodic
- pH neutral
- Low Cation Exchange Capacity
- Saturated with cations
- Shallow and gravely
- Low in organic matter
- Hydrological Group C.

4.6.2 The Red Earths

These soils occur on the plains surrounding the Surface Facilities Area, including the proposed locations for the Tailings Storage Facility and water supply dams. For the purposes of this assessment, we have characterised them as follows:

- Type F (fine) for the purpose of sediment basin design
- Non-sodic
- Strongly acidic
- Low Cation Exchange Capacity
- Saturated with cations
- Moderately deep
- Low in organic matter
- Hydrological Group B

4.7 AGRICULTURAL LAND CLASSIFICATION

Given the Project Site is in far western NSW there is no Agricultural Land Classification mapping available. However, the dry and irregular climate means the Agricultural Land Classes are:

- Class IV for Red Earths
- Class V for Lithosols

in accordance with NSW Agriculture (2002).

5. RECOMMENDATIONS FOR SOIL MANAGEMENT

5.1 SOIL STRIPPING

5.1.1 Surface Facilities and Waste Rock Emplacement Areas

The Surface Infrastructure Area is underlain by Lithosols – coarse gravely soils will little or no developed topsoil, although minor organic matter is present near the surface. They exist to depths which vary from 0 to about 1 m deep. We recommend the topsoil stripping depth here be 200 mm and the soil stored in stockpiles no more than 2 m in height. This will maximise the viability of any seed stock within the soil. Subsoils may be stripped to bedrock if necessary and stockpiled separately.

5.1.2 Tailings Storage Facility and Storage Dams

Earthworks are proposed to provide capacity for Tailings Storage Facility (with surface area of 43.8 ha) and to increase the capacity of Pete's Tank to 20 ML, and Back Tank. These areas are on the Red Earths and it is proposed to remove both the topsoil and the subsoil.

Topsoil should be stripped to 300 mm and either used immediately or stored in stockpiles no more than 2 m in height. This will maximise the viability of any seed stock within the soil. Subsoil can be removed down to the bedrock and either re-used immediately or stored in stockpiles no more than 3 m in height.

5.2 CONTROLLING WIND EROSION

The soils within the Project Site are susceptible to wind erosion. This should be controlled by regular wetting of the disturbed surfaces and surfaces that have minimal vegetation and / or grass cover. Dust suppression should also be enhanced by the use of a soil surface stabiliser such as Gluon or equivalent. Such stabilisers are added to water and dispensed from a water cart.

5.3 CONTROLLING SHEET AND GULLY EROSION

The soils within the Project Site are susceptible to sheet and gully erosion. Disturbed areas, soil stockpiles, and channels should be rapidly stabilised with rock-pitching over geotextile. Soil and water management issues are discussed in more detail in the Surface Water Assessment report, also prepared by SEEC.

5.4 SOIL REUSE

5.4.1 Anticipated Requirements for Rehabilitation

Soil will be required to rehabilitate all disturbed areas on completion of mining activities, following decommissioning of all surface structures and transfer of any remaining waste rock underground to backfill the mined stopes.

The soils (both Lithosols and the Red Earths) stockpiled from the site establishment and construction phase of the Project should only be used in the rehabilitation of the areas noted above if they are suitable, as described below.

5.4.2 The Lithosols

The Lithosols should be reused to rehabilitate land with more than 2% slope, but no more than 10% grade. They may be placed directly onto a scarified surface without compaction.

5.4.3 The Red Earths

The Red Earths should be used to rehabilitate land with no more than 2% slope. Topsoil and subsoil must be placed in their correct order and nominally compacted (placed in thick lifts). The subsoil may also be used to form the new dam walls for Pete's Tank and the Back Tank (subject to the Geotechnical Engineer's requirements).

5.4.4 Surface Profiling and Revegetation

Rehabilitated slopes and existing soils that would be exposed for more than three months would require revegetation to provide a minimum cover of at least 30% (Walker, 1991).

- Slopes between 2 and 10% would have a concave profile and should be covered with Lithosols. The resultant roughness, together with the use of locally-sourced mulch, is expected to be sufficient to ensure moisture is captured without the need for deep furrowing or "moonscaping" (which can both lead to long-term problems (Landloch, 2005).
- Slopes less than 2% should be rehabilitated with Red Earth. This soil is erodible and so furrowing is not recommended. In this case, the length of exposed slopes would be kept below 80 m by using windrows of mulch placed along the contour (being careful that these do not act as drains themselves).
- Slopes more than 10% should be confined to dam walls and protected with graded rock-pitching.

5.4.5 Fertiliser Use

The soils are close to their base saturation levels (**Table 10**) and have low CEC. Therefore, we do not recommend the use of chemical fertilisers. If required, the fertility of the soils may be improved by incorporating organic matter. Using organic matter will also be more compatible with the re-introduction of native species. It may be sourced from composting of cleared vegetation or from off-site.

6. ONSITE WASTEWATER MANAGEMENT

Wastewater will be generated in the offices and amenities. It should be treated on site and then disposed in one or more effluent management area (EMA). Those EMAs should be located on the Red Earths, not the Lithosols as the former are better suited to provide a good vegetative growth to ensure nutrient up-take.

7. REFERENCES

AS 1726 (1993). *Geotechnical Site Investigations*. Standards Australia, Sydney NSW.

Charman, P.E.V. (ed.) (1978). *Soils of New South Wales, Their Characterisation, Classification and Conservation.* Soil Conservation Service Technical Handbook No. 1, Soil Conservation Service of New South Wales, Sydney.

Charman, P.E.V. and Murphy, B.W. (eds). (2007). *Soils; Their Properties and Management.* Third Edition. Oxford University Press.

Coffey Mining Pty Ltd. (2010) *Geotechnical Investigation of Proposed TSF (Site A) Hera Project*, (MINEWPER00768AA_Geotech_Inv_Rep), June 2010.Coffey Mining Pty Ltd. (2010) *Tailings Geochemistry*, (MINEWPER00768AA_Geochemistry) October 2010.Department of Environment and Climate Change (DECC). (2008). *Managing Urban Stormwater: Soils and Construction.* Volume 2E Mines and Quarries. NSW Department of Environment and Climate Change, Sydney.

Department of Land and Water Conservation (DLWC). (2000). *Soil and Landscape Issues in Environmental Impact Assessment.* Technical Report No. 34, 2nd edition. NSW Department of Land and Water Conservation, Sydney.

Emery, K.A. (1985). *Rural Land Capability Mapping*. Soil Conservation Service of NSW, Sydney.

Hazelton, P.A. and Murphy, B.W. (eds). (1992). *What Do All the Numbers Mean? A Guide for the Interpretation of Soil Test Results.* Department of Conservation and Land Management, Sydney.

Hicks, R.W. (1991). Soil Engineering Properties. In Charman, P.E.V. and Murphy, B.W. (eds). *Soils; Their Properties and Management.* Sydney University Press.

Hulme, T., Grosskopf, T. and Hindle, J. (2002). Agfact AC.25 Agricultural Land Classification. NSW Agriculture

Landcom (2004). *Managing Urban Stormwater: Soils and Construction. 4th Edition.* Volume 1. NSW Government, Sydney.

Landcom, 2004. *Managing Urban Stormwater. Volume 1. Soils and Construction.*

Landloch, 2003. *Surface Roughness on Rehabilitated Slopes*. Landloch P/L

Landloch, 2005. *Concave Batter Slopes on Constructed Landforms*. Landloch P/L.

McDonald, R.C., Isbell, R.F., Speight, J.G, Walker, J. and Hopkins, M.S. (1990). *Australian Soil and Land Survey – Field Handbook* (2nd edition). Inkata Press, Melbourne and Sydney.

Mills, J.J., Murphy, B.W. and Wickham, H.G. (1980). A study of three simple laboratory tests for the prediction of shrink-swell behaviour. *J. Soil Cons. NSW* 36, 77-82.

NSW Agriculture (2002) Agfact AC.25. Agricultural Land Classification.

NSW Department of Health. (2001). Septic Tank and Collection Well Accreditation Guideline. NSW Government.

Rosewell, C.J. (2005). Soiloss Version 5.3.

Rosewell, C.J. and Edwards, K. (1988). Soiloss; A program to assist in the selection of management practices to reduce soil erosion. Soil Conservation Service of NSW Technical Handbook No 11.

Rosewell, C.J. (1993). A program to assist in the selection of management practices to reduce erosion, (SOILOSS Handbook), Technical Handbook No. 11 (2^{nd} edition) Soil Conservation Service, Sydney NSW.

R.W. Corkery & Co. Pty Limited (2010). Preliminary *Environmental Assessment for the Hera Project*, via Nymagee.

Walker, P.J. 1991. *Land Systems of Western New South Wales. Soil Conservation Service Technical Report No. 25.*

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Appendices

Total number of pages including blank pages = 18

Appendix 1 Test Pit Logs

Appendix 2 Soil Analysis Results

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Appendix 1
Test Pit Logs

Number of pages including blank pages = 12

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SEEC

Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:	See SEEC Drawing 10000076-D1	Slope (%):	

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 1

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown clay loam. Moderately pedal.			Slope 2%
				Mottled red brown and yellow brown gravelly sandy clay loam. 60-70% shale fragments			
		1.0		Mottled yellow and grey medium clay.			
				Rock			TP1 refusal at 1100 mm on weathered rock.
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 2

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown sandy clay loam.			Slope 6-7%. Gravelly surface.
				Fractured shaley bedrock.			TP2 refusal at 500 mm on bedrock
		1.0					
		2.0					

Key

Method		Sampling/testing		Consistency / strength			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist	The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations			
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

Comments:

This log must be read with the accompanying report by SEEC Rev 1, 10/07

SEEC

Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:	See SEEC Drawing 10000076-D1	Slope (%):	

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 3

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown, sandy clay loam, massive-very gravelly- schist.			TP3 refusal at 450 mm on bedrock
		1.0					
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 4

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown, clay loam to loam. Sandy in places. Moderately pedal.			
		1.0		Yellow weathered rock.			TP4 refusal at 900 mm on bedrock
		2.0					

Key

Method		**Sampling/testing**		**Consistency / strength**			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist				
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations

Comments:

This log must be read with the accompanying report by SEEC Rev 1, 10/07

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Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:	See SEEC Drawing 10000076-D1	Slope (%):	4-5%

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 5

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown, sandy clay loam gravelly (rock fragments).			
				Light grey clayey gravel-mostly shale in a clay matrix. Massive.			
							TP5 refusal at 700 mm in shaley bedrock.
		1.0					
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 6

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				As per TP5, gravel with sandy loam matrix.			
							TP6 refusal at 500 mm on bedrock
		1.0					
		2.0					

Key

Method		**Sampling/testing**		**Consistency / strength**			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist				
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations

Comments:

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Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:	See SEEC Drawing 10000076-D1	Slope (%):	

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 7

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown gravelly clay loam. Common rock fragments.			
				Rock fragments in a clay loam matrix. Clay matrix (grey) at depth.			TP7 refusal at 700 mm.
		1.0					
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 8

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown, sandy loam, weakly pedal. Some gravel.			
				Light grey gravelly sandy light clay. Rock fragments 30%.			
		1.0		Bedrock.			TP8 refusal at 1000 mm on bedrock
		2.0					

Key

Method		Sampling/testing		Consistency / strength			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist	The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations			
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

Comments:

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Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:	See SEEC Drawing 10000076-D1	Slope (%):	

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 9

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown sandy loam. Weakly pedal.			Slope 4-5%.
				.Red brown sandy loam with yellow brown rock fragments, 65-75%.			
				Gravelly mottled brown and grey strongly pedal medium to heavy clay. Common rock fragments.			TP 9 refusal at 1000 mm on weathered rock.
		1.0					
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 10

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Rock cobbles in sandy loam matrix. Red brown. Cobbles to 75mm. 75% cobbles.			Slope 3%.
		1.0					
							TP10 refusal at 1000 mm on rock.
		2.0					

Key

Method		**Sampling/testing**		**Consistency / strength**			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist	The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations			
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

Comments:

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Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:	See SEEC Drawing 10000076-D1	Slope (%):	

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 11

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Rock cobbles in sandy loam matrix. Red brown. Cobbles to 75 mm. 75% cobbles.			
				Weathered shale-light grey, fractured. Clay matrix.			TP 11 refusal at 1000 mm on shaley bedrock.
		1.0					
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 12

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Rock cobbles in sandy loam matrix. Red brown. Cobbles to 75 mm. 75% cobbles.			
		1.0					
				Some grey clay at base. Grey clayey gravel. Small gravel. Medium to heavy clay (not seen before).			TP12 refusal at 1400 mm on bedrock
		2.0					

Key

Method		Sampling/testing		Consistency / strength			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist	The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations			
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

Comments:

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Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:	See SEEC Drawing 10000076-D1	Slope (%):	

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 13

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown sandy clay loam.			
				As above but cobbly. Gravelly sandy loam. Redder.			
		1.0		Mottled red brown and grey gravelly clay. Common rock fragments. Light clay.			
							TP13 refusal at 1200 mm on weathered shaley rock.
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 14

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown sandy loam and clay loam. Moderately pedal. No course fragments.			
		1.0					TP12 Refusal at 1000mm.
		2.0					

Key

Method		**Sampling/testing**		**Consistency / strength**			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist	The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations			
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

Comments:

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Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:		Slope (%):	

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 15

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown sandy loam to clay loam. Grades to clay loam to light clay. Becomes clayeyer at bottom.			
		1.0					TP15 refusal at 900mm.
		2.0					

Excavation dimensions: length: width: orientation: RL surface

Test Pit № 16

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown sandy loam. Moderately pedal. No coarse fragments. Grades to silty clay loam. Minor gravel (rock fragments) at bottom.			
		1.0					
							TP16 refusal at 1600 mm on bedrock
		2.0					

Key

Method		Sampling/testing		Consistency / strength			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist				
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations

Comments:

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SEEC

Engineering Log, Excavations

SEEC

Job №: 10000076

Client:	YTC Resources	Date excavated:	20 May 2010
Project	Hera Gold Mine	Logged by:	MVP
		Datum:	
Pit location:		Slope (%):	

Excavation dimensions: length: width: orientation: RL surface **Test Pit № 17**

Method	Sampling / testing	Depth (m)	Layer Change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown loam, moderately pedal. Grades to silty clay loam at 400 mm.			
				Silty clay loam, strongly pedal (very small peds).			
		1.0					TP17 refusal at 1100 mm.
		2.0					

Excavation dimensions: length: width: orientation: RL surface **Test Pit № 18**

Method	Sampling / testing	Depth (m)	layer change	Material description	Moisture condition	Consist.y / strength	Remarks
				Red brown sandy clay loam.			
							TP18 refusal at 900 mm.
		1.0					
		2.0					

Key

Method		**Sampling/testing**		**Consistency / strength**			
N	natural exposure	HP	hand penetrometer test (kPa)	VS	very soft	Fb	friable
A	hand auger	DCP	dynamic cone penetrometer test (blows/150 mm)	S	soft	VL	very loose
ES	excavation, shovel	O	other	F	firm	L	loose
EB	excavation, backhoe			St	stiff	MD	medium dense
ED	excavation, bulldozer blade	**Moisture condition**		VSt	very stiff	D	dense
EG	excavation, grader	D	dry	H	hard	VD	very dense
G	gully	MM	moderately moist				
C	undisturbed core sample 50 mm diameter	M	moist				
O	other	W	wet				

The classification symbols and soil descriptions are based on the Unified Soil Classification System (Corps of Engineers, 1953) and AS 1726-1993, Geotechnical Site Investigations

Comments:

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Appendix 2
Soil Analysis Results

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Soil Laboratory Test results

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Page 2 of 2

SOIL AND WATER TESTING LABORATORY
Scone Research Service Centre

Report No: SCO10/298R2
Client Reference: M Passfield
SEEC
PO Box 1098
Bowral NSW 2576

Lab No	Method	P7B/2 Particle Size Analysis (%)					P7C/2 Particle Size Analysis - mech dis (%)					P8A/2	P9B/2
	Sample Id	clay	silt	f sand	c sand	gravel	clay	silt	f sand	c sand	gravel	D%	EAT
1	10000076 TP3	15	11	37	10	27	11	14	38	10	27	82	2(3)
2	10000076 TP5	24	10	25	16	25	18	11	30	16	25	19	3(2)
3	10000076 TP8	21	16	45	15	3	9	24	48	15	3	29	3(2)

Lab No	Method	C5A/3 CEC & exchangeable cations (me/100g)						C1A/4	C2A/3	C6A/2	P2B/2	P3A/1	P6A/1
	Sample Id	CEC	Na	K	Ca	Mg	Al	EC (dS/m)	pH	OC (%)	LL (%)	PL (%)	LS (%)
1	10000076 TP3	8.5	2.5	0.2	0.4	5.1	<0.1	0.35	7.7	0.25	20	13	3.0
2	10000076 TP5	13.6	0.8	1.0	6.2	3.2	<0.1	0.02	7.0	0.53	28	14	6.5
3	10000076 TP8	8.4	0.1	0.8	3.0	2.6	<0.1	0.01	5.4	0.85	21	14	3.5

END OF TEST REPORT

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