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Report on
Acid Sulphate Soil Management Plan

Proposed NSW Long Term Train Support Facility
Woodlands Close, Hexham

Prepared for
Aurizon Operations Limited

Project 39798.12
April 2013

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	39798.12	Document No.	1
Document title	Report on Acid Sulphate Soil Management Plan Proposed NSW Long Term Train Support Facility		
Site address	Woodlands Close, Hexham		
Report prepared for	Aurizon Operation Limited		
File name	P:\39798.12\Docs\39798.12 ASSMP [Rev 8].doc		

Document status and review

Revision	Prepared by	Reviewed by	Date issued
0	Dana Wilson	Stephen Jones	23 May 2008
1 (Draft)	Matthew Blackert	John Harvey	28 July 2011
2 (Final)	Matthew Blackert	John Harvey	22 August 2011
3 (Final)	Matthew Blackert	John Harvey	29 May 2012
4 (Final)	Matthew Blackert	Chris Bozinovski	27 September 2012
5 (Final)	Matthew Blackert	Chris Bozinovski	11 October 2012
6 (Final)	Matthew Blackert	Chris Bozinovski	12 November 2012
7 (Draft)	Matthew Blackert	Chris Bozinovski	5 April 2013
8 (Final)	Matthew Blackert	Chris Bozinovski	15 April 2013

Distribution of copies

Revision	Electronic	Paper	Issued to
0	1	3	QR National
1 (Draft)	1	0	John Megitt, ADW Johnson
2 (Final)	1	3	John Megitt, ADW Johnson
3 (Final)	1	3	Scott Day, ADW Johnson
4 (Final)	1	0	Chris Puslednik, Engenicom
5 (Final)	1	0	Chris Puslednik, Engenicom
6 (Final)	1	0	Chris Puslednik, Engenicom
7 (Draft)	1	0	Brett Peterkin, Engenicom
8 (Final)	1	0	Brett Peterkin, Engenicom

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		15 April 2013
Reviewer		15 April 2013

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1. Introduction

This Acid Sulphate Soil Management Plan (ASSMP) has been prepared for the proposed NSW Long Term Train Support Facility (LTTSF) at Hexham, New South Wales. The work was carried out at the request of Aurizon Operations Limited (Aurizon) and in consultation with JBA Planning.

This report supersedes Douglas Partners Pty Ltd (DP) previous ASSMP issued in November 2012 (Project 39798.08).

The proposed LTTSF development is presented in Section 3 of this report. Development of the LTTSF will result in disturbance of underlying acid sulphate soils and possible acid generating materials (Coal Washery Reject (CWR)) through excavation and localised dewatering during construction.

The ASSMP was prepared to provide the following information:

- Acid sulphate soil management strategies for the proposed LTTSF development;
- Monitoring program for soil and water quality; and
- Contingency procedure.

Reference should be made to GHD Pty Ltd (GHD), "NSW Long Term Train Support Facility Basis of Design Report, 90% Deliverable Track Lowered Option", dated 15 March 2013 for further details regarding the proposed development.

The results of the previous investigation undertaken at the site (Ref 1) has been used to formulate this ASSMP. It is noted that this investigation was limited to the eastern portion of the site. The results of additional limited Acid Sulphate Soil (ASS) testing conducted by GHD, as reported in Reference 5, were also considered in the ASSMP. Further investigations are proposed prior to the commencement of construction to better assess the presence and extent of ASS and possible acid generating materials within the site. A conservative approach has been adopted with respect to the extent of ASS and possible acid generating materials for the ASSMP. The ASSMP should be updated following additional ASS investigations and detailed design.

The ASSMP is intended to be used in conjunction with the Construction Environmental Management Plan (CEMP), which we understand will be developed prior to the commencement of construction and will provide further details of procedures to manage potential impacts associated with the disturbance of acid sulphate soils and potential acid generating materials during site development.

Reference has also been made to the NSW Acid Sulphate Soil Management Advisory Committee (ASSMAC), August 1998 (Ref 2) guidelines, and recent experience with similar works in acid sulphate soils.

2. Site Description and Regional Geology

The study area is located on the western side of the New England Highway and Pacific Highway at Hexham, NSW. The site comprises an irregular shaped area of approximately 255 ha and is bounded to the east by the Great Northern Railway, to the north by Woodland Close and New England Highway, to the west generally by Chichester pipeline and to the south by private rural residential property.

The proposed LTTSF development area (the site) comprises an area of about 38 ha and is generally limited to a corridor about 150 m wide adjacent to the Great Northern Railway, due to the linear nature of the development. The ARTC Hexham Relief Roads Project which comprised six new train line (tracks) is located between the proposed LTTSF and the Great Northern Railway. The indicative project construction footprint by Engenicom is presented in Sketch 80 Rev A in Appendix A. The "Proposed Arrangement" is presented in Worley Parsons – Figure 2 – Sheets 1 and 2, also in Appendix A.

It is noted that the previous preliminary geotechnical investigation (Ref 1) was limited to the proposed development area on the eastern portion of the site generally parallel with the Great Northern Railway. Limited additional investigation has also been conducted by GHD (Ref 5). This ASSMP is therefore based on data collected from limited investigations.

The 1:100,000 scale Newcastle Coalfield Regional Geology map (Sheet 9321), published by the Department of Mineral Resources, indicates that the site is underlain by Quaternary Alluvium. The alluvium typically comprises unconsolidated sediments deposited in a fluvial or estuarine environment, and includes gravel, sand, silt and clay.

Reference to the 1:25,000 scale Acid Sulphate Soil Risk Map for Beresfield (Sheet 9232 N3), published by the Department of Land and Water Conservation, indicates that the entire site has a high probability of ASS within one metre of the (natural) ground surface.

While the geotechnical investigation (Ref 1) was limited to the eastern portion of the site, reference to the regional geology and ASS risk maps suggest natural subsurface conditions are likely to be similar within the development area.

3. Proposed Development

It is understood that the proposed development comprises the construction of a rolling stock maintenance and refuelling (provisioning) facility, located adjacent to the Great Northern Railway Line.

Taking into account of the changes made to the design of the Hexham TSF, the project for which approval is now being sought includes the following:

- Construction of new connections to the Great Northern Railway;
- Construction of seven new train lines (tracks) parallel to the existing Mainline to provide for provisioning, inspections, servicing and maintenance of Aurizon trains, as well as a Shunt Neck at the northern part of the facility providing in total 10.5 km of railway track;
- A Provisioning Building generally as described in Section 6.4.2 of the EAR to provide provisioning, inspections and unscheduled rolling stock maintenance on a 24 hour, 7 days per week basis. Provisioning includes replenishing locomotives with fuel, sand, water, oil and other consumables as well as general cleaning and cab preparation;
- A Combined Maintenance Building located generally where the Wagon Maintenance Building was originally proposed in the EAR. The Combined Wagon Maintenance Building would generally be operated between 06:00 and 22:00 hours weekdays – however, with hours of operation driven by demand this could increase to a 7 day per week operation when and if required and approval is being sought for operations 7 day per week maintenance operations;
- The Combined Maintenance Building would include the TSF's main administration centre;
- A Service Vehicle Garage, car park, truck unloading and wheel set storage area located within the internal road turning loop, adjacent to the Combined Maintenance Building and Administration Centre. Car parking will be provided for up to 50 cars and light vehicles in the main car park, with a five space carpark also located near to the provisioning building for occasional parking of vehicles;
- A bulk fuel storage area with capacity for up to 630,000 L of diesel fuel in 90,000 L above ground, self-bunded fuel storage tanks. Bulk storage of sand would be located adjacent to the fuel storage area;
- At the completion of construction the facility will have a maximum of 30 personnel on-site over a 24-hour period;
- Construction of an intersection and a new access road from the Tarro Interchange;
- Construction of internal access roads comprising of sealed single carriage way road;
- The protection or diversion of existing utilities and, where appropriate, connection of the site to utilities;
- Beneficial reuse of up to 30,000 tonnes of geotechnical and environmentally suitable borrow materials sourced from on-site excavations / earthworks for construction;
- Permanent stockpiling of up to approximately 50,000m^3 of excess treated ASS and up to 100,000 m3 of treated acid generating materials; and
- Installation of a package Waste Water Treatment Plant with on-site effluent irrigation to be located within the internal road turning loop, adjacent to the Combined Maintenance Building and Administration Centre.

The project is planned to be constructed continuously over approximately 18 months. It is planned to commence provisioning of locomotives once the Provisioning Building and associated rail infrastructure has been constructed and commissioned. Provisioning would be carried out whilst construction of the maintenance facilities and associated railway track infrastructure is being constructed.

Whilst the construction period is expected to be continuous, the facility is likely to be delivered in a sequential manner. The phases of construction will be as follows:

Stage 1:

- Tarro Interchange, site access road and internal access roads;
- Demolition of structures (including the dairy ruins; the control cabin and bath house; remnant track work; the coal preparation plant footings and conveyor support footings);
- Remediation in accordance with the Remediation Action Plan (RAP);
- Civil work (including bulk earthworks, excavations and roads);
- Mainline connections and crossover;
- Bulk Fuel Storage;
- Provisioning facility; and
- Related railway tracks.

Stage 2:

- Maintenance (Wagon and Locomotive) and Administration building;
- Car Parking and landscaping around the Administration building;
- Sewage management system (including establishment of irrigation area);
- Railways tracks related to maintenance facility;
- Locomotive wash building;
- Locomotive turntable; and
- Wheel lathe.

At the completion of Stage 1 works, Aurizon will commence refueling activities for trains. Stage 2 construction works will continue during this time. Once the Stage 2 works are complete, the facility will commence full maintenance operations.

The proposed LTTSF development is shown in Worley Parsons – Figure 2 – Sheets 1 and 2, in Appendix A.

Filling

The majority of filling is proposed to be along the rail formation with the depth of filling in the range 0.2 m to 0.4 m on the southern parts of the site where the site is already filled and from 0.5 m to 1.4 m on the northern parts of the site, where the site is at low lying natural grades.

Localised areas of filling are also proposed as follows:

- 0.5 m high access road on northern parts of site;
- 0.2 m to 0.4 m access road on southern parts of the site, mostly on existing filled areas; and
- 0.5 m high temporary construction compound on northern low lying part of site.

Approximate areas of proposed filling are shown on the GHD Areas of Disturbance – Fill plan in Appendix A.

Excavations

Excavations on-site are proposed to comprise the following:

- Broad scale cuts are proposed for the proposed train tracks and facilities immediately to the west. Cuts typically range from 0.8 m in the southern portion of the site to 0.8 m to 1.0 m in the northern portion of the site. Cuts extend into the CWR capping to the west of the proposed rail lines for the proposed road turnaround;
- Proposed Basins 01 to 03, with cut ranging from 1.5 m for Basins 01 and 02 on the northern part of the site which are expected to be through natural clay soils to 2.6 m for the Basin 03 at the southern part of the site, which is expected to be mostly through existing filling;
- Proposed drains leading to the various basins with depths of cut ranging from 1.6 m through existing filling on the southern site to 1.0 m or less on the northern site;
- Site preparation for proposed access roads and associated culverts with depths of cut typically 0.3 m or less and in places up to 1.6 m;
- Excavations for foundations and ground improvements;
- Possible excavation of materials from within the proposed borrow area for beneficial re-use during LTTSF construction (TBC); and
- Temporary trench excavations for buried services, to depths of up to about 0.8 m.

Approximate areas of proposed cut (excavations) are shown on the GHD Area of Disturbance – Cut plan in Appendix A.

4. Summary of Acid Sulphate Soil and Site Conditions

Previous testing (Ref 1) involved ASS screening tests within the DP laboratory and detailed ASS testing on selected samples by ALS Environmental Pty Ltd (ALS).

The acid sulphate screening results have been reproduced in Table 1, below. The results of the ASS assessment generally indicated the presence of Potential Acid Sulphate Soil (PASS) conditions within natural soils.

Table 1: Acid Sulphate Soil Screening Tests (Ref 1)

Bore / Test Pit	Sample Depth [a] (m)	Sample RL (m AHD)	Sample Description	Screening Test Results			
				pH			Strength of Reaction [b]
				pH_F	pH_{FOX}	pH_F - pH_{FOX}	
14	2.4	-0.9	Silty Sand – grey	7.2	2.6	4.6	3FH
14	2.9	-1.4	Silty Sand – grey	7.4	5.2	2.2	1
16	2.3	0.0	Silty Clay – grey / brown	7.3	6.1	1.2	1-2
16	2.8	-0.5	Sandy Silty Clay – grey	7.6	6.5	1.1	1
16	3.0-3.45	-0.7 to -1.1	Sandy Silty Clay – grey	7.6	2.3	5.3	1-2
21	0.5-0.95	0.6 to 1.0	Silty Clay – grey brown	7.4	6.2	1.2	1-2
21	1.5-1.95	0.0 to -0.4	Silty Clay – grey brown	7.6	6.9	0.7	1
21	2.4	-0.9	Sandy Silt – grey	7.5	6.9	0.6	1
21	3.0-3.45	-1.5 to -1.9	Clayey Sand – grey	7.6	6.2	1.4	1
22	0.4	0.3	Silty Clay – grey	6.8	5.9	0.9	1H
22	0.9	-0.2	Silty Clay – grey	6.8	6.7	0.1	1H
22	1.4	-0.7	Clayey Silty Sand – grey mottled orange	7.0	6.8	0.2	1
22	1.7	-1.0	Clayey Silty Sand – grey mottled orange	7.1	6.9	0.2	1
22	2.4	-1.7	Clayey Silty Sand – grey mottled orange	7.1	6.9	0.2	1
23	0.7	0.4	Silty Clay – grey	7.4	6.6	0.8	1H
23	0.9	0.2	Silty Clay – grey	7.2	6.6	0.6	1H
23	1.2	-0.1	Clayey Silty Sand – grey	7.1	7.0	0.1	1H
24	0.4	3.1	Silty Clay – grey brown	7.3	6.0	1.3	1
24	0.7	2.8	Silty Sand – grey	6.7	6.3	0.4	1
24	0.9	2.6	Silty Sand – grey	6.7	6.2	0.5	1
24	1.6	1.8	Silty Sand – grey	6.5	5.5	1.0	1
25	0.8-0.95	0.4 to 0.5	Silty Sand - grey	8.4	7.2	1.2	1
25	1.4	-0.1	Silty Sand - brown	8.0	7.5	0.5	1
25	1.5-1.95	-0.2 to -0.6	Silty Sand - brown	8.0	6.4	1.6	1
25	2.4	-1.1	Silty Sand – brown (shells)	8.5	6.9	1.6	1-2
25	3.9	-2.6	Silty Sand - brown	8.3	6.3	2.0	1-2

Notes to Table 1:

a Depth below ground surface
b Strength of Reaction
1 denotes no or slight reaction
2 denotes moderate reaction
3 denotes high reaction
4 denotes very vigorous reaction
F denotes bubbling/frothy reaction indicative of organics
H denotes heat generated
c For actual Acid Sulphate Soils (ASS)
d Indicative value only for Potential Acid Sulphate Soils (PASS)

Shaded results indicate potential for acid generation upon oxidation (i.e. PASS)

Table 1: Acid Sulphate Soil Screening Tests (Ref 1) (continued)

Bore / Test Pit	Sample Depth [a] (m)	Sample RL (m AHD)	Sample Description	Screening Test Results			
				pH			Strength of Reaction [b]
				pH_F	pH_{FOX}	pH_F - pH_{FOX}	
25	0.8-0.95	0.4 to 0.5	Silty Sand - grey	8.4	7.2	1.2	1
25	1.4	-0.1	Silty Sand - brown	8.0	7.5	0.5	1
25	1.5-1.95	-0.2 to -0.6	Silty Sand - brown	8.0	6.4	1.6	1
25	2.4	-1.1	Silty Sand – brown (shells)	8.5	6.9	1.6	1-2
25	3.9	-2.6	Silty Sand - brown	8.3	6.3	2.0	1-2
27	1.5-1.95	0.3 to -0.2	Silty Clay - grey	8.1	5.5	2.6	1
27	2.4	-0.6	Clayey Silty Sand - grey	8.1	6.3	1.7	1
27	2.9	-1.1	Clayey Silty Sand - grey	8.0	6.0	2.0	1-2
27	3.0-3.45	-1.2 to -1.7	Clayey Silty Sand - grey	8.2	7.2	1.0	1-2
28	3.3	-0.3	Silty Clay - grey	7.8	3.9	3.9	1-2
28	4.5-4.95	-1.5 to -1.9	Sandy Silt - grey	7.6	5.6	2.0	1-2
30	0.4	1.4	Sandy Clay - brown	5.9	4.4	1.5	2
30	0.5-0.95	0.8 to 1.3	Sandy Clay - brown	6.3	6.3	0.0	1-2
30	1.4	0.4	Clay - grey	7.2	6.6	0.6	1-2
30	1.5-1.95	0.3 to -0.2	Clay - grey	7.1	6.5	0.6	1
30	2.4	-0.6	Silty Sand – grey mottled orange	7.0	6.6	0.4	1
30	3.0-3.45	-1.2 to -1.7	Clayey Silt – grey (shells)	7.7	2.4	5.3	1-2
30	4.5-4.95	-2.7 to -3.2	Clayey Silt – grey (shells)	7.5	2.6	4.9	4HF
31	1.3	0.0	Silty Clay – grey mottled orange	7.4	6.1	1.3	1H
31	1.5	-0.2	Silty Clay – grey mottled orange	7.0	6.9	0.1	1H
31	1.8	-0.5	Silty Clay – grey mottled orange	7.7	7.6	0.1	1H
34	1.3	-0.7	Silty Clay - grey	7.2	6.4	0.8	1
34	1.4-1.95	-0.8 to -1.35	Silty Clay - grey	7.1	6.5	0.6	1
34	2.4	-1.8	Silty Clay - grey	7.0	6.1	0.9	1
34	3.0-3.45	-2.4 to -2.8	Silty Clay - grey	7.2	4.5	2.7	1

Notes to Table 1:

a Depth below ground surface
b Strength of Reaction
1 denotes no or slight reaction
2 denotes moderate reaction
3 denotes high reaction
4 denotes very vigorous reaction
F denotes bubbling/frothy reaction indicative of organics
H denotes heat generated
c For actual Acid Sulphate Soils (ASS)
d Indicative value only for Potential Acid Sulphate Soils (PASS)
Shaded results indicate potential for acid generation upon oxidation (i.e. PASS)

Table 1: Acid Sulphate Soil Screening Tests (Ref 1) (continued)

Bore / Test Pit	Sample Depth [a] (m)	Sample RL (m AHD)	Sample Description	Screening Test Results			
				pH			Strength of Reaction [b]
				pH_F	pH_{FOX}	pH_F - pH_{FOX}	
36	0.4	0.8	Silty Sand - brown	6.9	5.4	1.5	1-2
36	0.5-0.95	0.3 to 0.7	Sandy Clay - brown	7.6	7.6	0.0	1
36	1.4	-0.2	Sand - brown	8.0	7.8	0.2	1
36	1.5-1.95	-0.3 to -0.7	Sand - brown	8.1	7.8	0.3	1
36	2.5	-1.3	Silty Sand - grey	8.1	6.6	1.5	1
36	3.0-3.45	-1.8 to -2.2	Silty Sand - grey	8.1	4.8	3.3	1-2
36	4.0	-2.8	Silty Sand - grey	8.2	6.8	1.4	1-2
37	1.4	-0.1	Clay - grey	7.3	5.2	2.1	1
37	2.4	-1.1	Clayey Silt - grey	7.3	2.9	4.4	1
Guideline			Sands to Loamy Sands	<4[c]	<3.5[d]	>1[d]	-
			Sandy Loams to Light Clays				
			Medium to Heavy Clays and Silty Clays				

Notes to Table 1:

a Depth below ground surface
b Strength of Reaction
1 denotes no or slight reaction
2 denotes moderate reaction
3 denotes high reaction
4 denotes very vigorous reaction
F denotes bubbling/frothy reaction indicative of organics
H denotes heat generated
c For actual Acid Sulphate Soils (ASS)
d Indicative value only for Potential Acid Sulphate Soils (PASS)
Shaded results indicate potential for acid generation upon oxidation (i.e. PASS)

Detailed laboratory testing for TPA, TAA and Chromium Reducible Sulphur content was undertaken on five selected soil samples and results are presented in Table 2 below.

Table 2: Detailed Acid Sulphate Soil Laboratory Testing (Ref 1)

Bore / Test Pit	Sample Depth [a] (m)	Sample RL (m AHD)	Sample Description	Laboratory Results			
				pH_{KCL}	Scr %S	TAA (mole H+/t)	TPA (mole H+/t)
14	2.4	-0.9	Silty Sand - grey	5.6	0.65	6	359
16	3.0-3.45	-0.7 to -1.1	Sandy Silty Clay - grey	6.8	0.08	<2	388
27	1.5-1.95	0.3 to -0.2	Silty Clay - grey	5.5	<0.02	21	184
28	3.3	-0.3	Silty Clay - grey	5.9	<0.02	4	<2
30	0.4	1.4	Sandy Clay - brown	5.4	0.04	16	230
Guideline			Sands to Loamy Sands	-	0.03	18	18
			Sandy Loams to Light Clays		0.06[b]/0.03[c]	36[b]/18[c]	36[b]/18[c]
			Medium to Heavy Cays and Silty Clays		0.1[b]/0.03[c]	62[b]/18[c]	62[b]/18[c]

Notes to Table 2:

a Depth below ground surface

b ASSMAC Action Criteria for disturbance of 1-1000 tonnes of material

c ASSMAC Action Criteria for disturbance of more than 1000 tonnes of material

Shaded results indicate an exceedence of ASSMAC action criteria for 1-1000 tonnes of ASS soil (Ref 2)

The result of the chromium reducible sulphur testing and TPA testing for samples 14/2.4 m, 16/3.0-3.45 m, 27/1.5-1.95 m and 30/0.4 m exceed the ASSMAC action criteria (Ref 2) for excavations above and below 1000 tonnes. The results of detailed laboratory analysis therefore confirm that *potential* acid sulphate soils are present within the site.

For construction purposes, disturbance of soils (either by excavation or dewatering) within natural soils should be treated as potential acid sulphate soils and managed under the guidance of this ASSMP.

Additional preliminary testing of CWR materials (coarse and coal fines) on the site by GHD (Ref 5) has indicated CWR materials may have some propensity to generate acid upon oxidation. It is noted, however that only limited testing has been conducted to date and it is unlikely that the potential for acid generation in CWR is extensive. It is understood that further assessment (sample collection / screening tests and laboratory testing) will be conducted on overlying coal reject fill prior to excavation and construction to confirm treatment requirements. As a precautionary measure and until further detailed assessment is conducted it should be assumed that all natural soils and all overlying CWR materials will require treatment with reference to this management plan to address possible acid generation. On this basis, GHD have estimated that the following quantities of soils will require treatment:

- Filling: (possible acid generating CWR) up to 100,000 m^3; and
- Underlying Natural Soils: (potential ASS) up to 50,000 m^3.

The subsurface conditions encountered during the Preliminary Geotechnical Investigation (Ref 1) generally comprised filling (typically coarse coal reject and intermixed sand and clays) up to 2 m depth in the southern portion of the investigation area, overlying alluvial clays, overlying sands, overlying residual clays at depth.

Groundwater levels typically varied from the ground surface to about 2 m below ground level. Due to irrigation over the northern portion of the site combined with flooding, perched water levels within fill and the ground surface may be present.

The Preliminary Contamination Assessment (PCA) conducted at the site by DP (Ref 4) included drilling / excavation of a series of bores / pits across the site. Subsurface conditions encountered were similar to those identified in Reference 1, with the exception of deeper fill within Lot 311, DP583724 and Lot 1, DP155530.

Groundwater levels measured during the PCA varied between about 0.3 m to 2.6 m below ground level (RL 0.2 AHD to 2.9 AHD). It should be noted that groundwater levels are affected by factors such as climatic conditions and soil permeability and will therefore vary with time.

Details of the ASS assessment undertaken, along with copies of borehole logs, are found in Reference 1. Drawing 1-2 in Appendix A shows the test locations from Reference 1.

The PCA indicated the presence of localised soil contamination generally within fill materials. The presence of widespread soil contamination in site filling and natural underlying soils within the LTTSF development area was considered to be low. Remediation of localised contaminated soils was recommended in the PCA. Such remediation should be conducted in accordance with site specific RAP.

Wide spread surface water and groundwater impacts have been identified both on-site and immediately off-site (i.e. generally E.Coli, nutrients, metals).

Earthworks including excavation and dewatering should be conducted with due regard to the presence of localised soil contamination, surface water and groundwater impacts, and acid sulphate soils and requirements for investigation, remediation and validation of possible contamination as outlined in the GHD RAP (Ref 6) in addition to the treatment and management requirements for ASS and possible acid generating materials as provided in this ASSMP.

5. Potential For Oxidising ASS and Possible Acid Generating Materials

The following activities may expose ASS / acid generating materials (CWR) to oxidising conditions during construction:

- Any excavation (i.e. for underground services, bulk earthworks, stripping of topsoils etc.) within ASS / acid generating materials;
- Installation of piles (if any) within ASS / acid generating material where spoil is generated; and
- Dewatering of excavations during the construction works.

Excavations associated with the construction of the LTTSF are likely to include:

- General earthworks for the proposed LTTSF alignment as a results of track lowering;
- Construction of proposed Basins 01 to 03;
- Footings excavations and ground improvement for proposed structures;
- Excavation for proposed site drainage (longitudinal and subsoil);
- Site preparation for proposed access roads and associated culverts;
- Temporary trench excavations for buried services; and
- Possible excavation of materials from within the borrow area for beneficial re-use during LTTSF construction.

Based on the shallow groundwater levels at site it is anticipated that most excavations will intersect groundwater (Refer to DP Assessment of Potential Groundwater Level Impacts report (Ref 7) for further details). Dewatering is therefore likely to be required for the majority of proposed excavations with the possible exception of the unlined longitudinal drains, unless particularly dry conditions prevail across the construction period.

Excavations on the southern parts of the site will be predominantly through existing filling which is typically granular and would be expected to be relatively permeable. Dewatering is likely to be achieved by a combination of sump and pump methods for localised excavations with the possibility of spear point dewatering in some areas, such as the locally deeper excavation.

On the northern parts of the site excavations will be through the natural clay soils which are generally of lower permeability with the exception of local sandy or silty layers in the upper 2 m depth. Sump and pump dewatering is expected to be used and due to the low permeability of these soils flow rates are likely to be relatively low if they are not under surface water. Appropriate bunding of excavations may be required to control surface water in these areas.

6. Management Strategy

6.1 Soil Treatment

Neutralisation of ASS / acid generating materials should be undertaken in accordance with the ASSMAC guidelines, as discussed below.

The excavated ASS / acid generating materials material should be contained within a suitable bunded area with an impermeable base and appropriately neutralised prior to stockpiling or re-use on-site. Based on the current design the proposed ASS treatment area is located over the southern location of the site as shown on Sketch 80 Rev A, in Appendix A.

The bunded treatment area should be designed to minimise the potential for impact on nearby sensitive receptors. Any leachate produced in the bunded area should be contained for monitoring and treatment as discussed below. The design of the treatment area should also consider the construction methodology and staging to ensure that sufficient area is available for staged excavation, treatment and stockpiling.

Suitable neutralising agents for acid sulphate or potential acid sulphate soils include agricultural lime ($CaCO_3$), calcined magnesia (MgO or $Mg(OH)_2$), and dolomite ($MgCO_3.CaCO_3$).

An assessment of the dosing rate for lime treatment can be calculated from the results of detailed laboratory testing, using the following equation, which includes a factor of safety:

Alkali Material Required (kg)

per unit volume of soil (m^3) = $\left(\frac{\%\,S \times 623.7}{19.98}\right) \times \frac{100}{ENV(\%)} \times D \times FOS$

where: *%S = net acidity (% S units);*
623.7 = % S to mol H+/t;
19.98 = mol H+/t to kg CaCO3 /t;
D = Bulk density of soil (t/m3);
FOS = Factor of safety (usually 1.5);
ENV = Effective Neutralising Value (e.g. 80% for Grade 1 Agricultural lime).

Note: *The ENV is calculated based on the molecular weight, particle size and purity of the neutralising agent and should be assessed for proposed materials in accordance with ASSMAC (Ref 2).*

It is recommended that Grade 1 agricultural lime is used for the neutralisation of potential acid sulphate soils / acid generating materials excavated during the construction.

The following liming / monitoring procedures for the treatment of ASS / acid generating materials are recommended:

- All excavated soil should be contained within a suitably designed and bunded area and kept moist to minimise oxidation, prior to treatment and neutralisation with lime. Progressive neutralisation will be required to manage the staged construction program which will minimise the area required for treatment;
- The base of excavations within ASS or acid generating materials should be treated with approximately 1 kg/m^2 of agricultural lime;
- Stockpiled soil should be limed at an average rate of about 37 kg/m^3 of soil (27 kg lime/tonne of soil) for neutralisation as soon as practicable following excavation. Lime treatment rates based on the detailed laboratory testing undertaken in Reference 1 ranged from 24 kg/m^3 of soil to 52 kg/m^3 of soil. The average value should be used initially and refined based on monitoring results as construction proceeds. Further detailed testing is required to assess appropriate lime application rates for treatment of ASS and possible acid generating materials (i.e. CWR filling);
- The neutralising agent and ASS should be thoroughly mixed and aerated using, for example, an agricultural lime spreader and excavator. The soil should be treated in layers up to 300 mm thick to encourage aeration (i.e. incorporate treatment with progressive re-use of soil or disposal at a suitably licensed landfill);

- It should be noted that the actual lime rate required will also depend on the results of monitoring during neutralisation. Additional lime will be required if monitoring results indicate that appropriate neutralisation has not been achieved. Conversely the liming rate may decrease if monitoring suggests over-liming is occurring;
- Sampling and testing should be undertaken in accordance with Section 6.1 to verify the neutralisation treatment. The acceptance criteria are discussed in Section 6.2. Depending on the results of testing, reapplication of lime may be necessary to gain adequate neutralisation;
- Upon verification of treatment, the neutralised ASS could be re-used on-site for construction (subject to geotechnical and environmental suitability) or permanently stockpiled on-site in designated area(s) as discussed below. Re-use and permanent stockpiling of excavated materials should be conducted in accordance with the GHD RAP (Ref 6); and
- Due to the size of the development, a staged construction program is recommended for the excavation / treatment / dewatering to minimise the volume of acid generating soils exposed at any one time and also the volume of water required to be managed at any one time.

We understand that some excavated fill borrow materials will be considered for beneficial re-use on-site for construction, where suitable. We understand that a volume of up to 30,000 m^3 of fill material could be re-used during the development subject to further investigation to confirm geotechnical and environmental suitability for re-use. Excess materials that cannot be re-used for construction will be permanently stockpiled on-site following appropriate treatment.

Staged excavation, treatment, re-use (where possible) and stockpiling of acid generating materials is proposed. It is anticipated that trenching up to 250 m in length will be conducted during each stage, however, this should be confirmed by the contractor subject to detailed design and the equipment, machinery, dewatering and treatment process proposed.

Treated soils will be re-used / stockpiled over approved areas within the site above the 10% Annual Exceedance Probability (AEP) flood levels (such as the CWR stockpiles). Areas designated for re-use will be assessed for suitability and stockpiling will be conducted in a manner to minimise the risk of adverse impact to the environment during and following construction.

The location, height and configuration of the final stockpiles will be subject to detailed design and will depend on the final volume of materials excavated. Stockpiling will be conducted in a controlled manner with due regard to environmental controls, which should be included in the Soil and Water Management Plan and CEMP. Following the completion of stockpiling the permanent stockpile area should be appropriately contoured and vegetated to minimise erosion.

6.2 Neutralising Leachate

Leachate water collected from the bunded treatment area should be neutralised as necessary before release. Calcined magnesia (magnesium hydroxide, burnt magnesite, or magnesia) is the recommended neutralising agent as it produces a two-step reaction, which proceeds rapidly at acidic pH and slows down as higher pH is approached, and hence reduces the potential for over-neutralisation to occur.

The amount of neutraliser required to be added to the leachate can be calculated from the equation below:

$$\textit{Alkali Material Required (kg)} = \frac{M_{Alkali} \times 10^{-pH\ initial}}{2 \times 10^{3}} \times V$$

Where: *pH initial = initial pH of leachate*

V = volume of leachate (litres)

M_{Alkali} *= molecular weight of alkali material (g/mole)*

Note: *molecular weight of calcined magnesia (M_{MgO}) = 40 g/mole.*

The alkali should be added to the leachate as a slurry. Mixing of the slurry is best achieved using an agitator.

The leachate water quality should meet regulatory authority requirements, prior to discharge.

The treatment area including the leachate collection system should be designed to accommodate the anticipated volumes of soil / water during construction. This design will be influenced by the construction methodology and staging program with contingencies for wet weather.

6.3 Dewatering

Based on recent experience the following procedure is recommended in order to minimise potential adverse impacts resulting from excavation and dewatering of acid sulphate soils during construction:

- Minimise the dewatering depth required for installation (i.e. as close as practicable to the invert level of the excavation);
- Minimise the time and volume of exposed acid sulphate soils (i.e. stage excavation and dewatering);
- Collection of extracted groundwater for temporary storage and treatment as necessary prior to appropriate disposal / release;
- The extracted groundwater could then be appropriately discharged to designated area(s) away from the dewatering site (i.e. evaporation / infiltration), or discharged to stormwater subject to regulatory requirements. Controlled infiltration of waters could be considered within staged construction zones or for adjacent overland discharge (i.e. coal tailings area), subject to detailed design and regulatory approvals;
- The pH of the extracted water should be monitored prior to discharge. Neutralisation should be undertaken, as discussed in Section 5.2, if discharge water pH falls below natural groundwater levels (evaporation / infiltration) or regulatory requirements (stormwater disposal);
- Dose the base of the excavation at a rate of approximately 1 kg/m^2 of agricultural lime in order to counteract the generation of acidic leachate following groundwater recovery;
- Treat ASS excavated during construction as discussed in Section 6.1; and
- Undertake monitoring as recommended in Section 7 below.

Minimising the depth and extent of dewatering (i.e. staging) will also minimise potential impacts to adjacent Groundwater Dependent Ecosystems (GDE).

Excavations and dewatering should be conducted with due regard to potential soil contamination, groundwater and surface water contamination and regulatory and statutory requirements.

Appropriate design of the dewatering system (including temporary storage and treatment) will be conducted considering detailed project design, construction methodology and staging of construction.

The design will have due regard to the soil, groundwater and surface water conditions present, including flow rates, volumes and water quality.

The design will address water collection, storage, discharge, re-use, disposal and contingencies etc. in order to minimise the risk of adverse impacts on human health and the environment during construction.

Management of waters from dewatering will be integrated with the overall Water Management Plan and CEMP for the project.

Detailed design should consider the anticipated volume of groundwater requiring treatment at any one time to ensure holding / treatment facilities have sufficient capacity to handle the anticipated flow rates with contingency for wet weather.

6.4 Permanent Drain Construction

The proposed unlined open drain east of the coal tailing stockpile is likely to be constructed within CWR materials. Such materials have been identified as having some risk of acid generation upon oxidation, however, further investigation is required for confirmation. If CWR materials within the open drain areas are confirmed to be acid generating, additional mitigation measure will be required for construction of the drains.

Where the open drains intercept groundwater, it is recommended that in-drain water control structures are implemented in the construction of permanent open unlined drains within acid generating materials. The purpose of in-drain water control structures is to elevate drain water levels, reducing the hydraulic gradient from the groundwater table to the drain, in order to minimise possible acid generation by the oxidation of surrounding potential acid sulphate soils. This in-turn reduces potential acid discharge entering drains and subsequently being discharged to nearby sensitive receptors. A number of water control structures can be implemented such as drop-boards, concrete weirs and sandbag weirs.

Water control structure design should include the following:

- Design to suit local conditions;
- Maintain the efficiency of the flood mitigation system during flooding;
- Capable of controlling minimum water levels;
- Low maintenance and durable; and
- Compliance with relevant legislation for both installation and management.

The following procedures are recommended for the construction upgrade of permanent open / unlined drainage channels within CWR on-site:

- Minimise the design depth of permanent drainage channels by constructing wide, shallow drains where possible;
- Installation of in-drain water control structures, such as drop-boards or weirs; and
- The base and sides of permanent drains or basins should be treated to a depth of 0.3 m as per excavated material (see Section 6.2) re-compacted and protected against erosion. Alternatively the exposed base and sides of drains / basins could incorporate a lime "buffer" through sand bagging the face (i.e. using limed sands in sandbags). The liming rate for sandbags should be confirmed following additional investigations of CWR materials.

Drainage waters from constructed open drains should be collected, monitored and treated prior to discharge, subject to regulatory requirements.

Monitoring prior to, during and following construction of the drains should be conducted. The monitoring program should be formulated in conjunction with the Soil and Water Management Plan and the CEMP for the project.

The requirement for the above mitigation measures relating to open drains within CWR should be confirmed following additional investigation of CWR materials.

7. Monitoring Strategies

7.1 Procedures

7.1.1 Soil Neutralisation/Management

It is recommended that the following inspections and monitoring be undertaken when excavating ASS materials, based on guidelines presented in the ASSMAC (Ref 2) manual:

- Daily inspection of liming operations by DP during excavation; and
- Sampling and testing after lime treatment by DP (i.e. measurements of soil pH in distilled water and pH in peroxide), undertaken initially at a frequency of at least one sample per 25 m^3 excavated soil, or daily, (whichever is greater) to verify the neutralisation treatment and confirm oxidation of acid generating soils is not occurring. The frequency of testing would be reviewed during the course of treatment.

7.1.2 Leachate Management

Leachate collected within the bunded area should be temporarily stored and neutralised as necessary. The pH of the leachate should be monitored daily, and prior to discharge. The leachate could be discharged overland (i.e. evaporation / infiltration), or discharged to stormwater, subject to regulatory requirements and licences.

Neutralisation should be undertaken if discharge water pH falls below natural background groundwater levels (evaporation / infiltration) or regulatory requirements (stormwater discharge).

A contingency procedure should be in place to allow lime dosing and monitoring to confirm neutralisation prior to discharge.

7.1.3 Dewatering

Extracted groundwater should be temporarily stored to allow monitoring and appropriate treatment (as necessary). The pH of extracted water associated with areas of ASS should be monitored twice daily by DP (am, pm) prior to possible discharge. The groundwater could be discharged overland (i.e. evaporation / infiltration), or discharged to stormwater subject to regulatory requirements and licences.

Neutralisation / treatment should be undertaken if discharge water pH falls below natural background groundwater levels (evaporation / infiltration) or regulatory requirements (stormwater discharge). Background groundwater pH should be confirmed at the commencement of dewatering.

A contingency procedure should be in place to allow lime dosing and monitoring to confirm neutralisation prior to discharge. Similarly nearby creeks / drains and groundwater monitoring wells should be periodically monitored for pH prior to and during construction.

Due regard should be given to the quality of groundwater extracted during dewatering activities. Water quality should therefore be confirmed prior to appropriate discharge / disposal, considering the elevated E.Coli, nutrients and metals identified in previous site assessments, subject to regulatory and statutory requirements.

The detailed monitoring strategy for ASS management during construction should be confirmed following detailed design and confirmation of the construction methodology and staging program. This strategy should be included in the CEMP for the project.

7.1.4 Reporting

A record of treatment of acid generating materials and leachate should be maintained by the contractor and should include the following details:

- Date;
- Location;
- Time of excavation and re-use or disposal (i.e. time stockpile has been exposed);
- Neutralisation / treatment process undertaken;
- Lime rate utilised;
- Results of monitoring of soil, leachate, and groundwater conducted by DP; and
- Destination of treated material (i.e. permanent stockpile(s)).

A record of dewatering activities should also include the following:

- Groundwater quality and pH at commencement of dewatering; and
- Monitoring of discharge water and surface waters in the vicinity of discharge (i.e. upstream and downstream).

A record should also be maintained confirming contingency measures and additional treatment if undertaken.

The records should ensure materials are tracked from excavation, treatment to disposal / re-use destinations.

A final report should be prepared upon completion of the works presenting the monitoring regime and results, and confirming that no adverse environmental impact has occurred during the works.

7.2 Acceptance Criteria

Water

Notwithstanding regulatory requirements, it is suggested that the ANZECC Guidelines for Fresh and Marine Water Quality, 2000 (Ref 3) for "slightly to moderately disturbed ecosystems" are considered before discharging any waters or leachate to the environment.

It is noted that current water quality on-site (surface water and groundwater) and off-site (Hexham Swamp and Hunter River) do not meet ANZECC guidelines, and as such indicate a degraded ecosystem. Discharge of waters from site dewatering activities should also consider background water quality and potential for controlled on-site infiltration in order to manage possible impacts, subject to regulatory approvals.

Soil

Further treatment may be required if monitoring of acid generating material reveals any of the following properties:

- pH of soil in water is less than background values (i.e. pH 6.6 to 8.3 – Ref 1); and
- pH in water minus pH in hydrogen peroxide is greater than 1 and pH in water is less than background values.

Depending on the results of testing, reapplication of lime may be necessary to gain adequate neutralisation. Care should be taken to ensure over liming does not occur. Additional laboratory testing may be required to confirm that appropriate treatment has occurred, subject to the results of monitoring and the results of additional investigations within CWR and natural soils (to be conducted prior to construction).

8. Contingency Plan

Remedial action will be required if the agreed standards or acceptance criteria are not being achieved. Remedial action shall comprise mixing of additional lime through the excavated material and neutralisation of leachate. The required mixing rate to remediate the soil or leachate should be confirmed by monitoring tests.

During periods of heavy or prolonged rainfall, stockpiling of acid generating materials should be appropriately contained / bunded to collect leachate for testing and neutralisation (if required) prior to disposal. Alternatively backfilling of ASS could be undertaken to prevent the migration of leachate.

Sufficient lime should be stored on-site during construction for the neutralisation of acid sulphate soils and contingency measures.

If overland discharge of groundwater is proposed, a contingency plan should be in place to allow neutralisation and confirmation monitoring prior to discharge if pH levels are low or fall below natural background levels.

Appropriate management of discharge waters will also be required to address potential WHS and Environmental impact in accordance with statutory and regulatory requirements.

Potential adverse impacts associated with excavations and dewatering should be mitigated through the implementation of an appropriate Soil and Water Management Plan (i.e. erosion and sediment controls, stormwater / drainage management) and Water Quality Management Plan (surface water and groundwater). Any disturbance of soils / waters at the site should be conducted in accordance with the GHD RAP (Ref 6).

An integrated surface water and groundwater monitoring program should be formulated as recommended in the PCA (Ref 4) to manage surface water and groundwater quality during and following development.

The above plans would form part of the CEMP for the proposed LTTSF development.

The ASSMP and CEMP should be updated following detailed design and confirmation of construction methodology prior to commencement of construction.

9. References

1. Douglas Partners Pty Ltd, "Report on Preliminary Geotechnical Investigation, Train Support Facility, Hexham", Project 39798.08, September 2012.
2. ASSMAC "ASSMAC Acid Sulphate Soil Manual", New South Wales Acid Sulphate Soil Management Advisory Committee, August 1998.
3. ANZECC (2000), Australian Water Quality Guidelines for Fresh and Marine Waters, November 2000.
4. Douglas Partners Pty Ltd, "Report on Preliminary Contamination Assessment, Train Support Facility, Maitland and Woodlands Close, Hexham", Project 39798.06, September 2012.
5. GHD Pty Ltd, "NSW Long Term Train Support Facility, Contamination Assessment, Implications of Track Lowering on Acid Sulphate Soil and Contamination Management", March 2013.
6. GHD Pty Ltd, "NSW Long Term Train Support Facility, Remediation Action Plan", Revision 3, 28 March 2013.
7. Douglas Partners Pty Ltd, " Report on Assessment of Potential Groundwater Level Impacts, Proposed NSW Long Term Train Support Facility", Project 39798.12, April 2013.

10. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Woodland Close, Hexham in accordance with DP's proposal NCL130080 dated 20 February 2013 and acceptance received from Aurizon Operations Limited (Aurizon). The work was carried out under Aurizon Operations Limited Short Term Consultancy Services Agreement (July 2012). This report is provided for the exclusive use of Aurizon for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. In preparing this report DP has necessarily relied upon information provided by the client and / or their agents.

The results of limited investigations were used to formulate this ASSMP. Additional investigations are required to confirm ASS conditions and requirements for management.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Douglas Partners Pty Ltd

Appendix A

About this Report
Indicative Project Construction Footprint – Sketch 80 Rev A (Engenicom)
Proposed Arrangement – Figure 2 – Sheets 1 and 2 (Worley Parsons)
Figure C0002 – Areas of Disturbance – Cut (GHD – 2216395-16-FIG-C0002) – Rev 7 – 28 March 2013
Figure C0003 – Areas of Disturbance – Fill (GHD – 2216395-16-FIG-C0003) – Rev 5 – 28 March 2013
Drawing 1-2 – Test Location Plan (Ref 1)

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

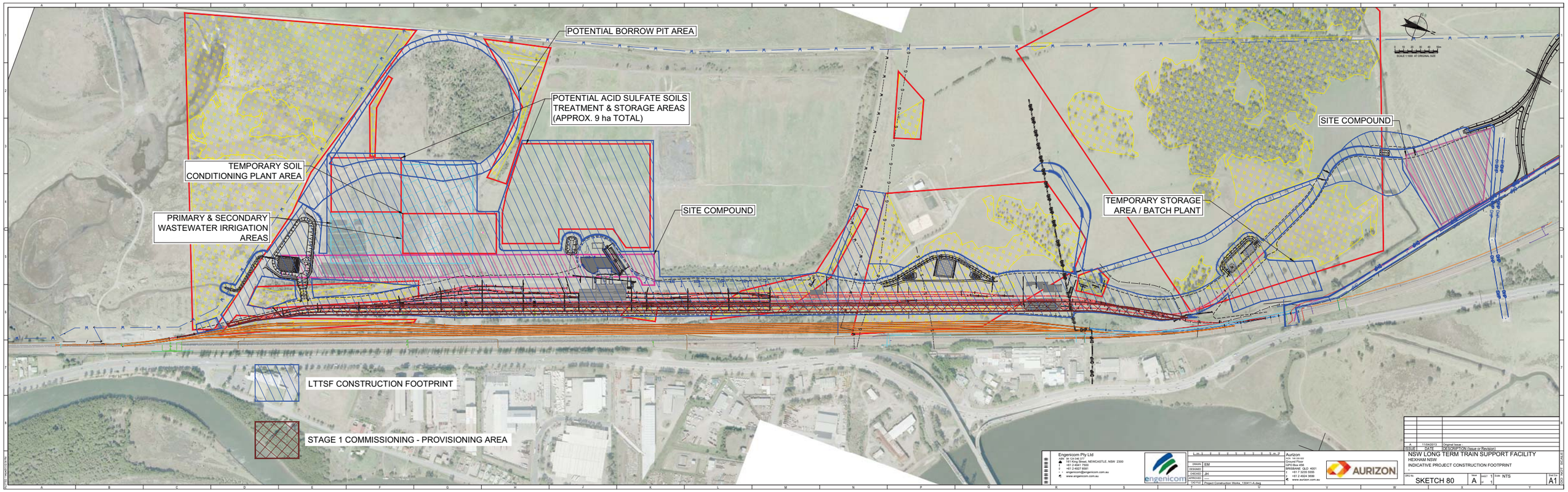
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.



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APPROVED
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AURIZON

ISSUE	DATE	DESCRIPTION (Issue or Revision)
A	11/04/2013	Original Issue

NSW LONG TERM TRAIN SUPPORT FACILITY
HEXHAM NSW
INDICATIVE PROJECT CONSTRUCTION FOOTPRINT

DRG No SKETCH 80 | Issue A | Sheet 1 of 1 | Scale NTS | Sheet Size A1

0 200m

1: 5000

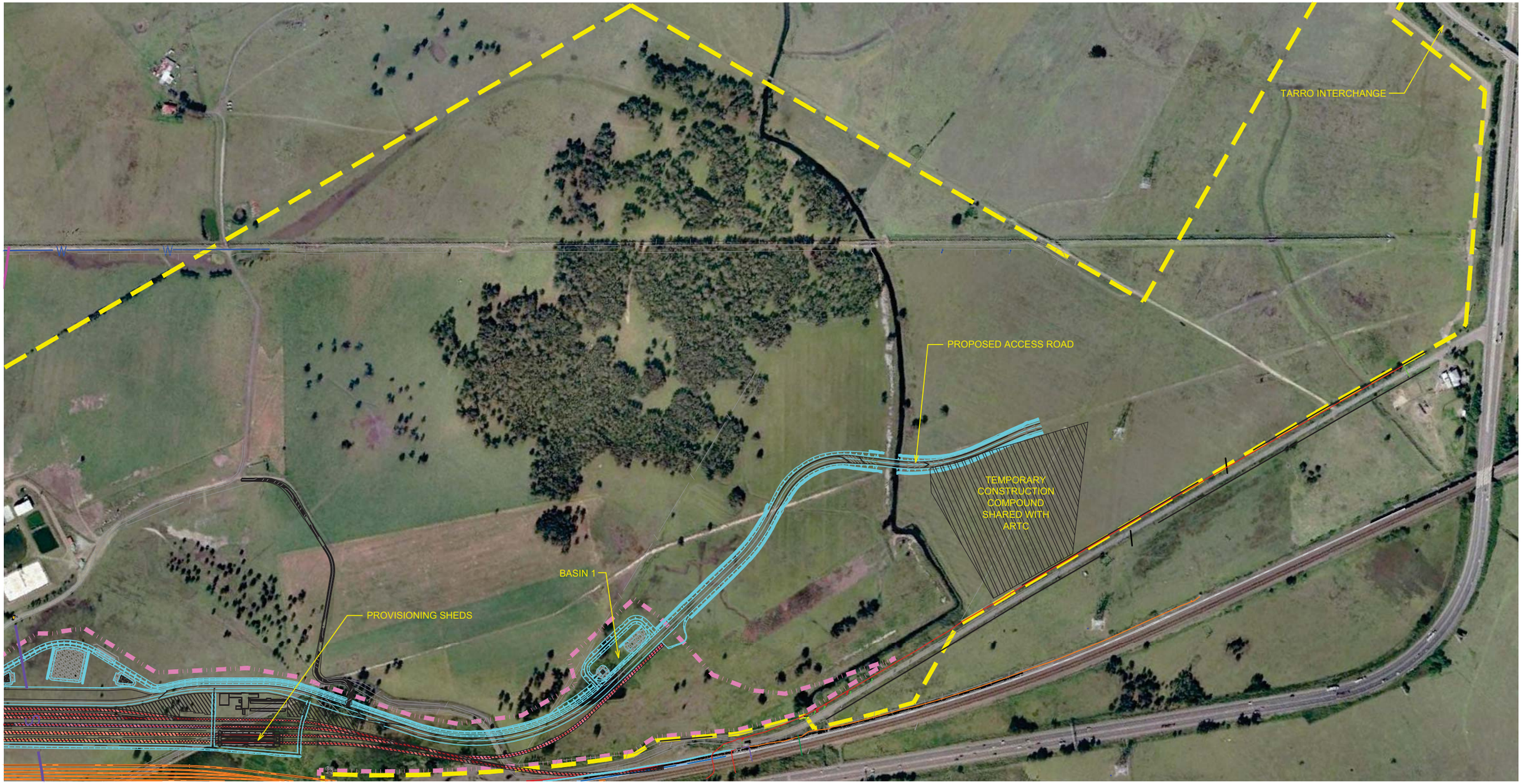
LEGEND

- TRAIN SUPPORT FACILITY BOUNDARY
- PROPERTY BOUNDARY
- WATER RECYCLING & WASTEWATER TREATMENT SYSTEM
- HWC PROPOSED WATER MAIN
- EXISTING WATER MAIN
- PROPOSED ARTC RELIEF ROADS (TRACKS)
- COAL TAILINGS STOCKPILE EXTENTS
- PROPOSED WASTEWATER DRAINAGE LINE
- PROPOSED RISING MAIN

WorleyParsons
resources & energy

PROPOSED ARRANGEMENT TRAIN SUPPORT FACILITY SHEET 1 OF 2

W: _Infrastructure\Projects\301020\301020-04881 Hexham Train Support Facility\Data In\13-04-04 Original Files From Newcastle\Drawings and xrefs\FIG 2-1_2-2_PROPOSED ARRANGEMENT.dwg 10/04/2013



LEGEND

- TRAIN SUPPORT FACILITY BOUNDARY
- PROPERTY BOUNDARY
- WATER RECYCLING & WASTEWATER TREATMENT SYSTEM
- TRUCK SHAKEDOWN AND WASHDOWN BAY (IF REQUIRED)

WorleyParsons
resources & energy

0 200m
1: 5000

PROPOSED ARRANGEMENT TRAIN SUPPORT FACILITY SHEET 2 OF 2

W: _Infrastructure\Projects\301020\301020-04881 Hexham Train Support Facility\Data In\13-04-04 Original Files From Newcastle\Drawings and xrefs\FIG 2-1_2-2_PROPOSED ARRANGEMENT.dwg 10/04/2013

0 50 100 150 200 250 300 m

SCALE: 1:5,000 AT ORIGINAL SIZE

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

LEGEND

- Aurizon NSW LTTSF Rail Centreline
- ARTC HRR Rail Centreline
- Road 10 Metre
- Road 5 Metre

Area Of Disturbance Cut mm

- 300
- 800
- 1000
- 1500
- 2600
- Aurizon NSW LTTSF Site Boundary

General

Potential Localised Dewatering May Be Necessary in Some Areas

SCALES SHOWN ARE FOR AN A1 SIZE ORIGINAL DRAWING

ALTERATIONS

6	TITLE BLOCK CHANGE	WRB	26.3.13
7	90% DESIGN REVIEW FOR TRACK LOWERED OPTION - GENERAL REVISION	WRB	28.3.13

GHD
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E ntlmail@ghd.com W www.ghd.com

PROJECT No. 22-16395

DRAWING No.

DESIGNED W. BIGGS
DESIGN CHECKED
DRAWN M.BARNIER
DRAFTING CHECK
APPROVED DATE

REVIEWED FOR AURIZON REQUIREMENTS
DESIGN MANAGER DATE
ISSUE AUTHORISED DATE

AURIZON

Aurizon Operations Ltd - ACN 124 649 967

HEXHAM TO TARRO

NSW LONG TERM TRAIN SUPPORT FACILITY

176.000km MAIN NORTH LINE
AREAS OF DISTURBANCE
CUT

FILE No. 2216395-16-FIG-C0002

DRAWING NUMBER 2216395-16-FIG-C0002

ISSUE 7

Data source: LPMA: DCTB - 2007; Nearmap: Aerials - 2012; Engenicom: Design Data - 2012. Created by:mabarnier

Cad File No: G:\22\16395\GIS\Maps\Deliverables\Internal\General\2216395-16-FIG-C0002.mxd
Plotted by: mabarnier
Plot Date: Thursday, 28 March 2013 - 3:37 PM

0 50 100 150 200 250 300 m

SCALE: 1:5,000 AT ORIGINAL SIZE

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

LEGEND

- Aurizon NSW LTTSF Rail Centreline
- ARTC HRR Rail Centreline
- Road 10 Metre
- Road 5 Metre

Area Of Disturbance Fill mm

- 0-200
- 200-400
- 500
- 1400
- Aurizon NSW LTTSF Site Boundary

General

Potential 200mm Site Stripping Prior to Filling of Site

SCALES SHOWN ARE FOR AN A1 SIZE ORIGINAL DRAWING

ALTERATIONS

4	TITLE BLOCK CHANGE	WRB	26.3.13
5	90% DESIGN REVIEW FOR TRACK LOWERED OPTION - GENERAL REVISION	WRB	28.3.13

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PROJECT No. 22-16395

DRAWING No.

DESIGNED W. BIGGS
DESIGN CHECKED
DRAWN M.BARNIER
DRAFTING CHECK
APPROVED
DATE

REVIEWED FOR AURIZON REQUIREMENTS
DESIGN MANAGER DATE
ISSUE AUTHORISED
DATE

Aurizon Operations Ltd - ACN 124 649 967

HEXHAM TO TARRO

NSW LONG TERM TRAIN SUPPORT FACILITY

176.000km MAIN NORTH LINE
AREAS OF DISTURBANCE
FILL

FILE No. 2216395-16-FIG-C0003

DRAWING NUMBER 2216395-16-FIG-C0003

ISSUE 5

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Plotted by: mabarnier
Plot Date: Thursday, 28 March 2013 - 4:16 PM