

CONDOBLIN ETHANOL SITE

**PRELIMINARY GEOTECHNICAL
INVESTIGATION**

FOR

SWAN HILL ETHANOL PTY LTD

PO BOX 551
SWAN HILL
50 322 488 (w)
50 323 499 (f)
office@shthanaol.net



TYPICAL LANDSCAPE OF THE CONDOBLIN SITE

GTS Report Number 06/4479
January 2007

DISCLAIMER

This investigation has been carried out in goodwill and under the instructions of the Swan Hill Ethanol. The investigation has been undertaken with the care and skill of competent personnel as defined within Geotechnical Testing Services quality system. It is not a comprehensive investigation but a guide to the conditions throughout the designated area.

The results from this investigation relate to the specified sites labelled throughout this document, and hence the information obtained may need to be extrapolated to the rest of the designated area. While care has been taken throughout this investigation, soil conditions can vary between each individual test site and at depths greater than that excavated during this investigation. The actual conditions of the whole area can only be determined with further excavation. Hence, if variations from this report are found during excavations/construction then Geotechnical testing Services should be notified so it can be assessed and appropriate advice provided.

This document has been prepared for the Swan Hill Ethanol, and hence no responsibility or liability is being accepted to any third party, where any part of the report is used in either isolation or without consideration of the whole document. This document is not appropriate where there has been a significant change in the project or either for the specific needs of the reader.

Prepared by

Mr John Boykett
(Director of GTS Pty Ltd)

Date:

Mr Terry Stevens (BE (Civil))
Terry Stevens Consulting Engineers Pty Ltd

Date:

Reviewed by

Dr. Scott Pigdon
(B.App.Sci (Hons) PhD (Sci) Eng)

Date:

Please, don't hesitate to contact me, if you require any further information or help.

Dr Scott Pigdon
Consultant

Telephone: (03) 54 414 881
Mobile: 0427 496 228
Email: scott@geotest.com.au

TABLE OF CONTENTS

	Page number
1 INTRODUCTION	4
2 SITE AND GEOLOGY	5
2.1 SITE LOCATION AND GENERAL CONDITION	5
2.2 GEOLOGY	5
3 FIELD WORK	6
4 RESULTS	6
4.1 FIELD RESULTS – SOIL PROFILING	6
4.2 FIELD RESULTS -	7
DYNAMIC CONE PENETROMETER RESULTS AND	
POCKET PENETROMETER RESULTS	
4.3 LABORATORY RESULTS	8
5 PRELIMINARY RECOMMENDATIONS	9
5.1 BUILDINGS	9
5.1.1 Small Domestic Type Buildings	9
5.1.2 Large or Heavily Loaded Structures	10
5.2 ROADWORKS	11
5.3 DAMS	11
5.4 HARDSTAND AREAS	12
5.5 RETAINING WALLS	12
5.6 BATTERS ON EMBANKMENTS	12
5.7 CONCLUSIONS	13
6 IMPORTANT NOTE	13

APPENDIX

Site location map – Vic Roads	A1
Location of each test pit	A2
Photographs of the immediate area	A3-A4
Soil profiles of each test pit and their subsequent geotechnical information	A5-A7
Nata accredited soil reports	A8-A14

1 INTRODUCTION

Swan Hill Ethanol commissioned Geotechnical Testing Services (GTS) to undertake a geotechnical investigation for a proposed Ethanol Plant in the Condoblin Region. Both the field investigation and report were undertaken and completed by suitably qualified and/or experienced staff members. GTS has also the appropriate insurances required to undertake such work, and they are available upon request. The purpose of the investigation was to provide the relevant site and soil information for a future design and construct contract.

The investigation included six excavated test pits. The approximate dimension of each pit was three to four metres in depth, three to four metres in length and approx. half a metre in width. At each pit, a series of soil and geotechnical information was collected to provide the required information for the aforementioned contract.

The report presents all the soil and geotechnical information collected from the investigation with particular attention given to subsurface conditions in the location of proposed storage dams. The report will also provide

- a site classification in accordance with Australian Standard 2870 for any proposed small structures for this site
- preliminary recommendation on the maximum allowable bearing pressures for large or heavy loaded buildings
- preliminary assessment of the sub-grade conditions for proposed access roads
- preliminary advice on the suitability of the soil and proposed earthworks for dams
- preliminary advice on hardstand areas, retaining walls and batters on embankments

2 SITE AND GEOLOGY

2.1 SITE LOCATION AND GENERAL CONDITION

The proposed Ethanol plant is located approximately 5km north west of the Condoblin Township (Page Appendix (A)1). Price Merrit Pty Ltd completed a full feature survey of the site, and GTS has used a portion of this survey to highlight the location of each pit undertaken at the property (Page A2).

The property has experience unprecedented drought conditions in recent years, and subsequently the site was incredibly dry. At the time of this investigation the site had a very slight fall to the north east of the property. The surface of the site was dry, well covered in grasses and there were also no visual signs of any rock outcrops. However, there was visual evidence of surface cracking over the site. The land is relevantly clear with a few large trees present. Several photos of the area were taken during the investigation, some of which highlight the aforementioned features (Page A3-A4), namely

- The excavation of a test pit
- General landscape and vegetation of the area
- Surface cracking over the area
- A neighbouring dam to the test pit area

GTS has taken more photos of the site and these would be made available, if required.

2.2 GEOLOGY

The Condoblin ethanol site falls within the Murray Basin geological structure. The Murray Basin landscape predominantly Aeolian consisting of sandy ridges interrupted by clay pans and lunettes. Information provided by Department of Primary Industries- Minerals.

3 FIELD WORK

The geotechnical investigation was carried out in accordance with Australian Standard (AS) 1726 – Geotechnical Site Investigations. The location of test pits was provided by Mr Stewart Rendell of Swan Hill Ethanol, and each pit was excavated by Warren Ross Excavations in December, 2006, using a 20 tonne excavator. The field investigation was completed by Mr John Boykett, which included soil profiling and the taking field samples. Dr Scott Pigdon provided off-site supervision when required.

The geotechnical investigation consisted of field testing and the sampling of each soil at each varying soil profile. Field tests included both pocket penetrometer readings and dynamic cone penetration tests (depending upon soil structures). Disturbed samples were also recovered from test pits for laboratory testing.

On completion of each test pit, the excavated soil was used to backfill the open pit and then compacted to an appropriate level.

4. RESULTS

4.1 FIELD RESULTS – SOIL PROFILES

The soil profile observed in the wall of each test pit was found to be relatively consistent between the surface and approx. 1200mm.

- 0-200mm Sandy silty top soil, brown
- 200-600mm Silty clay, brown, high plasticity
- 600-1200mm Silty clay, pale red/brown, moderate plasticity

There were various soil profiles logged between 1200-4000mm, which were combinations of silty sandy clay to gravelly clay, various colours and typically moderately to highly plastic (pages A5-A7). During the excavation of all 6 test pits no ground water was encountered.

4.2 FIELD RESULTS - DYNAMIC CONE PENETROMETER RESULTS AND POCKET PENETROMETER RESULTS

The field investigation consisted of pocket penetrometer (PP) readings at every 1000mm, and each sample tested had an estimated shear capacity in excess of 225 kPa. A summary of PP results are presented in Table 4.1. Dynamic cone penetration (DCP) tests were performed at the surface level of each pit and at every 100mm to approx. 500mm below ground level. An allowable bearing pressure was then calculated using Stockwell, M.J. (1977). Typically, the allowable bearing capacity of the soil at each level tested was in excess of 240 kPa. A summary of the DCP tests can be observed in Table 4.2.

**Table 4.1 Summary of the Field Testing
(Pocket Penetrometer - Estimated Shear Strength (kPa))**

Depth (mm)	Test Pit 1	Test Pit 2	Test Pit 3	Test Pit 4	Test Pit 5	Test Pit 6
1000	+225	+225	+225	+225	+225	+225
2000	+225	+225	+225	+225	+225	+225
3000	+225	+225	+225	+225	-	+225
3500	+225	+225	-	-	-	-

**Table 4.2 Summary of the Field Testing
(DCP - Estimated Bearing Capacity (kPa))**

Depth (mm)	Test Pit 1	Test Pit 2	Test Pit 3	Test Pit 4	Test Pit 5	Test Pit 6
0-100	240	240	170	210	240+	240
100-200	240+	240+	210	210	230	240+
200-300	240+	240+	230	230	210	240+
300-400	240+	240+	240	240+	240	240+
400-500	240+	240+	240+	240+	240+	240+

4.3 LABORATORY RESULTS

The laboratory investigations were completed on eight selected samples over the six excavated test pits and at various soil depths. Soil tests performed included Moisture Contents, Atterberg Limits, Sieve Analysis and Emerson Class Numbers. A summary of the results from each selected soil can be observed in Table 4.3. At each test pit soil samples were obtained immediately below topsoil at a depth of approximately 300mm. A California Bearing Ratio (CBR) was completed on each soil completed from this depth, and a summary of CBR results can be observed in Table 4.4.

Table 4.3 Summary of the Laboratory Testing

Test Pit Number	Soil Depth (mm)	Moisture Content (%)	Atterberg Limits				Soil Passing 75µm (%)	Emerson Number
			Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)		
1	200	3.6	19	11	8	1.5	44	2
1	1000	8.7	59	29	30	14.0	22	2
4	300	11.2	41	20	21	9.0	60	2
4	1100	21.9	62	25	37	16.5	82	2
5	500	18.5	45	26	19	10.0	52	2
5	700	14.4	35	22	13	6.0	26	2
5	2500	19.3	70	23	47	17.0	85	2
5	3500	20.9	57	21	36	13.0	76	2

Note:

GTS is a NATA accredited laboratory and the NATA reports on each soil test can be observed in pages A8-A15

Table 4.4 Summary of the Laboratory Testing
(4-Day Soaked CBR – 98% Compaction and 100% Optimum)

Test Pit Number	Soil Depth (mm)	Max. Dry Density (t/m ³)	Optimum Moisture Content (%)	Swell (%)	CBR (%)
1	200	2.01	8.7	0.0	13.0
2	500	1.53	24.6	0.5	12.5
3	200	1.82	12.8	0.5	5.5
4	300	1.59	20.3	0.0	5.0
5	700	1.61	20.8	0.0	16.5
6	200	1.94	10.6	0.0	8.0

5 PRELIMINARY RECOMMENDATIONS

At the time of preparing this report, the type and extent of earthworks for buildings, roadways, dams, retaining walls and storage areas were not known. Hence, the recommendations given below are of a general nature only and should be treated as such.

5.1 BUILDINGS

5.1.1 Small Domestic Type Buildings

Where this type of construction is proposed the Australian Standard AS 2870-1996 “Residential Slabs and Footings – Construction” may apply to forms of construction other than houses, including some light industrial, commercial and institutional buildings. If they are similar to houses in size, loading and superstructure flexibility (refer to Section 3.1.1 of this standard for applicability). Standard footing designs are given in Section 3 of this standard for slab-on-ground, stiffened rafts, waffle rafts, strip footings, pad footings and piled foundations.

Further testing of the site at the specific location of these buildings will be required but initial consideration could be made using a 'Class H-D' classification.

This is based on the climatic conditions for the site being semi-arid leading to deep seated moisture movement and the predominantly clay based material being highly reactive (linear shrinkage values ranged to 17.0%). 'Class H-D' places limits on types of slab and footing systems and the method of construction as well as drainage details and the type of plumbing fittings for pipework.

5.1.2 Large Or Heavily Loaded Structures

These will generally require a stiffened raft construction or deep spread footings (pad footings or strip footings). Where pad footings are proposed, it is advisable to consider the use of concrete tie beams between the footings to limit the amount of differential settlement. The footings should be founded a minimum of 600 mm below existing surface level and into the natural sandy, silty clay material.

Initial estimates of safe bearing capacity taken from field DCP readings and PP readings are:

Pad Footings	200 kPa
Strip Footings	150 kPa

Using these values should provide adequate safety margin against shear failure of the soil and excessive settlement under load. Design parameters for these footings should be re-assessed when actual locations and relative magnitudes of these loads are known.

Further factors to consider are moisture conditions at the time of construction and the requirements for resistance to lateral loads and uplift.

For industrial slabs and pavements subjected to heavy and frequent traffic (e.g. forklift vehicles) the designer should give consideration to the possibility of pumping action of water in the clay material below the slab, as the natural material on site appears susceptible to this problem.

CBR estimates of 5.0 to 16.5 and the percentage of soil passing 75 microns being over 45% in five of eight samples tested for the clay sub-grade material on site indicate a granular sub-base material or some other type of sub-grade drainage is warranted.

5.2 ROADWORKS

The natural clay material on site extends to at least 4.0 m below surface and is considered highly reactive to moisture variations (swelling when wet and shrinking when dry). In addition, the CBR values recorded indicate a low modulus of sub-grade reaction of approximately 40 kPa/mm. On this basis, it is suggested that imported granular material be used for roadwork constructions and/or lime stabilization of the existing clay material be used.

It is also important that adequate drainage be provided during construction and for in-service conditions.

5.3 DAMS

Dams will most likely be placed on-site to catch surface run-off from roadways and buildings and possibly for effluent. The soil material on-site appears to be generally both sandy and gravelly in nature and subsequently it is unlikely that will be sufficiently impermeable to hold water. It is also unlikely that these materials will be suitable for use in the construction of the embankments due to the potential risk of piping.

Given the predominately sandy and gravelly nature of the subsoil and the limited volume of clay in the area investigated it would be likely that a High Density Polyethylene (HDPE) membrane or similar would be required to line the dams for the retention of water. The liner would need to be covered with 0.5m of fine grained soil to protect the HDPE from both drainage and ultra-violet light. During installation care would also be needed to avoid punctures within the liner.

Correct construction techniques and compaction testing should prevent most problems related to dam construction. Further testing of specific dam sites will be required so that more accurate soil parameters can be ascertained for wall and liner design.

5.4 HARDSTAND AREAS

Refer also to the section on Roadwork above. Hardstand areas for storing transient loads that are not sensitive to differential settlement may be treated as for roadworks.

Where loads are longer term and/or sensitive to excessive or differential settlement they should be supported on a footing system as discussed in section on Large or Heavily Loaded Structures above. It is worth reiterating that the natural materials on-site are considered very susceptible to moisture movement variation and as such will require adequate attention to design of surface drainage.

5.5 RETAINING WALLS

Should retaining walls be proposed then the following guidelines should be observed:

- i. A suggested value for the Co-efficient of Active Earth Pressure, K_a , is in the order of 0.33;
- ii. Natural material should not be used for backfill as it is too liable to shrinkage and swelling. A coarse granular backfill is recommended with adequate attention to surface and sub-surface drainage made.

5.6 BATTERS ON EMBANKMENTS

For short-term batters a grade of 1:1 is considered safe for slope stability where cut-off drains are used on the high side of the embankment. For longer term batters this grade should be reduced to say 1 vertical: 2 horizontal. Being a clay material and considered only slightly dispersive then erosion of batters should not be problematic.

Surface drains above and below these batters should be provided.

5.7 CONCLUSION

These preliminary recommendations are based on conditions encountered on-site at the time of investigation and results of tests carried out both in the field and in the laboratory.

Although test results are generally consistent they are indicative for the locations tested only.

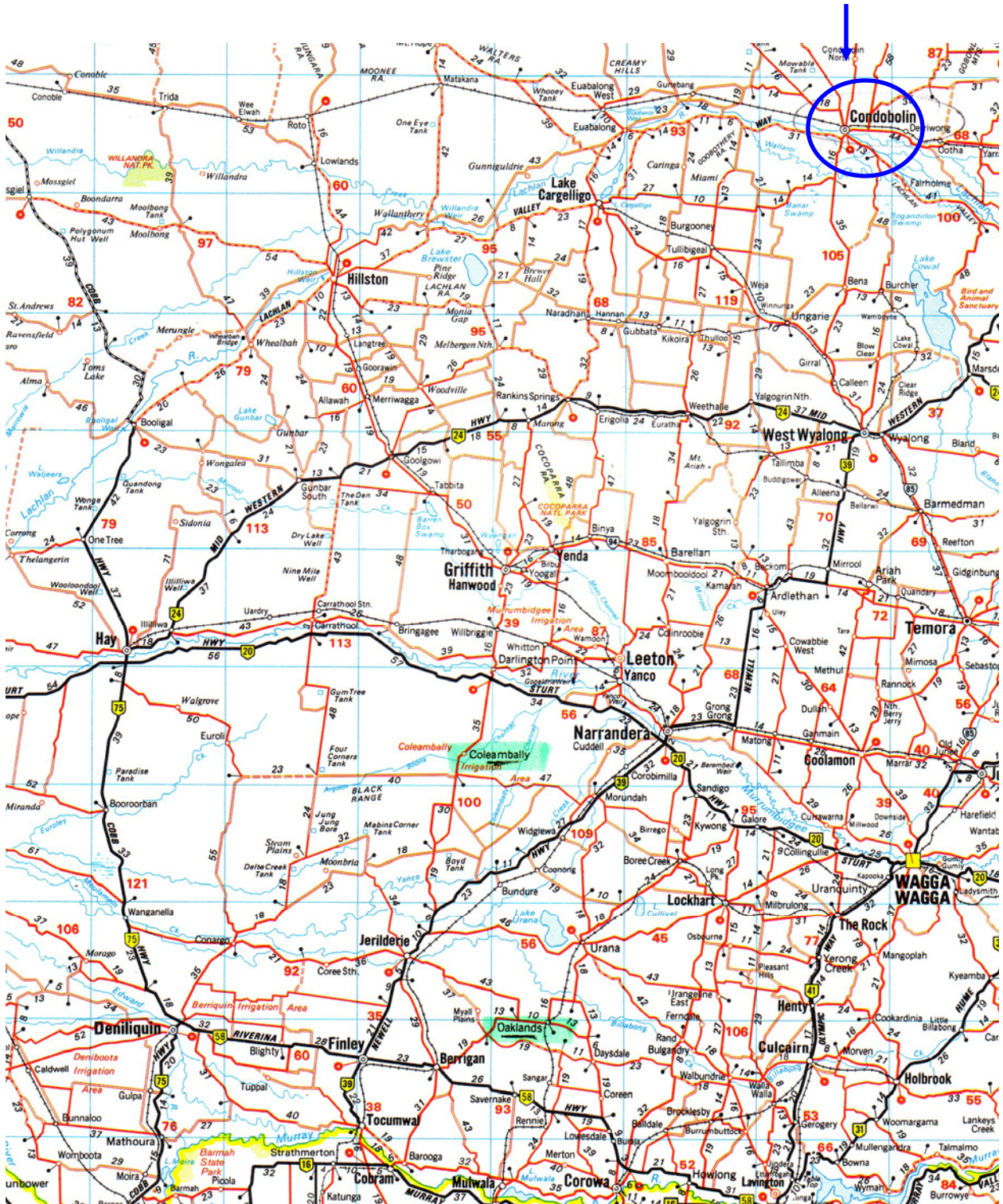
These recommendations are subject to verification by further investigations when the layout of the development and serviceability requirements are better understood.

6 IMPORTANT NOTE

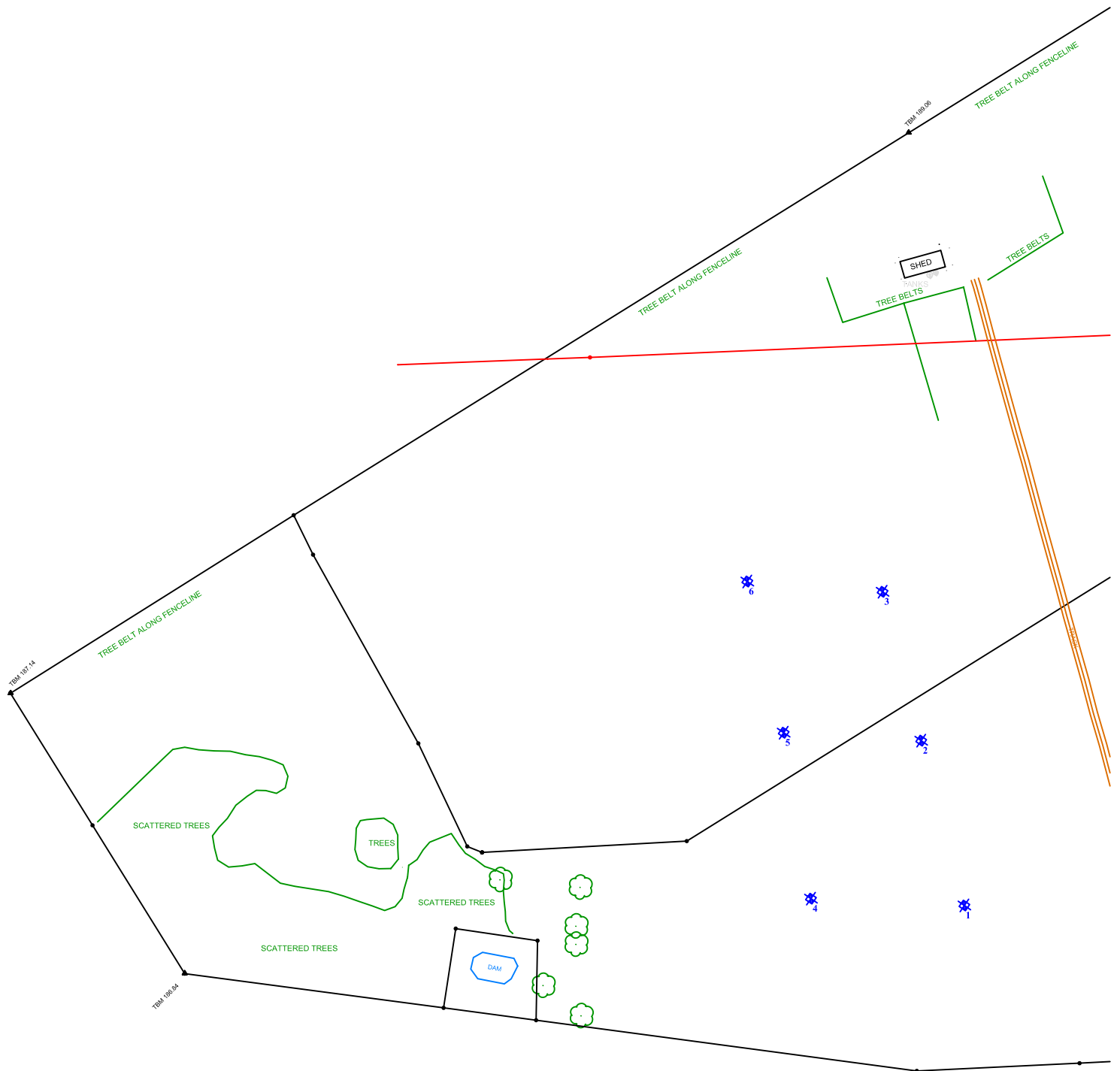
This report has highlighted several times that the subsoil present at Condoblin is susceptible to moisture movement variation. This investigation was undertaken during a period of extreme dry conditions, and subsequently sections of the subsoil are currently very dry. Hence, care is recommended.


APPENDIX

Site location



Location- Australian Road Atlas



 = TEST PIT APPROX. LOCATION/ NUMBER
2



GEOTECHNICAL TESTING SERVICES PTY LTD
 BENDIGO: (03) 54414881 - gts.bgo@geotest.com.au
 SWAN HILL: (03) 50322547 - gts.sh@geotest.com.au
 MILDURA: (03) 50213477 - gts.mil@geotest.com.au

PLAN
 LAYOUT & TEST LOCATIONS
 APPROX SCALE 1:2500

Condobolin Ethano; Site
 SITE:
 Condobolin

G.T.S CONTACT: **DR. SCOTT PIGDON (B.App.Sci.(Hons) PhD (Sci) Eng)**

G.T.S REF: 06/4479

DATE: JAN 2007



Excavator and typical test pit



General landscape and vegetation of the area



Visual signs of surface cracking over the property



Dam with the vicinity of pits

TEST PITS No: 1 & 2



CLIENT: SWAN HILL ETHANOL Pty. Ltd
LOCATION: CONDOBLIN
JOB No.: 06-4479

METHOD: Test Pits- 22T Excavator
OPERATOR: John Boykett

LOG SHEET No: 1 OF 3

FIELD DATA				SOIL DESCRIPTION	LABORATORY DATA									
field & other tests	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	moisture content (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	linear shrinkage (%)	percent fines (%)	swell (%)	CBR	dry density (t/m ³)	optimum moisture content (%)
				Topsoil, brown (SM)										
				Silty sandy clay (SC), brown	3.6	19	11	8	1.5	44.0	0.0	13.0	2.01	8.7
		1.0		Silty gravelly clay (GC), red/ brown	8.7	59	29	30	14.0	22.5				
				Gravelly silty clay (GC), red/ brown										
		2.0		Sandstone gravel (GP), pale brown										
				Sandstone gravel (GP), pale brown/ pale yellow										
		3.0		Highly weathered sandstone (R), pale brown										
		4.0												
		5.0												

				Topsoil (SM), brown										
				Silty clay (CL), brown							0.5	12.5	1.53	24.6
		1.0		Silty clay (CH), red/ brown										
				Silty clay (MH), pale brown										
		2.0		Silty sandy clay (SC), pale brown										
				Silty sandy clay (SC), orange/ pale brown										
		3.0												
		4.0		Sandy gravelly clay (GC), pale grey/ pale brown										
		5.0												

LEGEND	FIELD DATA ABBREVIATIONS	FIELD DATA SYMBOLS	DENSITY (N-value)	CONSISTENCY (su)
	DCP = Dynamic Cone Penetration (kPa) PP = Pocket penetrometer (kPa)	✗ = Dynamic Cone Penetration ⚡ = Pocket Penetrometer test □ = Environmental Sample ■ = Undisturbed Tube Sample ● = Disturbed sample ▣ = Bulk sample	VL (very loose) 0-4 L (loose) 4-10 MD (medium dense) 10-30 D (dense) 30-50 VD (very dense) 50-100 CO (compact) >50/150mm	VS (very soft) <12kPa S (soft) 12-15 F (firm) 25-50 St (stiff) 50-100 VSt (very stiff) 100-200 H (hard) >200kPa
	GROUNDWATER ABBREVIATIONS ● = Water level (static) ○ = Water level (during excavation)		MOISTURE CONDITION D = Dry M=Moist W=Wet	

TEST PITS No: 3 & 4



CLIENT: SWAN HILL ETHANOL Pty. Ltd
LOCATION: CONDOBLIN
JOB No.: 06-4479

METHOD: Test Pits- 22T Excavator
OPERATOR: John Boykett

LOG SHEET No: 2 OF 3

FIELD DATA			SOIL DESCRIPTION		LABORATORY DATA									
field & other tests	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	moisture content (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	linear shrinkage (%)	percent fines (%)	swell (%)	CBR	dry density (t/m³)	optimum moisture content (%)
				Topsoil (SM), brown Silty clay (CH), brown Silty clay (CH), orange/ pale brown Silty clay (CH), pale brown mottled red Sandy clay (SC), pale brown Sandy clay (SC), grey mottled pale red							0.5	5.5	1.82	12.8

				Clayey topsoil (SC), brown Silty clay (CH), brown/ grey Silty clay (CH), brown Sandy silty clay (SC), pale brown Silty sandy clay (SC), pale brown Silty clay (MH), pale grey	11.2	41	20	21	9.0	60.0	0.0	5.0	1.59	20.3	
					21.9	62	25	37	16.5	82.0					

LEGEND	FIELD DATA ABBREVIATIONS	FIELD DATA SYMBOLS	DENSITY (N-value)	CONSISTENCY (su)
	DCP = Dynamic Cone Penetration (kPa) PP = Pocket penetrometer (kPa) Suv = Remoulded vane shear (kPa)	⊗ = Dynamic Cone Penetration ⏏ = Pocket Penetrometer test □ = Environmental Sample ■ = Undisturbed Tube Sample ● = Disturbed sample ▣ = Bulk sample	VL (very loose) 0-4 L (loose) 4-10 MD (medium dense) 10-30 D (dense) 30-50 VD (very dense) 50-100 CO (compact) >50/150mm	VS (very soft) <12kPa S (soft) 12-15 F (firm) 25-50 St (stiff) 50-100 VSt (very stiff) 100-200 H (hard) >200kPa
	GROUNDWATER ABBREVIATIONS ● = Water level (static) ○ = Water level (during excavation)		MOISTURE CONDITION D = Dry M=Moist W=Wet	

TEST PITS No: 5 & 6



CLIENT: SWAN HILL ETHANOL Pty. Ltd
LOCATION: CONDOBLIN
JOB No.: 06-4479

METHOD: Test Pits- 22T Excavator
OPERATOR: John Boykett

LOG SHEET No: 3 OF 3

FIELD DATA			SOIL DESCRIPTION		LABORATORY DATA									
field & other tests	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	moisture content (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	linear shrinkage (%)	percent fines (%)	swell (%)	CBR	dry density (t/m³)	optimum moisture content (%)
				Topsoil (SM), brown Silty clay (CH), brown	18.5	45	26	19	10.0	52.0				
		1.0		Silty clay (MH), pale red/ pale brown	14.4	35	22	13	6.0	26.0	0.0	16.5	1.61	20.8
		2.0		Silty gravelly clay (GC), pale brown	19.3	70	23	47	17.0	85.5				
		3.0		Silty gravelly clay (GC), pale brown/ pale grey										
		4.0		Silty gravelly clay (GC), red/ pale brown	20.9	57	21	36	13.0	76.0				
		5.0		Silty sandy clay (SC) Orange mottled pale grey/ pale brown										

				Topsoil (SM), brown Silty clay (CH), red/ brown							0.0	8.0	1.94	10.6
		1.0		Silty clay (MH), red/ pale brown										
		2.0												
		3.0		Silty gravelly clay (GC) brown mottled grey/ red										
		4.0		Silty sandy clay (SC) pale grey mottled pale red										
		5.0												

LEGEND	FIELD DATA ABBREVIATIONS	FIELD DATA SYMBOLS	DENSITY (N-value)	CONSISTENCY (su)
	DCP = Dynamic Cone Penetration (kPa) PP = Pocket penetrometer (kPa) Suv = Remoulded vane shear (kPa)	⊗ = Dynamic Cone Penetration ⚡ = Pocket Penetrometer test □ = Environmental Sample ■ = Undisturbed Tube Sample ● = Disturbed sample ▢ = Bulk sample	VL (very loose) 0-4 L (loose) 4-10 MD (medium dense) 10-30 D (dense) 30-50 VD (very dense) 50-100 CO (compact) >50/150mm	VS (very soft) <12kPa S (soft) 12-15 F (firm) 25-50 St (stiff) 50-100 VSt (very stiff) 100-200 H (hard) >200kPa
	GROUNDWATER ABBREVIATIONS ● = Water level (static) ⊗ = Water level (during excavation)		MOISTURE CONDITION D = Dry M=Moist W=Wet	

SOIL PROPERTIES- sampled by Laboratory Staff
Testing in Accordance with AS1289
TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd P.O Box 551 SWAN HILL Vic 3585	Report N°	06/4479 (Final)
			Page A8
		Date of Report:	11 Jan 2007

LABORATORY INFORMATION

Project: Condoblin Ethanol Site

Sample Location: Condoblin

Date of Sampling: 12/12/06

SAMPLE IDENTIFICATION

Laboratory Identification	Client Identification
4479A	Pit 1 @ 200
4479D	Pit 4 @ 300
4479E	Pit 5 @ 700
4479G	Pit 1 @ 1000
4479H	Pit 4 @ 1100
4479 I	Pit 5 @ 500

SAMPLE DESCRIPTION

Laboratory Identification	Description
4479A	Sandy clay/ red/ brown
4479D	Sandy clay, brown
4479E	Sandy clay, red/ brown
4479G	Sandy clay with sandstone, red/ brown
4479H	Sandy clay, red/ brown
4479 I	Sandy clay & limestone pieces, red/ brown

Approved Signatory:
S.P.Pigdon

Date: 11 January, 2006

Testing Laboratory: Bendigo



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test report herein has been performed in accordance with its scope of accreditation. This document shall not be reproduced, except in full.
 NATA Accredited Laboratory Number: 842

SOIL PROPERTIES- sampled by Laboratory Staff
Testing in Accordance with AS1289
TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd P.O Box 551 SWAN HILL Vic 3585	Report N° 06/4479 (Final)
		Page A9
		Date of Report: 11 Jan 2007

LABORATORY INFORMATION

Project: Condoblin Ethanol Site

Sample Location: Condoblin

Date of Sampling: 12/12/06

SAMPLE IDENTIFICATION

Laboratory Identification	Client Identification
4479J	Pit 5 @ 2500
4479K	Pit 5 @ 3500
*	*
*	*
*	*
*	*

SAMPLE DESCRIPTION

Laboratory Identification	Description
4479J	Silty clay, pale brown/ grey mottled white
4479K	Silty clay, red/ brown/ grey
*	*
*	*
*	*
*	*

Approved Signatory:
S.P.Pigdon

Date: 11 January 2007

Testing Laboratory: Bendigo



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 NATA Accredited Laboratory Number: 842

SOIL PROPERTIES- sampled by Laboratory Staff
Testing in Accordance with AS1289
TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd P.O Box 551 SWAN HILL Vic 3585	Report N° 06/4479 (Final)
		Page A10
		Date of Report: 11 Jan 2007

Sample Identification:	4479A	4479D	4479E	4479G	4479H	4479I
Client Identification	Pit 1 @ 200	Pit 4 @ 300	Pit 5 @ 700	Pit 1 @ 1000	Pit 4 @ 1100	Pit 5 @ 500
Plasticity Index						
Liquid Limit %	19	41	35	59	62	46
Plastic Limit %	11	20	22	29	25	26
Plasticity Index %	8	21	13	30	37	19
Linear Shrinkage %	1.5	9.0	6.0	14.0	16.5	10.0
Preparation Method:	Oven dry	Oven dry	Oven dry	Oven dry	Oven dry	Oven dry
Shrinkage Mould Length:	254mm	254mm	254mm	254mm	254mm	254mm
Shrinkage Crumbling:	Yes	Yes	Yes	Yes	Yes	Yes
Shrinkage Curling:	Yes	Yes	Yes	Yes	Yes	Yes
Test Methods Used:	2.1.1	3.1.2	3.2.1	3.3.1	3.4.1	
Mechanical Analysis						
Sieve Size (mm)	Percentage Passing (%)					
200	*	*	*	100	*	*
75.0	*	*	*	80	*	*
63.0	*	*	*	59	*	*
37.5	*	*	*	53	*	*
26.5	*	*	*	52	*	*
19.0	*	*	*	49	*	*
13.2	100	*	*	46	*	100
9.5	99	*	*	42	*	99
6.7	98	*	*	38	*	98
4.75	97	*	100	35	*	98
2.36	95	100	98	31	100	97
1.18	91	98	89	29	97	95
600µm	82	95	73	28	95	90
425µm	76	91	61	27	93	87
300µm	70	87	51	26	92	83
212µm	*	*	*	*	*	*
150µm	60	75	35	24	87	70
75µm	44	60	26	22	82	52
Test Method Used	3.6.1					
Field Moisture Content						
Lab Id:	4479A	4479D	4479E	4479G	4479H	4479 I
Moisture Content (%)	3.6	11.2	14.4	8.7	21.9	18.5
Test Method Used:	3.7.1					

Approved Signatory:
S.P.Pigdon

Date: 11 January 2007

Testing Laboratory: Bendigo



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NATA Accredited Laboratory Number: 842

SOIL PROPERTIES- sampled by Laboratory Staff
Testing in Accordance with AS1289
TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd P.O Box 551 SWAN HILL Vic 3585	Report N° 06/4479 (Final)
		Page A11
		Date of Report: 11 Jan 2007

Sample Identification:	4479J	4479K	*	*	*	*
Client Identification	Pit 5 @ 2500	Pit 5 @ 3500	*	*	*	*
Plasticity Index						
Liquid Limit %	70	57	*	*	*	*
Plastic Limit %	23	21	*	*	*	*
Plasticity Index %	47	36	*	*	*	*
Linear Shrinkage %	17.0	13.0	*	*	*	*
Preparation Method:	Oven dry	Oven dry	*	*	*	*
Shrinkage Mould Length:	254mm	254mm	*	*	*	*
Shrinkage Crumbling:	Yes	Yes	*	*	*	*
Shrinkage Curling:	Yes	Yes	*	*	*	*
Test Methods Used:	2.1.1	3.1.2	3.2.1	3.3.1	3.4.1	
Mechanical Analysis						
Sieve Size (mm)	Percentage Passing (%)					
200	*	*	*	*	*	*
75.0	*	*	*	*	*	*
63.0	*	*	*	*	*	*
37.5	*	*	*	*	*	*
26.5	*	*	*	*	*	*
19.0	*	*	*	*	*	*
13.2	*	100	*	*	*	*
9.5	*	99	*	*	*	*
6.7	*	98	*	*	*	*
4.75	*	96	*	*	*	*
2.36	100	91	*	*	*	*
1.18	98	89	*	*	*	*
600µm	98	88	*	*	*	*
425µm	97	87	*	*	*	*
300µm	96	86	*	*	*	*
212µm	*	*	*	*	*	*
150µm	92	82	*	*	*	*
75µm	86	76	*	*	*	*
Test Method Used	3.6.1					
Field Moisture Content						
Lab Id:	4479J	4479K	*	*	*	*
Moisture Content (%)	19.3	20.9	*	*	*	*
Test Method Used:	3.7.1					

Approved Signatory:
S.P.Pigdon

Date: 11 January 2007

Testing Laboratory: Bendigo



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SOIL PROPERTIES- sampled by Laboratory Staff
Testing in Accordance with AS1289
TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd P.O Box 551 SWAN HILL Vic 3585	Report N°	06/4479 (Final)
		Page A12	
		Date of Report:	11 Jan 2007

LABORATORY INFORMATION

Project: Condoblin Ethanol Site

Sample Location: Condoblin

Date of Sampling: 12/12/06

SAMPLE IDENTIFICATION

Laboratory Identification	Client Identification
4479A	Pit 1 @ 200
4479D	Pit 4 @ 300
4479E	Pit 5 @ 700
4479G	Pit 1 @ 1000
4479H	Pit 4 @ 1100
4479 I	Pit 5 @ 500

SAMPLE DESCRIPTION

Laboratory Identification	Description
4479A	Sandy clay/ red/ brown
4479D	Sandy clay, brown
4479E	Sandy clay, red/ brown
4479G	Sandy clay with sandstone, red/ brown
4479H	Sandy clay, red/ brown
4479 I	Sandy clay & limestone pieces, red/ brown

Approved Signatory:
S.P.Pigdon

Date: 11 January 2007

Testing Laboratory: Bendigo



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SOIL PROPERTIES- sampled by Laboratory Staff
Testing in Accordance with AS1289
TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd P.O Box 551 SWAN HILL Vic 3585	Report N° 06/4479 (Final)
		Page A13
		Date of Report: 11 Jan 2007

Sample Identification:	4479A	4479B	4479C	4479D
*Client Identification:	Pit 1 @ 200	Pit 2 @ 500	Pit 3 @ 200	Pit 4 @ 300

Test Results				
Date of Test:	22/12/06	22/12/06	22/12/06	22/12/06
Laboratory Density Ratio:	98.0	97.0	98.5	98.0
Laboratory Moisture Ratio:	97.5	102.5	97.5	102.5
Moisture Content Top 30mm:	11.1	29.8	17.6	23.0
Compaction Type:	Standard	Standard	Standard	Standard
Number of Layers:	3	3	3	3
% Material retained 19.0mm sieve:	0	0	0	0
Material crushed & reused:	NA	NA	NA	NA
Mass of Surcharge:g	5542.5	5500.8	5523.4	5491.4

Soaked sample Information				
Period of Soaking (days)	4	4	4	4
Dry Density After Soaking: t/m ³	1.96	1.47	1.78	1.55
Moisture Content After Soaking: %	10.7	27.2	15.6	22.6
Swell: %	0.0	0.5	0.5	0.0

Maximum dry density / Optimum moisture content				
Maximum dry density: t/m ³	2.01	1.53	1.82	1.59
Optimum moisture content: %	8.7	24.6	12.8	20.4

Penetration Depth of C.B.R Determination: 5.0mm	13.0	11.0	5.0	4.0
CALIFORNIA BEARING RATIO:				

Test Methods Used:

2.1.1

5.1.1

6.1.1

Approved Signatory:
S.P.Pigdon

Date: 11 January 2007

Testing Laboratory: Bendigo



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SOIL PROPERTIES- sampled by Laboratory Staff
Testing in Accordance with AS1289
TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd P.O Box 551 SWAN HILL Vic 3585	Report N° 06/4479 (Final)
		Page A14
		Date of Report: 11 Jan 2007

Sample Identification:	4479E	4479*F	*	*
*Client Identification:	Pit 5 @ 700	Pit 6 @ 200		

Test Results				
Date of Test:	22/12/06	22/12/06	*	*
Laboratory Density Ratio:	98.5	98.0	*	*
Laboratory Moisture Ratio:	97.0	100.0	*	*
Moisture Content Top 30mm:	23.0	13.1	*	*
Compaction Type:	Standard	Standard	*	*
Number of Layers:	3	3	*	*
% Material retained 19.0mm sieve:	0	0	*	*
Material crushed & reused:	NA	NA	*	*
Mass of Surcharge:g	5526.0	5502.7	*	*

Soaked sample Information				
Period of Soaking (days)	4	4	*	*
Dry Density After Soaking: t/m ³	1.59	1.90	*	*
Moisture Content After Soaking: %	22.5	12.7	*	*
Swell: %	0.0	0.0	*	*

Maximum dry density / Optimum moisture content				
Maximum dry density: t/m ³	1.61	1.94	*	*
Optimum moisture content: %	120.8	10.6	*	*

Penetration Depth of C.B.R Determination: 5.0mm	16.0	8.0	*	*
CALIFORNIA BEARING RATIO:				

Test Methods Used:

2.1.1

5.1.1

6.1.1

Approved Signatory:
S.P.Pigdon

Date: 11 January 2007

Testing Laboratory: Bendigo



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 NATA Accredited Laboratory Number: 842

Client: **Geotechnical Testing Services**

Address: PO Box 555
GOLDEN SQUARE VIC 3555

Attention: **Scott Pigdon**

Page 1 of 3

Certificate of Analysis

Batch No: 07-00422

Replacement Report

Report Number: 2313

This report replaces Report Number: 1794



Ecowise Environmental
Gate 6 Sharon Street, La Trobe
University, Bendigo, VIC

Tel: 03 5444 7890

Fax: 03 5444 7895

Date Issued: **20-Feb-2007**

Client Program Ref: **06/4479 Condoblin**

PO No: **Not Available**

Date Sampled: **12-Dec-2006**

Ecowise Program Ref: **22347**

Date Received: **19-Jan-2007**

The sample(s) referred to in this report were analysed by the following method(s):

Analysis	Method	Laboratory	Analysis	Method	Laboratory
CEC	WSL 068	Melbourne	EC	WSL 063	Melbourne
Exch. Cations	WSL 023A	Melbourne	OOC	WSL 064	Melbourne
pH	WSL 062	Melbourne			

Client sample reference 4479H had insufficient sample for Organic Carbon analysis.

The units for CEC are meq/100 gm.

Principal Contact for this Report:

Wayne Woodall
Process Co-ordinator



This document is issued in
accordance with NATA's
accreditation requirements.

Accredited for compliance
with ISO/IEC 17025.

The results in this report were authorised by:

Name	Title
John Levvey	Principal Trace Metals Chemist
Samantha Smith	Client Manager
Vic Willms	Manager Chemistry

Client: Geotechnical Testing Services

Report Number: 2313

Client Program Ref: 06/4479 Condoblin

Ecowise Program Ref: 22347



Soil Analysis

			Analysis:	pH	EC	OOC	CEC
Sample	Sampled Date	Your Ref	Component: Units:	pH Units	EC uS/cm	Ox Org C %	CEC -
1106554	12-12-06	4479 A		7.6	8	1.0	18
1106555	12-12-06	4479 D		7.4	200	1.0	27
1106556	12-12-06	4479 E		7.8	750	1.2	25
1106557	12-12-06	4479 G		8.2	470	0.8	0.19
1106558	12-12-06	4479 H		8.3	1300		20
1106559	12-12-06	4479 I		7.9	140	0.8	22
1106560	12-12-06	4479 J		8.8	260	0.5	19
1106561	12-12-06	4479 K		9.3	280	0.9	23
1106562	12-12-06	4479 TP1		7.9	5	1.2	9.2
1106563	12-12-06	4479 TP3		7.7	5	1.3	15
1106564	12-12-06	4479 TP5		7.6	6	1.2	20

Soil Metals - OES

			Analysis:	Exch. Cations
Sample	Sampled Date	Your Ref	Component: Units:	Ex-Na mg/kg
1106554	12-12-06	4479 A		95
1106555	12-12-06	4479 D		2100
1106556	12-12-06	4479 E		1500
1106557	12-12-06	4479 G		780
1106558	12-12-06	4479 H		3000
1106559	12-12-06	4479 I		650
1106560	12-12-06	4479 J		2700
1106561	12-12-06	4479 K		2700
1106562	12-12-06	4479 TP1		47
1106563	12-12-06	4479 TP3		200
1106564	12-12-06	4479 TP5		380

Client: Geotechnical Testing Services

Report Number: 2313

Client Program Ref: 06/4479 Condoblin

Ecowise Program Ref: 22347



Quality Control

Soil Metals - OES

Exch. Cations	
Ex-Na	
1107390 BLANK Value (mg/kg)	1.2
1107391 DUPLICATE Sample Value (mg/kg)	920
1107391 DUPLICATE Duplicate Value (mg/kg)	920
1107391 DUPLICATE % RPD (%)	0.9
1107392 DUPLICATE Sample Value (mg/kg)	630
1107392 DUPLICATE Duplicate Value (mg/kg)	640
1107392 DUPLICATE % RPD (%)	0.8
1107393 DUPLICATE Sample Value (mg/kg)	52
1107393 DUPLICATE Duplicate Value (mg/kg)	53
1107393 DUPLICATE % RPD (%)	1.4

Soil Analysis

pH		OC	CEC
pH		Ox Org C	CEC
			32
			34
1108383 DUPLICATE % RPD (%)			6.8
			25
			45
1108385 SPIKE % Recovery (%)			84.8
			22
			42
1108386 SPIKE % Recovery (%)			82.3
			20
			20
1108387 DUPLICATE % RPD (%)			0.9
1108890 DUPLICATE Sample Value (%)		1.1	
1108890 DUPLICATE Duplicate Value (%)		1.0	
1108890 DUPLICATE % RPD (%)		9.5	
1108891 DUPLICATE Sample Value (%)		1.2	
1108891 DUPLICATE Duplicate Value (%)		1.1	
1108891 DUPLICATE % RPD (%)		8.7	
1109184 DUPLICATE Sample Value (Units)	7.9		
1109184 DUPLICATE Duplicate Value (Units)	7.9		
1109184 DUPLICATE % RPD (%)	0.0		