OAKLANDS ETHANOL SITE

PRELIMINARY GEOTECHNICAL INVESTIGATION

FOR
SWAN HILL ETHANOL PTY LTD

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TYPICAL LANDSCAPE OF THE OAKLANDS SITE

GTS Report Number 06/4325
December 2006

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

Daniel Curtain Date:

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

Reviewed by

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

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

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

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APPENDIX

1 INTRODUCTION

Swan Hill Ethanol commissioned Geotechnical Testing Services (GTS) to undertake a geotechnical investigation for a proposed Ethanol Plant, Oaklands, 1km north of the Oaklands Township. 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 1km north of the Oaklands 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. The site is typical of grain growing land, and a slight fall to the rear of the property with a good coverage of dry grasses. 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 topographical features (Page A3-A4), namely

- Soil profile of pit 2
- General landscape (facing south- east)
- The excavation of pit 2
- Brooks grain silos (facing east)

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

2.2 GEOLOGY

The Oaklands 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 Earthmovers Willis PR & LE on the 4th of December, 2006, using a 20 tonne excavator. The field investigation was completed by Mr Daniel Curtain, 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, namely

- 0-200mm Sandy silty top soil, grey/ brown
- 200-600mm Clayey Sand, brown/ orange, low plasticity
- 600-3500mm Sandy clay, pale brown/ yellow, low/ medium plasticity

During the excavation of all 6 test pits no ground water was encountered. Soil profile logs can be seen in pages A5-A7.

4.2 FIELD RESULTS - DYNAMIC CONE PENETROMETER RESULTS AND POCKET PENETROMTER 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 preformed 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 preformed 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	3500	15.0	35	24	11	5.0	18.0	2
2	1000	15.0	37	19	18	5.5	32.0	2
2	200	8.4	25	13	12	5.0	49.0	2
3	3000	17.6	44	28	16	6.5	7.0	2
4	2000	25.0	55	27	28	8.0	43.0	2
4	2600	20.0	41	26	15	5.0	15.5	2
5	1000	13.3	39	20	19	5.0	37.0	2
6	300	8	25	12	13	4.5	45.5	2

Note:

GTS is a NATA accredited laboratory and the NATA reports on each soil test can be observed in pages A8-A14, and also the Emerson class 2 is representative of a slightly dispersive soil.

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	300	1.84	13.0	0.0	3.5
2	300	1.78	13.3	0.0	2.0
3	300	1.83	12.8	0.0	5.0
4	300	1.89	11.3	0.0	6.0
5	200	1.88	12.4	0.0	4.0
6	300	1.86	11.6	0.0	3.0

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 M-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 moderately reactive (linear shrinkage values ranged to 8.0%). 'Class M-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 clay material.

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

Pad Footings	240 kPa
Strip Footings	200 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 the 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 2.0 to 6.0 for the sandy clay sub-grade material on site indicate a granular sub-base material or some other type of sub-grade drainage is warranted.

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5.2 ROADWORKS

The natural sandy clay material over the site extends to at least 3.0 to 3.5 m below the surface and is considered 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 approx. 20 kPa/mm. On this basis, it is suggested that imported granular material be used for roadworks 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 gravely 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 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 ultr-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 Roadworks 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, Ka, 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.

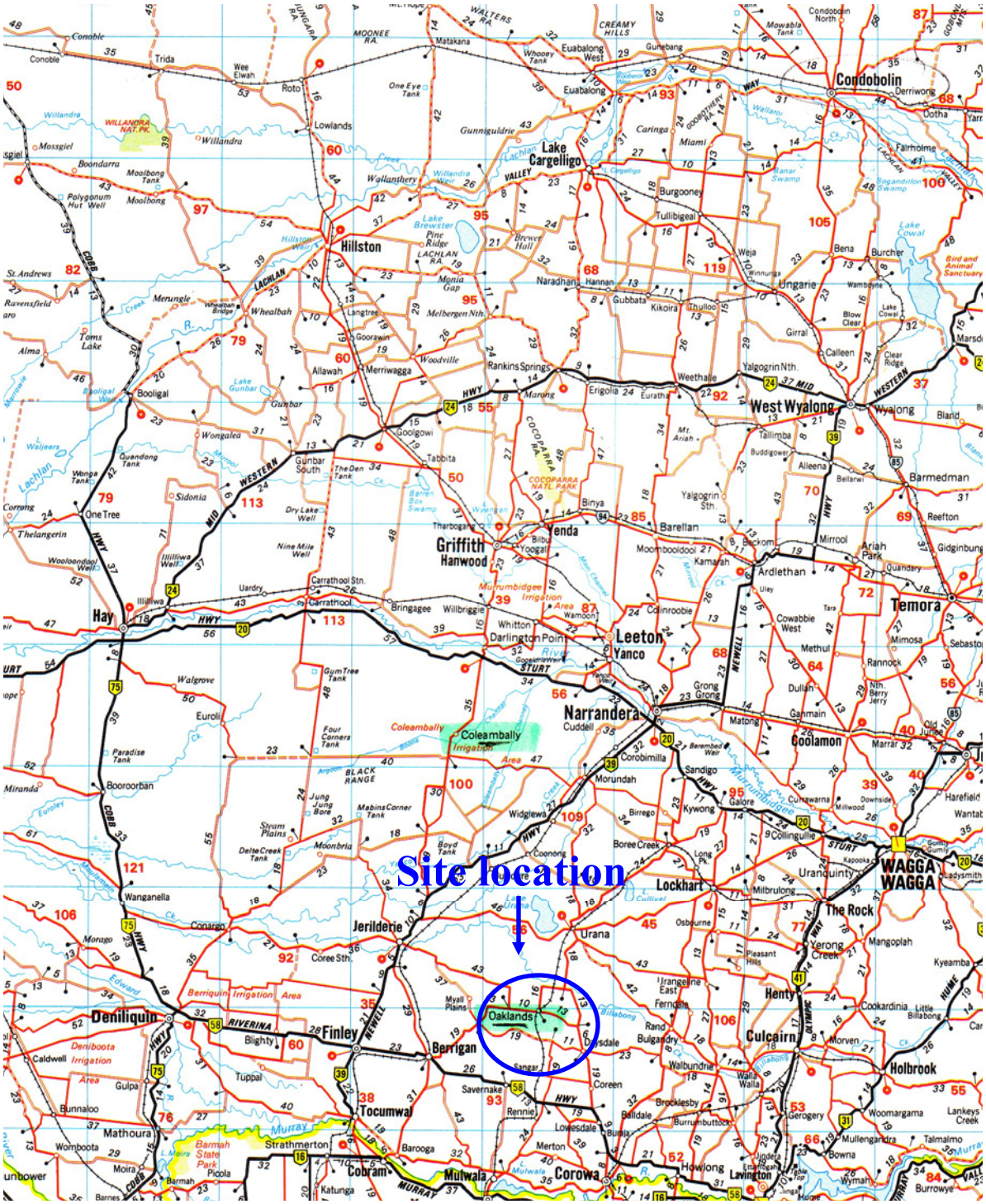
Although test results are generally consistent they are indicative for the locations tested only.

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

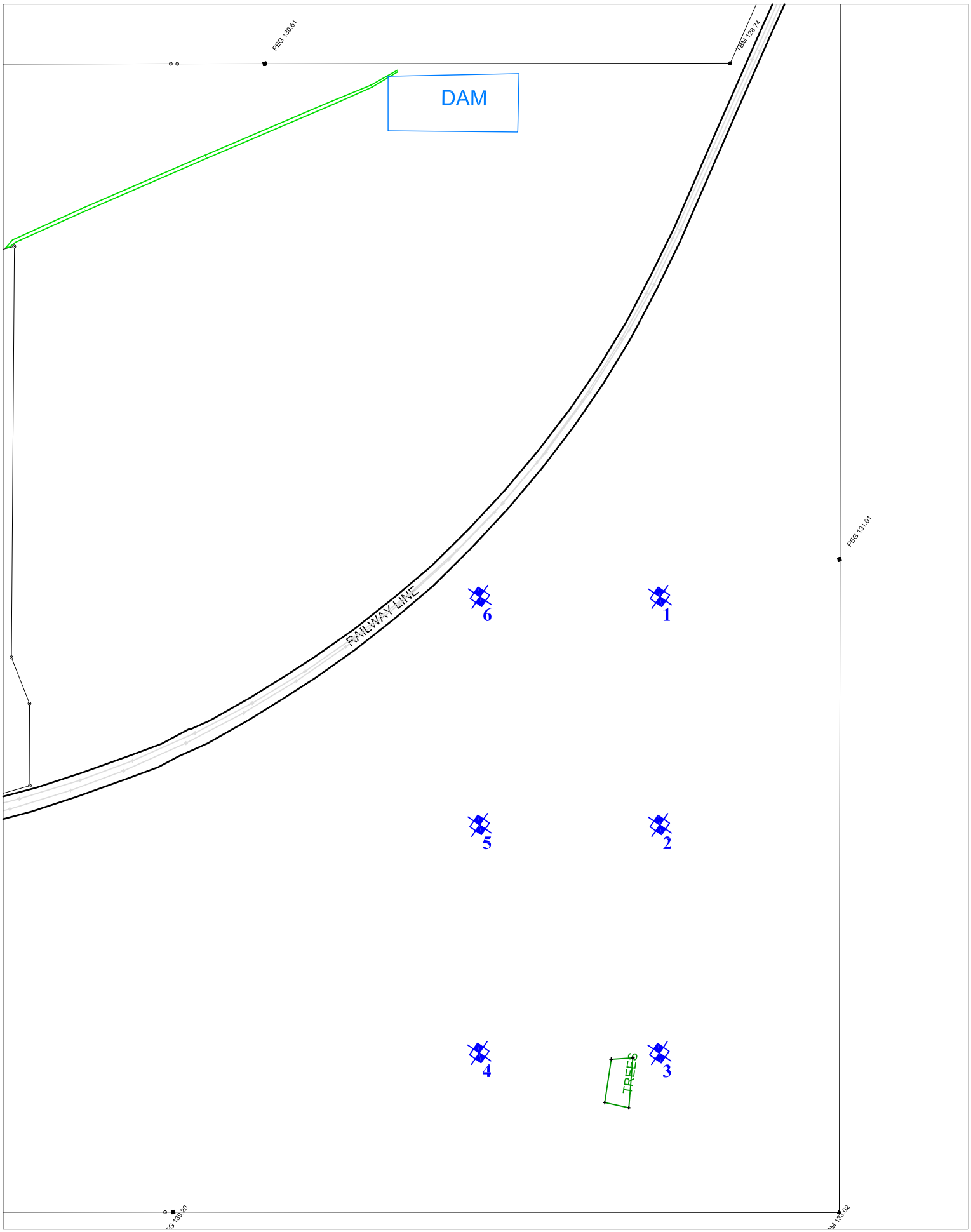
6 IMPORTANT NOTE

This report has highlighted several times that the subsoil present at Oaklands 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



Location- Australian Road Atlas



= TEST PIT APPROX. LOCATION/ NUMBER

6

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 1:4000

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

G.T.S REF: 06/4325
DATE: DEC 2006

Soil profile (pit 2)

General landscape (facing south- east)

Excavator (pit 2)

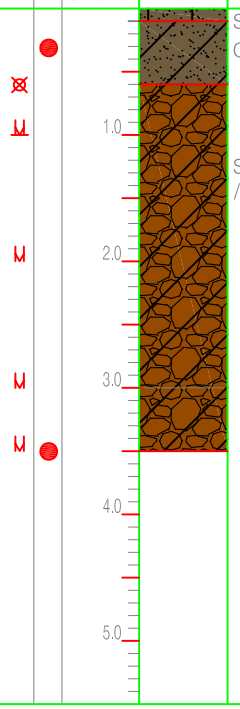
Brooks grain silos (facing east)

TEST PITS No: 1 & 2

CLIENT: SWAN HILL ETHANOL Pty. Ltd
LOCATION: OAKLANDS
JOB No.: 06-4325

METHOD: Test Pits- 20T Exacavator
OPERATOR: Daniel Curtin

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/m³)	optimum mositure content (%)
				Sandy silt topsoil (SM), grey / brown Clayey sand (SC), brown / orange							0.0	3.5	1.84	13.0
				Sandy clay & some gravel (GC), pale brown / yellow (more gravelly @3000)										
					15.0	35	24	11	5.0	18.0				
				Sandy silt topsoil (SM), grey / brown Clayey sand (SC), brown / orange	8.4	25	13	12	5.0	49.0	0.0	2.0	1.78	13.3
				Sandy clay & some gravel (GC), pale brown / yellow (more gravelly @3000)										
					15.0	37	19	18	5.5	32.0				

LEGEND

FIELD DATA ABREVIATIONS
DCP = Dynamic Cone Peneration (kPa)
PP = Pocket penetrometer (kPa)

GROUNDWATER ABBREVIATIONS
= Water level (static)
= Water level (during excavation)

FIELD DATA SYMBOLS
= Dynamic Cone Peneration
= Pocket Penetrometer test
= Environmental Sample
= Undisturbed Tube Sample
= Disturbed sample
= Bulk sample

DENSITY (N-value)

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

MOISTURE CONDITION
D = Dry M=Moist W=Wet

CONSISTENCY (su)

VS (very soft)	<12kPa
S (soft)	12-15
F (firm)	25-50
St (stiff)	50-100
VSt (very stiff)	100-200
H (hard)	>200kPa

TEST PITS No: 3 & 4

CLIENT: SWAN HILL ETHANOL Pty. Ltd
LOCATION: OAKLANDS
JOB No.: 06-4325
METHOD: Test Pits- 20T Exacavator
OPERATOR: Daniel Curtin
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 mositure content (%)
				Sandy silt topsoil (SM), grey / brown Clayey sand (SC), brown / orange							0.0	5.0	1.83	5.0
		1.0		Sandy clay & some gravel (GC), pale brown / yellow (more gravelly @2300)										
		2.0												
		3.0			17.6	44	28	16	7.0	7.0				
		4.0												
		5.0												
				Sandy silt topsoil (SM), grey / brown Clayey sand (SC), brown / orange							0.0	6.0	1.89	11.3
		1.0		Sandy clay & some gravel (GC), pale brown / yellow (more gravelly @2600)										
		2.0			25.0	55	27	28	8.0	43.0				
					20.0	41	26	15	5.0	15.0				
		3.0												
		4.0												
		5.0												

LEGEND

FIELD DATA ABREVIATIONS
DCP = Dynamic Cone Peneration (kPa)
PP = Pocket penetrometer (kPa)
Suv = Remoulded vane shear (kPa)

GROUNDWATER ABBREVIATIONS
= Water level (static)
= Water level (during excavation)

FIELD DATA SYMBOLS
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VS (very soft)	<12kPa
S (soft)	12-15
F (firm)	25-50
St (stiff)	50-100
VSt (very stiff)	100-200
H (hard)	>200kPa

TEST PITS No: 5 & 6

CLIENT: SWAN HILL ETHANOL Pty. Ltd
LOCATION: OAKLANDS
JOB No.: 06-4325

METHOD: Test Pits- 20T Exacavator
OPERATOR: Daniel Curtin

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 mositure content (%)
				Sandy silt topsoil (SM), grey / brown Clayey sand (SC), brown / orange							0.0	4.0	1.88	12.4
		1.0		Sandy clay & some gravel (GC), pale brown / yellow (more gravelly @3000)	13.3	39	20	19	5.0	37.0				
		2.0												
		3.0												
		4.0												
		5.0												
				Sandy silt topsoil (SM), grey / brown Clayey sand (SC), brown / orange	8.0	25	12	13	4.5	45.5	0.0	3.0	1.86	11.6
		1.0		Sandy clay & some gravel (GC), pale brown / yellow (more gravelly @1200)										
		2.0												
		3.0												
		4.0												
		5.0												

LEGEND

FIELD DATA ABREVIATIONS
DCP = Dynamic Cone Peneration (kPa)
PP = Pocket penetrometer (kPa)
Suv = Remoulded vane shear (kPa)

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= Water level (static)
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VS (very soft) <12kPa
S (soft) 12-15
F (firm) 25-50
St (stiff) 50-100
VSt (very stiff) 100-200
H (hard) >200kPa

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 Nº 06/4325 (Final) Page A8 Date of Report: 19 Dec 2006

LABORATORY INFORMATION

Project:	Oaklands Ethanol Site
Sample Location:	Oaklands
Date of Sampling:	4/12/06

SAMPLE IDENTIFICATION

Laboratory Identification	Client Identification
4325G	Pit 1 @ 3500
4325H	Pit 2 @ 1000
4325I	Pit 2 @ 200
4325J	Pit 3 @ 300
4325K	Pit 4 @ 2000
4325L	Pit 4 @ 2600

SAMPLE DESCRIPTION

Laboratory Identification	Description
4325G	Sandy clay + gravel, pale brown/ yellow
4325H	Sandy clay + gravel, pale brown/ yellow
4325I	Clayey sand, brown/ orange
4325J	Sandy clay + gravel, pale brown/ yellow
4325K	Sandy clay + gravel, pale brown/ yellow
4325L	Sandy clay + gravel, pale brown/ yellow

Approved Signatory:
S.P.Pigdon

Date:19 December, 2006

Testing Laboratory: Bendigo

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

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 Nº 06/4325 (Final) Page A9 Date of Report: 19 Dec 2006

LABORATORY INFORMATION

Project:	Oaklands Ethanol Site
Sample Location:	Oaklands
Date of Sampling:	4/12/06

SAMPLE IDENTIFICATION

Laboratory Identification	Client Identification
4325M	Pit 5 @ 1000
4325N	Pit 6 @ 300
*	*
*	*
*	*
*	*

SAMPLE DESCRIPTION

Laboratory Identification	Description
4325M	Sandy clay + gravel, pale brown/ yellow
4325N	Clayey sand, brown/ orange
*	*
*	*
*	*
*	*

Approved Signatory: _____
S.P.Pigdon

Date:19 December, 2006

Testing Laboratory: Bendigo

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

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

TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd	Report Nº 06/4325 (Final)
	P.O Box 551	Page A10
	SWAN HILL Vic 3585	Date of Report: 19 Dec 2006

Sample Identification:	4325G	4325H	4325I	4325J	4325K	4325L
Client Identification	**Pit 1 @ 3500**	**Pit 2 @ 1000**	**Pit 2 @ 200**	**Pit 3 @ 3000**	**Pit 4 @ 2000**	**Pit 4 @ 2600**
Plasticity Index						
Liquid Limit %	35	37	25	44	55	41
Plastic Limit %	24	19	13	28	27	26
Plasticity Index %	11	18	12	16	28	15
Linear Shrinkage %	5.0	5.5	5.0	7.0	8.0	5.0
Preparation Method:	Oven dry	Oven dry	Oven dry	Oven dry	Oven dry	Oven dry
Shrinkage Mould Length:	249.5mm	250mm	250mm	250mm	249.5mm	250mm
Shrinkage Crumbling:	Yes	Yes	Yes	Yes	Yes	Yes
Shrinkage Curling:	No	No	No	No	No	No
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	*	*	*	100	*	*
13.2	100	*	*	97	*	100
9.5	96	100	*	88	100	99
6.7	88	97	*	76	99	97
4.75	79	94	100	68	99	94
2.36	69	90	99	56	97	86
1.18	58	79	96	43	94	73
600µm	49	69	89	31	88	57
425µm	44	63	85	25	82	49
300µm	37	55	77	20	74	38
212µm	31	48	68	15	65	29
150µm	25	42	60	12	56	22
75µm	18	32	49	7	43	15
Test Method Used	3.6.1					
Field Moisture Content						
Lab Id:	4325G	4325H	4325I	4325J	4325K	4325L
Moisture Content (%)	15.0	15.0	8.4	17.6	25.0	20.0
Test Method Used:	3.7.1					

Approved Signatory:
S.P.Pigdon

Date:19 December, 2006

Testing Laboratory: Bendigo

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test report herein has been preformed 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 Nº 06/4325 (Final) Page A11 Date of Report: 19 Dec 2006

Sample Identification:	4325M	4325N	*	*	*	*
Client Identification	Pit 5 @ 1000	Pit 6 @ 300	*	*	*	*
Plasticity Index						
Liquid Limit %	39	25	*	*	*	*
Plastic Limit %	20	12	*	*	*	*
Plasticity Index %	19	13	*	*	*	*
Linear Shrinkage %	5.0	4.5	*	*	*	*
Preparation Method:	Oven dry	Oven dry	*	*	*	*
Shrinkage Mould Length:	250mm	254mm	*	*	*	*
Shrinkage Crumbling:	Yes	Yes	*	*	*	*
Shrinkage Curling:	No	No	*	*	*	*
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	98	*	*	*	*	*
6.7	92	*	*	*	*	*
4.75	87	*	*	*	*	*
2.36	79	100	*	*	*	*
1.18	70	97	*	*	*	*
600μm	64	90	*	*	*	*
425μm	61	84	*	*	*	*
300μm	56	75	*	*	*	*
212μm	50	66	*	*	*	*
150μm	45	58	*	*	*	*
75μm	37	45	*	*	*	*
Test Method Used	3.6.1					
Field Moisture Content						
Lab Id:	4325M	4325N	*	*	*	*
Moisture Content (%)	13.3	8.0	*	*	*	*
Test Method Used:	3.7.1					

Approved Signatory:
S.P.Pigdon

Date:19 December, 2006

Testing Laboratory: Bendigo

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

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 Nº 06/4325 (Final) Page A12 Date of Report: 19 Dec 2006

LABORATORY INFORMATION

Project:	Oaklands Ethanol Site
Sample Location:	Oaklands
Date of Sampling:	4/12/06

SAMPLE IDENTIFICATION

Laboratory Identification	Client Identification
4325A	Pit 1 @ 300
4325B	Pit 2 @ 300
4325C	Pit 3 @ 300
4325D	Pit 4 @ 300
4325E	Pit 5 @ 300
4325F	Pit 6 @ 300

SAMPLE DESCRIPTION

Laboratory Identification	Description
4325A	Clayey sand, brown/ orange
4325B	Clayey sand, brown/ orange
4325C	Clayey sand, brown/ orange
4325D	Clayey sand, brown/ orange
4325E	Clayey sand, brown/ orange
4325F	Clayey sand, brown/ orange

Approved Signatory:
S.P.Pigdon

Date:19 December, 2006

Testing Laboratory: Bendigo

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

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

TEST REPORT:

Client:	Swan Hill Ethanol Pty Ltd	Report Nº 06/4325 (Final)
	P.O Box 551	Page A13
	SWAN HILL Vic 3585	Date of Report: 19 Dec 2006

Sample Identification:	4325A	4325B	4325C	4325D
***Client Identification:**	**Pit 1 @ 300**	**Pit 2 @ 300**	**Pit 3 @ 300**	**Pit 4 @ 300**

Test Results				
Date of Test:	13/12/06	13/12/06	13/12/06	13/12/06
Laboratory Density Ratio:	98.5	98.5	98.5	98.5
Laboratory Moisture Ratio:	97.0	97.0	96.0	99.0
Moisture Content Top 30mm:	14.8	14.5	14.4	13.5
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	5477.6	5519.3	5541.2	5411.8

Soaked sample Information				
Period of Soaking (days)	4	4	4	4
Dry Density After Soaking: t/m^3	1.81	1.76	1.81	1.85
Moisture Content After Soaking: %	14.0	14.1	14.0	13.2
Swell: %	0.0	0.0	0.0	0.0

Maximum dry density / Optimum moisture content				
Maximum dry density: t/m^3	1.84	1.78	1.83	1.89
Optimum moisture content: %	13.0	13.3	12.8	11.3

Penetration Depth of C.B.R Determination: 5.0mm	3.5	2.0	5.0	6.0
CALIFORNIA BEARING RATIO:				
Test Methods Used:	2.1.1	5.1.1	6.1.1	

Approved Signatory: _____
S.P.Pigdon

Date:19 December, 2006

Testing Laboratory: Bendigo

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

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 Nº 06/4325 (Final) Page A14 Date of Report: 19 Dec 2006

Sample Identification:	4325E	4325F	*	*
***Client Identification:**	**Pit 5 @ 300**	**Pit 6 @ 300**		

Test Results				
Date of Test:	13/12/06	13/12/06	*	*
Laboratory Density Ratio:	98.5	98.0	*	*
Laboratory Moisture Ratio:	96.0	100.0	*	*
Moisture Content Top 30mm:	14.1	14.4	*	*
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	5502.7	5491.4	*	*

Soaked sample Information				
Period of Soaking (days)	4	4	*	*
Dry Density After Soaking: t/m^3	1.85	1.82	*	*
Moisture Content After Soaking: %	13.4	12.9	*	*
Swell: %	0.0	0.0	*	*

Maximum dry density / Optimum moisture content				
Maximum dry density: t/m^3	1.88	1.86	*	*
Optimum moisture content: %	12.4	11.6	*	*

Penetration Depth of C.B.R Determination: 5.0mm	4	3	*	*
CALIFORNIA BEARING RATIO:				
Test Methods Used:	2.1.1	5.1.1	6.1.1	

Approved Signatory: _____
S.P.Pigdon

Date:19 December, 2006

Testing Laboratory: Bendigo

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

Client: **Geotechnical Testing Services**

Address: PO Box 555
GOLDEN SQUARE VIC 3555

Attention: **Scott Pigdon**

Certificate of Analysis

Batch No: 07-00420

Replacement Report

Report Number: **2312**

This report replaces Report Number: **1731**

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: **06/4325 Oaklands**

Ecowise Program Ref: **22347**

PO No: **Not Available**

Date Sampled: **05-Dec-2006**

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			

Units for CEC are meq/100gm.

Principal Contact for this Report:

Wayne Woodall
Process Co-ordinator

NATA No. 992

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**

Batch No: 07-00420

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

Client: **Geotechnical Testing Services**

Report Number: **2312**

Client Program Ref: **06/4325 Oaklands**

Ecowise Program Ref: **22347**

Ecowise Environmental

Soil Analysis

Sample	Sampled Date	Your Ref	Analysis:	pH	EC	OOC	CEC
			Component:	pH	EC	Ox Org C	CEC
			Units:	Units	uS/cm	%	-
1106528	05-12-06	4325 G		8.9	24	0.5	22
1106529	05-12-06	4325 H		8.7	20	0.5	20
1106530	05-12-06	4325 I		6.2	11	0.8	7.7
1106531	05-12-06	4325 J		8.9	79	0.3	26
1106532	05-12-06	4325 K		9.0	95	0.7	30
1106533	05-12-06	4325 L		9.0	77	0.7	25
1106534	05-12-06	4325 M		8.1	44	0.8	13
1106535	05-12-06	4325 N		6.7	13	1.2	9.6
1106536	05-12-06	4325 TP1		5.8	18	0.8	9.0
1106537	05-12-06	4325 TP3		6.2	9	1.0	10
1106538	05-12-06	4325 TP5		6.6	10	1.1	8.5

Soil Metals - OES

Sample	Sampled Date	Your Ref	Analysis:	Exch. Cations
			Component:	Ex-Na
			Units:	mg/kg
1106528	05-12-06	4325 G		740
1106529	05-12-06	4325 H		470
1106530	05-12-06	4325 I		41
1106531	05-12-06	4325 J		1000
1106532	05-12-06	4325 K		1200
1106533	05-12-06	4325 L		1100
1106534	05-12-06	4325 M		350
1106535	05-12-06	4325 N		53
1106536	05-12-06	4325 TP1		87
1106537	05-12-06	4325 TP3		52
1106538	05-12-06	4325 TP5		40

Client: **Geotechnical Testing Services**

Client Program Ref: **06/4325 Oaklands**

Batch No: 07-00420

Report Number: **2312**

Ecowise Program Ref: **22347**

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

Ecowise Environmental

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

	OOC	CEC
	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**	