

ENVIRONMENTAL AND ENGINEERING CONSULTANT





REPORT

SHOTOVER PROPERTY INVESTMENTS LTD

Frankton Flats Development

Geotechnical Investigations

Report prepared for:

SHOTOVER PROPERTY INVESTMENTS LTD

Report prepared by:

TONKIN & TAYLOR LTD

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1. Introduction

1.1. General

This report presents the results of geotechnical investigations which have been completed by Tonkin & Taylor Ltd (T&T) for the site at Frankton Flats (S.H. 6), Queenstown. The site (pt Sec 5, Blk XXI Shotover Survey District, SO 6431, SO1516 and Lot 1 DP26426) is located immediately east of the existing Frankton Cemetery.

This report was commissioned by Shotover Property Investments Ltd and is a revision of an earlier report by T&T for the site (T&T Reference No 890762.00).

This report has been completed in accordance with the scope of work and conditions of engagement outlined in the T&T proposal dated 10 August 2010.

1.2. Development

We understand it is proposed to re-zone the area of the site currently designated as 'low density residential' to 'mixed use' which is likely to comprise commercial, business and residential.

As the project is only a zone change application at this stage the proposed building size and layout has not yet been determined. For the purposes of this report, T&T expect any future development is likely to comprise 2 to 4 storey building blocks with associated parking and landscaping.

2. Site Description

2.1. General

The larger part of the site is bounded on its south-eastern side by State Highway 6 (SH6), on its eastern side by Hansen Road, and, by Frankton Cemetery to the southwest. A separate small area (Lot 1 DP26426) is located to the east of the main site and adjacent to Hansen Road

The site is currently undeveloped and covered in grass with trees and scrub lining most boundaries. A water race runs sub-parallel to the base of the steep slope which is present in the north-western portion of the site.

A temporary unsealed roadway crosses the site from SH6. This roadway was constructed to provide site access for construction of the Terrace Junction development and some imported gravels, and mounds of removed topsoil are present in this area.

2.2. Topography and Surface Drainage

The majority of the site is flat, the exception being the toe of a steep hill slope is present in the north-western portion of the site. This hill slope is highly undulating with numerous outcrops and small bluffs of schist rock. The site map (see Appendix A) does not show these undulations, as the surveyor's contours are an average slope derived from the difference in elevation between points at the bottom and top of the slope. The toe of the hill runs parallel to the proposed re-zoning area.

The proposed area of re-zoning is on the flat land at the base of the slope. There are no overland flow paths across the proposed development area, although portions of this flat area form slight depressions that may act as areas for surface water to pool during periods of increased rainfall.

3. Investigations

An engineering geologist from T&T conducted a walkover inspection of the site on 22 November 2010 and twelve test pits have been excavated to a maximum depth of 3.8 m. Scala penetrometer tests were carried out adjacent to Test Pits 2, 7, 9, 11 and 12 (results attached) Test pit locations and logs are shown in Appendices A and B, respectively. The test pits and scala penetrometer testing were completed in July 2004.

4. Subsurface Conditions

4.1. Geological Setting

The site is located on the north flank of the Wakatipu Basin, which is a feature formed by former glacial advances. The regional basement rock comprises icescoured schist of the Haast Schist Group. Locally, sedimentary cover consists of Quaternary till, outwash sediments, and lake sediments. Post-glacial deposits comprise fluvial valley infill and localised colluvium.

Active fault traces were not observed at the site or in the vicinity. However, significant seismic risk exists in this region from potentially strong ground-shaking likely to be associated with a rupture of the Alpine Fault, located along the West Coast of South Island. There is a high probability that an earthquake with an expected magnitude of over 7.5 will occur along the Alpine Fault within the next 50 years.

4.2. Stratigraphy

The stratigraphy beneath the site comprises a surface layer of topsoil and roots underlain by lake sediments that include silt, and sand with minor silt. Test Pit 9 encountered fill underlying the topsoil horizon. These units are underlain by deltaic gravel. In Test Pits 3, 4, 7, 8, 10, and 12 the lake sediment and deltaic gravel layers were interbedded, and lenses of sand and silt occur within the deltaic gravels.

The site is typically covered by 300-400 mm of topsoil that comprises slightly moist and rare moist to wet, loose, non-stratified, dark brown organic silt with rare sand and gravel, and minor roots.

The lake sediments underlying the topsoil comprises two distinctive soil-types:

- 1. Slightly moist (rare moist), medium dense to dense, brownish grey, silt with rare sand and roots, and rare horizons of sandy silt. The silt is highly micaceous and the sand is fine. The silt is well graded and has poorly developed, sub-horizontal, thin to laminated bedding.
- 2. Slightly moist, medium dense, light grey sand with minor silt. The sand is fine to medium. The sand is uniform, dilatant, non-stratified, and the unit is sub-horizontal.

The lake sediments occur as lenses and interbedded layers within the deltaic gravel. Scala penetrometer testing indicates that the lake silt is firm to very stiff where it occurs near the surface adjacent to Test Pits 2, 7, 9, 11, and 12.

The fill in Test Pit 9 comprises moist, loose, brown silt with minor sand and gravel, and rare roots and cobbles. The fill is uniform, dilatant, non-plastic, and non-stratified. Scala penetrometer testing adjacent to Test Pit 9 indicates that the fill is firm to stiff.

Deltaic gravel was the lowest unit observed in all test pits, apart from Test Pit 7 where lake silt is lowest. As mentioned above, the deltaic gravel is interbedded with layers of the lake silt and sand, and lenses of the lake sediments (0.1 m-0.2 m thick) also occur within the gravel. The deltaic gravel comprises slightly moist, dense sandy gravel with rare silt, and rare thin (<100 mm) beds of sandy silt. In Test Pit 2 the gravel is present as sandy gravel with rare silt, interbedded with sand with some silt. The gravel is well graded with poorly developed bedding (~ 50 - 200 mm thick) that dips very gently to the southeast.

Schist, the regional basement rock, is exposed on the steep slopes on the northwest of the site. Foliation planes in the schist dip about 30° towards south to southwest, which is typical for schist in the Queenstown area. The schist is expected to occur at moderate depth beneath the area of the proposed development.

4.3. Groundwater

A single minor seep was observed on the north side of Test Pit 9 at a depth of 1.6 m. This seep occurs within lake sands with minor silt, and is probably derived from the nearby water race. All other test pits were dry and all soil-types were slightly moist to moist. The regional water table is expected to be deep in the high permeability sediments, grading gently towards the lake.

5.1. General

Recommendations and opinions in this report are based on the data sources noted above. The nature and continuity of subsoil conditions away from the test pits and exposures are inferred, and it must be appreciated that actual conditions could vary from the assumed model.

5.2. Site Preparation

All topsoil and any fill should be removed to at least 0.5 m past the extent of any future structures or pavement areas. The surface of the exposed platform and any fill required should be compacted in accordance with NZS 4431 to 95% of maximum density with a heavy vibrating roller.

5.3. Excavations

No cuts are currently proposed, however, basement excavation could be carried out within the deltaic gravels if required. Cohesionless strata may be encountered, which may fret back to slopes of 1.5:1 (horizontal to vertical). All temporary excavations should be trimmed back to this gradient. Provided excavations do not pass beneath a 1.5:1 from property boundaries, or in close proximity to the water race, no stability issues are envisaged.

5.4. Settlement and Foundations

Foundations for the structures will be predominantly on lake sediments including silt and sand. Enhanced bearing could be obtained by founding on the deltaic gravel or fill compacted in accordance with NZS 4431.

Conservative site-specific bearing for shallow footings is recommended in Figure 5-1, but higher bearing may be possible after inspection of excavations and testing of the foundation subgrade areas. Footing stresses are limited by differential settlement where foundations straddle the different materials.



Figure 5-1. Recommended Bearing Pressures for Footings

No reduction for earthquake loading is applicable.

For detailed design purposes it is recommended that the magnitude of seismic acceleration be estimated in accordance with the recommendations provided in NZS 1170.5:2004.

It is recommended that Class C subsoil conditions be adopted for the site.

5.5. Slope Stability

The south facing hillsides throughout the Frankton area show extensive instability with both dormant and actively creeping schist debris landslides.

The slopes directly above the site show relatively surficial creep and rates of 5-20 mm/yr may be expected. More rapid surficial (<0.5 m thick) failures may occur, with minor blockage of the water race being the only likely hazard. Some ongoing maintenance of the water race will be required to mitigate the risk of flooding, with back up drainage paths established between the race and the proposed development. However, provided no un-retained cuts are made into the slope, accelerated movement rates are unlikely.

It is recommended that the building walls are not used to retain any cuts formed in the toe of the north-western slope. In addition, a nominal 5.0m wide service vehicle access should be maintained between the rear of any building and the slope toe. All excavations required in close proximity to the water race should be designed by a chartered professional engineer to ensure the stability of the water race is not jeopardised. If required, recommendations for protection of the water race (e.g. permanent or temporary culverting or diversion), suitable construction techniques or staging of the works should also be provided. It should also be noted that Arrow Irrigation, as owner and operator of the water race, will need to review and approve any earthworks affecting the water race.

5.6. Liquefaction

A detailed liquefaction assessment has not been completed for the site. Based on a review of ground investigation data held on the T&T database for the general site area the risk of liquefaction is expected to be low, however, to provide confirmation of the risk from liquefaction it is recommended specific assessment be completed as part of the detailed design phase of future development.

5.7. Neighbouring Structures/Boundaries

No buildings are present within close proximity to the site.

5.8. Environmental Issues

It is understood the site was once owned or used by Queenstown airport, and in recent years, an old decommissioned concrete sewage tank was temporarily stored at the site. The site is not listed on the Otago Regional Council verified contaminated sites list.

An appropriately qualified and experienced Environmental Engineer should an environmental desk top study and confirm the need, or otherwise, to undertake testing as part of the detailed design phase and prior to the commencement of future construction.

6. Conclusions and Recommendations

- Re-zoning of the site to 'mixed use' (commercial, residential and business) is considered acceptable from a geotechnical perspective provided the recommendations of this report are followed.
- Subsurface conditions at the Frankton Flats Development site are quite straightforward, consisting of shallow topsoil overlying lake silt and rarely overlying fill. A thin layer of lake sediment underlies the silt and fill. Deltaic gravels are expected to persist well below the depth of influence of the proposed structures.
- Groundwater is deep and no issues are envisaged with the development.
- The site is suited to lightly loaded spread footings for which allowable bearing capacity has been prescribed.
- The recommendations of Section 5.5. should be adhered to with respect to earthworks completed in close proximity to the water race and/or toe of the adjacent hillside slopes.
- During the detailed design phase specific assessment should be completed to assess the risk posed to the site from liquefaction.

• An appropriately qualified and experienced Environmental Engineer should complete an environmental desk top study and confirm the need, or otherwise, to undertake testing prior to the commencement of construction.

7. Applicability

This report has been prepared for the benefit of Shotover Property Investments Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

During excavation, exposures should examined at an early stage and progressively by an inspector or engineer competent to confirm that localised subsurface conditions encountered are compatible with the inferred conditions on which this report has been based. It is important that we be contacted if there is any variation in subsoil conditions from those described in this report.

TONKIN & TAYLOR LTD

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor by:

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Paul Faulkner Engineering Geologist

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Anthony Fairclough Project Coordinator

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Appendix A: Site Map and Cross Sections









Appendix B: Test Pit Logs and Scala Penetrometer Tests



EXCAVATION NUMBER:

PROJECT: Frank Ceme	tery			Job Number: 890762		
LOCATION: North West		Direction: N/A				
CO-ORDINATES:	TOR: Nigel					
Method:	ANY: Horrell Contracting					
ELEVATION:	TED: 1-Jul-04					
Methou.			EXCAV: DATOM: Ground Level	HOLL FINIS	ILD.	1-Jul-04
PENETRATION		1	ENGINEERING DESCRIPTION		1	GEOLOGICAL
PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRUMENTS SAMPLES DEPTH (m)	- GRAPHIC LOG CLASSIFICATION SYMBOL		SOIL / ROCK CLASSIFICATION, PLAST PARTICLE SIZE CHARACTERISTICS, C WEATHERING, SECONDARY AND MINOR C	ICITY OR OLOUR, OMPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		dark b fine to	prown, organic SIL1 with rare sand and gravel, and coarse, gravel is fine to coarse, clasts are angular	minor roots, sand is to sub-rounded		TOPSOIL & ROOTS
0.4	ХМН	schist,	, uniform, dilatant, non-plastic, loose, non-stratified	l, unit is sub-		LAKE SILT
0.8	X	horizo browi sandy	ntal nish grey, SILT with rare sand and roots, an y SILT, organic content is <5%, silt is highly uniform dilatant non-plastic loose to medi	d rare horizons of micaceous, sand is		
		devel	loped thin to laminated bedding, sub-horizor	tal		
1.2	Ŷ				st	
1.6	X				moi	
2.0	GW C C C C C C C C C C C C C C C C C C C	greyis (<100 to coa	sh brown, sandy GRAVEL with rare silt, and 0 0 mm) beds of sandy SILT, sand is fine to co arse, silt is micaceous, clasts are angular to	are thin barse, gravel is fine sub-rounded schist,	slightly	DELTAIC GRAVEL
2.4	400 000	very g	gradea, dense, poorly developed beds (~50 gently SE	to 200 mm) alpping		
<u>υ</u> 2.8	20.00 20.00 20.00					
sbag	4°.0°					
2.2 3.2	0 0 0					
3.6			٦	otal Depth = 3.4 m		
4.0						
<u>т.</u>						
4.4	-					
4.8	-					
5.2						
5.6						
6.0	+					
6.4						

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	-			



EXCAVATION NUMBER:

PROJECT: Frank Cemetery											J	ob Number: 890762	
LOCATION: Near NW Corner Inclination: Vertica							Vertical		Direction: N/A				
CO-ORDINATES: See site plan mE EQUIPMENT: 20T Excavator OPERATO									OR:	Nigel			
	Method: See site plan mN INFOMAP NO. ELEVATION: 356 m DIMENSIONS: HOLE								HOLE START	ARTED: 1-Jul-04			
		Met	hod:		Site	e plan		EXCAV. DATUM: Gr	ound Level	HOLE FINISH	IED: 1-Jul-04		
	PF	NFT	RATI	ON				ENGINEERING D	SCRIPTION			GEOLOGICAL	
	T	L2				Ъ					7	02020010/12	
PENETRATION (N)	GROUNDWATER / SEEPAGE	INSTALLED INSTRUMEN	SAMPLES	DEPTH (m)	- GRAPHIC LOG	CLASSIFICATION SYMB		SOIL / ROCK CLASSIFI PARTICLE SIZE CHAR WEATHERING, SECONDAR	CATION, PLASTICI ACTERISTICS, COL Y AND MINOR COM	TY OR OUR, IPONENTS	MOISTURE CONDITIO	SOIL / ROCK TYPE, ORIGI MINERAL COMPOSITION DEFECTS, STRUCTURE, FORMATION	N, I,
					\sim	OL	dark b fine to	rown, organic SILT with rare sau coarse, gravel is fine to coarse,	nd and gravel, and min clasts are angular to	nor roots, sand is sub-rounded		TOPSOIL & ROOTS	
				0.4	X	МН	schist,	uniform, dilatant, non-plastic, lo	oose, non-stratified, u	nit is sub-		LAKE SILT	
				0.8	$\left \times \right\rangle$		brown SILT, (dilatar	ish grey, SILT with rare sand an organic content is <5%, silt is hi t, non-plastic, loose to medium	d roots, and rare horiz ghly micaceous, sand dense, poorly develop	zons of sandy is fine, uniform, ped thin to			_
				1.2	$\times^{}$		lamina	ted bedding, sub-horizontal					
				1.2	0,	GW	greyisl sandy clasts	n brown, sandy GRAVEL with ran SILT, sand is fine to coarse, gra are angular to sub-rounded schi	e silt, and rare thin (< vel is fine to coarse, s st, well graded, dense	<100 mm) beds of ilt is micaceous, e, poorly developed	ist	DELTAIC GRAVEL	-
				1.6	10/0	CW	cross-l	peds that face SW, the unit is su	b-horizontal		om		
				2.0		Gw	light l WITH coars	prownish grey, sandy GRAVE SAND with some silt, sand e, silt is micaceous, clasts ar	EL with rare silt, IN is fine to coarse, gr e angular to sub-ro	TERBEDDED ravel is fine to ounded schist,	slightly		_
				2.4	4 00 0 00		well g thick	raded, dense, beds are sub	horizontal and are	100-300 mm			_
	ige			2.8	0°0°								_
	Vo Seepa			3.2	0.0								_
_				3.6	2020				Tota	al Depth = 3.4 m			
				5.0	1								-
				4.0	_								_
				4.4									_
				4.8									_
				5.2									
				5.6									
					1								
				6.0									-

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EXCAVATION NUMBER:

TP 3

PROJECT: Frank Cemetery								Job Number: 890762					
LOCATION: Near NW Corner Inclination: Vertical							Direction: N/A						
CO-ORDINATES: See site plan mE EQUIPMENT: 20T Excavator OPERATO									ror: Nigel				
	Method: See site plan mN INFOMAP NO. COMPA								ANY: Horrell Contracting				
ELEVATION: 356 m DIMENSIONS: HOLE START								ED:	1-Jul-04				
<u> </u>		Meu	iou.		Site	e pian		EXCAV. DATUM: GO		HULE FINISH	IED.	1-Jul-04	
	PE	NET	RATI	N			1	ENGINEERING DE	SCRIPTION			GEOLOGICAL	
PENETRATION (N)	GROUNDWATER / SEEPAGE	INSTALLED INSTRUMENTS	SAMPLES	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL		SOIL / ROCK CLASSIFIC PARTICLE SIZE CHARA WEATHERING, SECONDARY	CATION, PLASTICI ACTERISTICS, COL (AND MINOR COM	TY OR OUR, IPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIG MINERAL COMPOSITIOI DEFECTS, STRUCTURE FORMATION	SIN, N, ,
				0.2	<u>در</u>	OL	dark l roots, angul	orown, organic SIL1 with rar sand is fine to coarse, grave ar to sub-rounded schist, un tratified unit is sub-borizont	e sand and gravel, el is fine to coarse, iform, dilatant, nor	and minor clasts are n-plastic, loose,		TOPSOIL & ROOTS	_
				0.4	XX	MH	brown sandy	v SILT, organic content is <5	d and roots, and ra %, silt is highly mi	are horizons of caceous, sand is		LAKE SILT	-
				0.6	×××		devel	oped thin to laminated beddi	ing, sub-horizontal	dense, poony			-
				0.8	X								
						SP	light g	rey, SAND with minor silt, sand is	s fine to medium, uni	form, dilatant,		LAKE SAND	
				1.0	X.	MH	brown	ish grey. SILT with rare sand and	t roots, and rare hori	zons of sandy		LAKE SILT	
				1.2	X		SILT, o dilatan lamina	organic content is <5%, silt is high ht, non-plastic, loose to medium o ted bedding, sub-horizontal	ghly micaceous, sand dense, poorly develop	is fine, uniform, bed thin to			
				1.4	10°0°	GW	greyis (<100 to coa	sh brown, sandy GRAVEL wit) mm) beds of sandy SILT, s arse, silt is micaceous, clasts	h rare silt, and rare and is fine to coars are angular to sub	e thin se, gravel is fine p-rounded schist,		DELTAIC GRAVEL	
				1.6	0.00 0.00 0.00		well g very g	raded, dense, poorly develog gently SE	ped beds (~50 to 2	200 mm) dipping	ly moist		
				1.8	\$0°0°						slight		
				2.0	0.0		brown	ish grey, SILT with rare sand and	d roots, and rare hori;	zons of sandy			_
				2.2	X	МН	SILT, o dilatar	organic content is <5%, silt is high at, non-plastic, loose to medium of	ghly micaceous, sand dense, poorly develop	is fine, uniform, bed thin to		LAKE SILT	
				24	2.	SP GW	lamina light gi to med	ited bedding, sub-horizontal rey, SAND with minor silt, sand is dium dense, non-stratified, unit is	s fine to medium, unif sub-horizontal	orm, dilatant, loose		LAKE SAND DELTAIC GRAVEL	-
				2.1	200		greyis (<100	sh brown, sandy GRAVEL wit) mm) beds of sandy SILT, s	h rare silt, and rare and is fine to coars	e thin se, gravel is fine			-
				2.6	4000		to coa well g	arse, silt is micaceous, clasts raded, dense, poorly develo	are angular to sub ped beds (~50 to 2	o-rounded schist, 200 mm) dipping			-
				2.8	0.00		very <u>c</u>	yendy SE					-
	lo Seepage			3.0									-

Total Depth = 3.2 m

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EXCAVATION NUMBER:

PROJECT: Frank Cemetery		Job Number: 890762	
LOCATION: North Side	Inclination: Vertical	Direction: N/A	
CO-ORDINATES: See site pla	n mE EQUIPMENT: 20T Excavator OPERAT	OR: Nigel	
Method: See site pla	n mN INFOMAP NO. COMPA	NY: Horrell Contracting	
ELEVATION: 35	5 m DIMENSIONS: HOLE START	ED: 1-Jul-04	
Method: Site pla	n EXCAV. DATUM: Ground Level HOLE FINISH	ED: 1-Jul-04	
PENETRATION	ENGINEERING DESCRIPTION	GEOLOGICAL	
NTS 80L		z	
	SOIL / ROCK CLASSIFICATION, PLASTICITY OR	SOIL / ROCK TYPE, ORIGIN,	
TH 100	PARTICLE SIZE CHARACTERISTICS, COLOUR,	S MINERAL COMPOSITION,	
TCA SAL SAL	WEATHERING, SECONDARY AND MINOR COMPONENTS	FORMATION	
SSIF		SI	
		W	
	dark brown, organic SILT with rare sand and gravel, and minor	र्ष TOPSOIL & ROOTS	
	roots, sand is fine to coarse, gravel is fine to coarse, clasts are	to v	
	angular to sub-rounded schist, uniform, dilatant, non-plastic, loose,	– loist	
	non-stratified, unit is sub-norizontal		
	sandy SILT, organic content is <5%, silt is highly micaceous, sand is		
	fine, uniform, dilatant, non-plastic, loose to medium dense, poorly	tt.	
0.6	developed thin to laminated bedding, sub-horizontal	-	
0.8			
SP	light grey, SAND with minor silt, sand is fine to medium, uniform, dilatant,	LAKE SAND	
	loose to medium dense, non-stratified, unit is sub-horizontal	LAKE SILT	
	SILT, organic content is <5%, silt is highly micaceous, sand is fine, uniform,	-	
	dilatant, non-plastic, loose to medium dense, poorly developed thin to		
1.2 CM	laminated bedding, sub-horizontal grevish brown, sandy GRAVEL with rare silt, and rare thin (<100 mm) beds of		
	sandy SILT, sand is fine to coarse, gravel is fine to coarse, silt is micaceous,		
1.4	clasts are angular to sub-rounded schist, well graded, dense, poorly developed beds (~50 to 200 mm) dipping very gently SE	-	
	SILT, organic content is <5%, silt is highly micaceous, sand is fine, uniform,	LAKE SILT	
	dilatant, non-plastic, loose to medium dense, poorly developed thin to		
1.8 0°, GV	laminated bedding, sub-horizontal	DELTAIC GRAVEL	
ရိ <u>ု</u> စ်	(<100 mm) beds of sandy SILT, sand is fine to coarse, gravel is fine		
2.0	to coarse, silt is micaceous, clasts are angular to sub-rounded schist,	n yt	
	well graded, dense, poorly developed beds (~50 to 200 mm) dipping	igi –	
	very genuy SE	<u>s</u>	
		-	
0-6-0			
2.4		-	
2.6		-	
2.00			
2.8 2.8			
gade gade			
		-	
	Total Depth = 3.1 m		
	· ·		

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EXCAVATION NUMBER:

PROJECT: Frank Cemetery									Job Number: 890762		
LOCATION: North Side Inclination: Vertical									Direction: N/A		
CO-ORDINA	TES:	9	See site	e plan	mΕ	EQUIPMENT: 20T Excavator	OPERAT	OR:	Nigel		
Met	thod:	9	See site	e plan	mΝ	nN INFOMAP NO. COMPANY: Horrell Cont			Horrell Contracting		
ELEVATION: 356						DIMENSIONS:		ED:	1-Jul-04		
Method: Site plan						EACAV. DATOM. GIOUND LEVEN	HOLL FINIS	LD.	1-Jul-04		
PENET	RATIC	ON			<u> </u>	ENGINEERING DESCRIPTION			GEOLOGICAL		
PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRUMENTS	SAMPLES	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL		SOIL / ROCK CLASSIFICATION, PLASTICI PARTICLE SIZE CHARACTERISTICS, COL WEATHERING, SECONDARY AND MINOR COM	TY OR OUR, IPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIG MINERAL COMPOSITIO DEFECTS, STRUCTURE FORMATION	5IN, N, E,	
			\sim	OL	dark b	prown, organic SILT with rare sand and gravel, and min	nor roots, sand is		TOPSOIL & ROOTS		
		0.4	X	мн	schist,	, uniform, dilatant, non-plastic, loose, non-stratified, ur	nit is sub-		I AKE SILT	-	
			Γ_{X}		horizo	ntal nish grey_SILT with rare sand, and rare sandy '	STIT silt is				
		0.8	X		highly	y micaceous, sand is fine, uniform, dilatant, nor	-plastic, loose to				
					mediu	um dense, poorly developed thin to laminated b	edding, sub-				
		1.2	X	SP	horizo	ontal Irey, SAND with minor silt, sand is fine to medium, unit	form dilatant		LAKE SAND	_	
			X	MH	loose t	to medium dense, non-stratified, unit is sub-horizontal	ionn, undunt,		LAKE SILT		
		1.6	L X		brown	ish grey, SILT with rare sand and roots, and rare horiz	zons of sandy	ist			
			X.		SILT, (dilatar	organic content is <5%, silt is highly micaceous, sand	is fine, uniform, ed thin to	Ĕ			
		2.0	X	MH-	lamina	ated bedding, sub-horizontal		ghtly			
		2.0	ĺΩΧ	SP	brown	nish grey, sandy SILT, sand is fine to medium, s	silt is highly	slig		-	
		2.4	$\mathbf{X}^{\mathbb{C}}$		poorly	y developed thin to laminated bedding, sub-hor	izontal				
		2.4	ŀX			, i 5,				-	
		2.0	×.	GW	arevis	sh brown, sandy GRAVEL with rare silt, and rare	e thin		DELTAIC GRAVEL	-	
		2.8	1/ 4 2 0	011	(<100	0 mm) beds of sandy SILT, sand is fine to coars	se, gravel is fine			-	
age			00		to coa	arse, silt is micaceous, clasts are angular to sub	-rounded schist,				
Seep		3.2	400		well g	graded, dense, poorly developed beds (~50 to 2 gently SE	200 mm) dipping			-	
No			္ဂိုလ္ ဂ		very						
	Ì	3.6	<u>× </u>			Tota	al Depth = 3.5 m			= _	
		4.0									
		4.4									
		4.8									
		5.2									
			1								
		5.6									
			1								
		60									
		0.0	1							-	
		6.4	1								

PURPOSE:	Logged By: BXB			
	Checked Date:			
PHOTO REF.:	Sheet:	1 of 1		
	-			



EXCAVATION NUMBER:

TP 6

LOCATION: Centre of Site Inclination: Vertical Operation: NA CO-ORDIMATES: See site plan mE EDUIDMENT: 20T Excavator OPERATOR: Nigel COMPANY: Horrell Contracting HOLE STARTED: 1-Jul-04 ELEVATION: 336 m Directors NA HOLE STARTED: 1-Jul-04 Method: Site plan EXCAV. DATUM: Ground Level HOLE FINATED: 1-Jul-04 GEOLOGICAL PENETRATION ENGINEERING DESCRIPTION GEOLOGICAL Image: Start Start Soil, / ROCK TYPE, ORIGIN, MILERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION GEOLOGICAL Image: Start Start Soil, / ROCK TYPE, ORIGIN, MILERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION GEOLOGICAL Image: Start Start Soil, / ROCK TYPE, ORIGIN, MILERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION TOPSOIL & ROOTS Image: Start Miler Start Soil, / ROCK TYPE, ORIGIN, MILERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION TOPSOIL & ROOTS Image: Start Miler Start Soil, / ROCK TYPE, ORIGIN, MILERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION TOPSOIL & ROOTS Image: Start Miler Start Soil, / ROCK TYPE, ORIGIN, MILERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION TOPSOIL & ROOTS Image: Start Miler Start Soil, / ROCK TYPE, ORIGIN, MILERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION TOPSOIL & ROOTS Image: Start Miler Start Miler Start Miler Start Miler Start Miler Start Miler Miler Start, MILERAL COMPOSITION, DETAIL CRAVEL TOPSOIL & ROOTS <t< th=""><th>PROJECT:</th><th>Frank</th><th>< Cemete</th><th>J</th><th>lob Number: 890762</th><th></th></t<>	PROJECT:	Frank	< Cemete	J	lob Number: 890762							
CC-ORDINATES: See site plan mt EQUIPMENT: 20T Excavator OPERATOR: Nogl LEVATION: 356 m DIMENSIONS: HOLE STARTED: 1-Jul-04 Method: Site plan EXCAV. DATUM: Ground Level HOLE STARTED: 1-Jul-04 Method: Site plan ENCINEERING DESCRIPTION GEOLOGICAL PENETRATION ENCINEERING DESCRIPTION GEOLOGICAL Image: Site plan Image: Site plan ENCINEERING DESCRIPTION GEOLOGICAL Image: Site plan Image: Site plan ENCINEERING DESCRIPTION GEOLOGICAL Image: Site plan Image: Site plan ENCINEERING DESCRIPTION GEOLOGICAL Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan Image: Site plan <td>LOCATION:</td> <td>Cent</td> <td>re of Site</td> <td>9</td> <td></td> <td></td> <td>Incl</td> <td>lination:</td> <td>Vertical</td> <td></td> <td>Direction: N/A</td> <td></td>	LOCATION:	Cent	re of Site	9			Incl	lination:	Vertical		Direction: N/A	
Method: See site plan mN INFOMAP NO. COMMPARY: Hornel Contracting ELEVATION: S35 m DIMENSIONS: HOLE STATED: :-Jui-04 PENETRATION EXCAV. DATUM: Ground Level HOLE FINISHED: :-Jui-04 Visition of the state	CO-ORDINA	TES:	S	See site	e plan	mE	EQUIPMENT: 20T Excava	ator	OPERAT	OR:	Nigel	
ELEVATION: 335 m DIMENSIONS: HOLE STARTED: 1-Jul-04 Image: Step plan Step plan EXCAV_DATUM: Ground Level HOLE STARTED: 1-Jul-04 Image: Step plan Step plan EXCAV_DATUM: Ground Level HOLE STARTED: 1-Jul-04 Image: Step plan Step plan EXCAV_DATUM: Ground Level HOLE STARTED: 1-Jul-04 Image: Step plan Step plan Soll / ROCK TYPE, ORIGIN, MILROR COMPONENTS Image: Step plan Soll / ROCK TYPE, ORIGIN, MILROR COMPONENTS Image: Step plan Image: Step plan Step plan Step plan Soll / ROCK TYPE, ORIGIN, MILROR COMPONENTS Image: Step plan Soll / ROCK TYPE, ORIGIN, MILROR COMPONENTS Image: Step plan Image: Step plan Step plan Step plan OL Gark brown, organic SLIT with rare stand and gravel, and minor nogues rost-rowded step step step step step step step step	Met	thod:	S	See site	e plan	mΝ	INFOMAP NO.		COMPA	NY:	Horrell Contracting	
PRETROI: Site plan EXCAV. DATUM: Ground Level PHOLE FURISHED: 101/04 PENETRATION ENGINEERING DESCRIPTION GEOLOGICAL 00 50	ELEVAT	ION:		C ''	356	356 m DIMENSIONS: HOLE STAF				ED:	1-Jul-04	
PENETRATION GEOLOGICAL 00 yOULDELING Soll / ROCK 1745, ORCK 1	Metr	nod:		Site	e plan		EXCAV. DATUM: Ground Lev	vel	HOLE FINISH	ED:	1-Jul-04	
1010011141 1010000000000000000000000000000000000	PENET	RATIC	N				ENGINEERING DESCRIPTION				GEOLOGICAL	
0.1 dark brown, organic SLT with rare sand and gravel, and minor colors, sand is fine to coarse, clasts are angular to sub-rounded schist, uniform, dilatant, non-plastic, loose, non-statified, unit is sub-horizontal TOPSOL & ROOTS 0.4 MH brownish grey, SLT with rare sand and nocts, and is fine to coarse, graves is sub-horizontal LAKE SLT 0.6 MH brownish grey, SLT with rare sand and nocts, sand is fine, unform, dilatant, non-plastic, loose to medium dense, poorly developed thin to laminated bedding, sub-horizontal LAKE SLT 1.0 SP light grey, SAND with minor sit, sand is fine to medium, unform, dilatant, toose to medium dense, non-statified, unit is sub-horizontal LAKE SAND 1.1 SP light grey, SAND with minor sit, sand is fine to medium, unform, dilatant, toose to medium dense, poorly developed thin to laminated bedding, sub-horizontal LAKE SAND 1.1 SP light grey, SAND with minor sit, sand is fine to medium, unform, dilatant, toose to medium dense, poorly developed thin to laminated bedding, sub-horizontal LAKE SAND 1.4 GW GW grey sith in microaccus, unform, gilts in hijh microaccus, unform, elist sith bindy microaccus, unform, elist sith bindy microaccus, unform, elist sith individuance sith, and rare thin ((<100 mm) beds of sandy SLT, sand is fine to coarse, grave list microaccus, unform, elist microaccus, elist and is fine to coarse, grave list microaccu	PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRUMENTS	SAMPLES	DEPTH (m)	- GRAPHIC LOG	CLASSIFICATION SYMBOL		SOIL / ROCK CLASSIFICATION, PARTICLE SIZE CHARACTERIST WEATHERING, SECONDARY AND MI	PLASTICI TICS, COL NOR COM	TY OR OUR, IPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIG MINERAL COMPOSITION DEFECTS, STRUCTURE FORMATION	IN, N, ,
0.4 MH brownish grey, SLT with are sand and roots, and rare horizons of sandy SLT, organic content is <5%, sill is highly micaceus, sand is fine, uniform, dilatant, non-plastic, loose to medium dense, poorly developed thin to laminated bedding, sub-horizontal			0.2	دد{	OL	dark l roots, angul	brown, organic SILT with rare sand ar , sand is fine to coarse, gravel is fine t ar to sub-rounded schist, uniform, dik tratified, unit is sub-borizontal	nd gravel, to coarse, atant, nor	and minor clasts are n-plastic, loose,		TOPSOIL & ROOTS	_
0.6 0.8 Implementation of a bit of a grant			0.4	X	MH	brown	hish grey, SILT with rare sand and roc SILT, organic content is <5% silt is	ots, and ra	are horizons of		LAKE SILT	
0.8 0.8 Image: Constraint of the second sec			0.6	X)		fine, i devel	uniform, dilatant, non-plastic, loose to oped thin to laminated bedding, sub-f	medium norizontal	dense, poorly			
1.0 SP light grey, SAND with minor silt, sand is fine to medium, uniform, dilatant, loose to medium dense, non-stratified, unit is sub-horizontal LAKE SAND 1.2 MH- source to medium dense, non-stratified, unit is sub-horizontal LAKE SAND 1.4 GGW minated bedding, sub-horizontal LAKE SAND 1.4 GGW minated bedding, sub-horizontal DELTAIC GRAVEL 1.6 GGW greyish brown, sandy GRAVEL with rare silt, and rare thin (<100 mm) beds of sandy SILT, sand is fine to coarse, gravel is fine to coarse, silt is micaceous, clasts are angular to sub-rounded schist, well graded, dense, poorly developed beds (~50 to 200 mm) dipping very gently SE			0.8	X								
SP light grey, SAND with minor sit, sand is fine to medium, uniform, dilatant, loose to medium dense, non-stratifed, unit is sub-horizontal brownish grey, sandy SILT, sand is fine, sit is highly micaceous, uniform, dilatant, non-plastic, loose to medium dense, poorly developed thin to laminated bedding, sub-horizontal greyish brown, sandy GRAVEL with rare sit, and rare thin (<100 mm) beds of sandy SILT, sand is fine to coarse, gravel is fine to coarse, sit is micaceous, clasts are angular to sub-horizontal greyish brown, sandy GRAVEL with rare sit, and rare thin to coarse, gravel is fine to coarse, sit is micaceous, clasts are angular to sub-horizontal greyish brown, sandy GRAVEL with rare sit, and rare thin to coarse, gravel is fine to coarse, sit is micaceous, clasts are angular to sub-horizontal greyish brown, sandy SILT, sand is fine to coarse, gravel is fine to coarse, sit is micaceous, clasts are angular to sub-horizontal greyish brown set sit is micaceous, clasts are angular to sub-horizontal greyish brown set sit is micaceous, clasts are angular to sub-horizontal greyish brown set.			1.0	X								
1.2 X: MH- SP MH- SP Index of an additional additionadditex additional additex additional additionad					SP	light g loose t	rey, SAND with minor silt, sand is fine to m to medium dense, non-stratified, unit is sub	edium, uni horizontal	form, dilatant,		LAKE SAND	
SP dilatant, non-plastic, loose to medium dense, poorly developed thin to laminated bedding, sub-horizontal DELTAIC GRAVEL 1.4 GW			1.2	X÷j	MH-	brown	ish grev, sandy SILT, sand is fine, silt is hig	hlv micace	ous, uniform,		LAKE SILT	
Image: Sub-Forzontal grey is brown, sandy GRAVEL with rare silt, and rare thin grey is brown, sandy GRAVEL with rare silt, and rare thin to coarse, gravel is fine to coarse, gravel is fine to coarse, silt is micaceous, clasts are angular to sub-rounded schist, well graded, dense, poorly developed beds (~50 to 200 mm) dipping very gently SE Image: Sub-Forzontal grey is fine to coarse, gravel is fine to coarse, gravel is fine to coarse, gravel is fine to coarse, silt is micaceous, clasts are angular to sub-rounded schist, well graded, dense, poorly developed beds (~50 to 200 mm) dipping very gently SE Image: Sub-Forzontal grey is fine to coarse, gravel is fine to coarse, gravel is fine to coarse, silt is micaceous, clasts are angular to sub-rounded schist, well graded, dense, poorly developed beds (~50 to 200 mm) dipping very gently SE Image: Sub-Forzontal grey is fine to coarse, gravel is fine to coarse, gravel is fine to coarse, silt is micaceous, clasts are angular to sub-rounded schist, well graded, dense, poorly developed beds (~50 to 200 mm) dipping very gently SE Image: Sub-Forzontal grey is fine to coarse, gravel is fine				\mathbf{X}	SP	dilatar	nt, non-plastic, loose to medium dense, poo	orly develop	ed thin to			
Image: Second			1.4	0.	GW	lamina	ited bedding, sub-horizontal				DELTAIC GRAVEL	
well graded, dense, poorly developed beds (~50 to 200 mm) dipping 1.8 2.0 2.0 2.1 2.0 2.1 2.0 2.1 2.1 2.2 2.2 2.3 2.4 2.6 2.8 3.0 3.0 3.0			1.6	000		greyis (<100 to coa	on brown, sandy GRAVEL with rare slit 0 mm) beds of sandy SILT, sand is fin arse, silt is micaceous, clasts are angu	t, and rare le to coars ilar to sub	e thin se, gravel is fine -rounded schist,	moist		-
1.8 1.8 <td></td> <td></td> <td></td> <td>00</td> <td></td> <td>well g</td> <td>graded, dense, poorly developed beds</td> <td>(~50 to 2</td> <td>200 mm) dipping</td> <td>htly</td> <td></td> <td></td>				00		well g	graded, dense, poorly developed beds	(~50 to 2	200 mm) dipping	htly		
2.0 2.2 2.4 2.4 2.4 2.6 2.6 2.8 3.0 3.0 3.0 3.0			1.8	0,00		very <u>t</u>	Jenuy SE			slig		_
2.2 2.4 2.4 2.6 2.6 3.0 3.0 3.0 3.2			2.0	4 C								_
			2.2									_
			2.4	400								
			2.6									
			2.0	0								
	Ð		2.8	0.0								-
	Vo Seepaç		3.0	00000								-

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PURPOSE:	Logged By:	BXB
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EXCAVATION NUMBER:

PRO	DJECT	: Frar : Cen	nk Cemete	ery				Jol			lob Number: 890762 Direction: N/A	
				- See cit	e nlan	mF		20T Excavator		-OB ·	Nigel	
00 0	Me	thod		See sit	e plan	mN	INFOMAP NO.		COMPA	ANY:	Horrell Contracting	
E	ELEVA	TION	:	Cit	356 a alaa	m	DIMENSIONS:	Creater de la sual	HOLE STAR	TED:	1-Jul-04	
	Me	LIIOU:		Site	e pian		EXCAV. DATUM:	Ground Level			1-Jul-04	
<u> </u>	PENET	RATI	ON			r	ENGINEERING	DESCRIPTION			GEOLOGICAL	
PENETRATION (N) GROUNDWATER /	SEEPAGE INSTALLED INSTRUMENT	SAMPLES	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOI	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS					SOIL / ROCK TYPE, ORIG MINERAL COMPOSITION DEFECTS, STRUCTURE, FORMATION	IN, I,
			3.4	0.0	Gw	sand is rounde gently S	fine to coarse, gravel is fine to o d schist, well graded, dense, poo SE	slightly moist				
			3.6					Tot	al Depth = 3.4 m			_
			3.8									_
			4.0									_
			4.2	_								-
			4.4									-
			4.6									-
			4.8									-
			5.0	-								-
			5.2									-
			5.4									-
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			5.8									-
	υ		6.0	-								-
	n ocehad		6.2									-
	ž	1	6.4	1		1						

PURPOSE:	Logged By:	BXB
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EXCAVATION NUMBER:

TP 7

PR	DJECT	T: F	rank	Cemete		Job Number: 890762								
LOC	ATION	V: C	entr	e of Site					Inclination:	Vertical		Direction: N/A		
CO-0	ORDIN	IAT	ES:	S	ee site	e plan	mF	EOUIPMENT	20T Excavator	OPERAT	OR:	Niael		
	М	leth	od:	S	ee site	e plan	mΝ	INFOMAP NO.		COMPA	NY:	Horrell Contracting		
	ELEVA	ATIC	ON:			356.5	m	DIMENSIONS:		HOLE START	TED: 1-Jul-04			
	Me	etho	od:		Site	e plan		EXCAV. DATUM:	Ground Level	HOLE FINISH	IED:	1-Jul-04		
	PENE	TRA	ATIC	N				ENGINEERING	DESCRIPTION			GEOLOGICAL		
	TS	2				ОL					z			
PENETRATION (N) GROUNDWATER /	SEEPAGE INSTALLED INSTRUMEN		SAMPLES	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMB		SOIL / ROCK CLASS PARTICLE SIZE CH, WEATHERING, SECOND,	MOISTURE CONDITIO	SOIL / ROCK TYPE, ORIGI MINERAL COMPOSITION DEFECTS, STRUCTURE, FORMATION	N, I,			
				0.2	ددد	OL	dark l roots, angul	brown, organic SILT with sand is fine to coarse, gr ar to sub-rounded schist, tratified unit is sub boild		TOPSOIL & ROOTS	_			
				0.4	XX	MH	browr sandy	hish grey, SILT with rare s SILT, organic content is	sand and roots, and r <5%, silt is highly mi	are horizons of caceous, sand is		LAKE SILT		
				0.6	XX		fine, u devel	uniform, dilatant, non-pla oped thin to laminated be	stic, loose to medium dding, sub-horizontal	dense, poorly			_	
				0.8	X									
				1.0	X									
				1.2	Ŷ									
				1.4	$\hat{\mathbf{x}}$									
			Ī	1.6	XX						moist			
			ľ	1.0	X						slightly		-	
			ł	1.8	X								-	
			ŀ	2.0		GW	greyish sand is	brown, sandy GRAVEL with rare fine to coarse, gravel is fine to co	silt, and rare thin (<100 mm parse, silt is micaceous, clast	n) beds of sandy SILT, is are angular to sub-		DELTAIC GRAVEL		
			ł	2.2	X	MH	gently S	a scnist, weil graded, dense, poor SE ish grey, SILT with rare sand	and roots, and rare horiz	200 mm) dipping very zons of sandy SILT,		LAKE SILT		
			ł	2.4	0,	GW	organi non-pl beddir	c content is <5%, silt is highly astic, loose to medium dense ng, sub-horizontal	v micaceous, sand is fine , poorly developed thin t	e, uniform, dilatant, o laminated		DELTAIC GRAVEL	-	
			ŀ	2.6	400		greyisl sandy	n brown, sandy GRAVEL with SILT, sand is fine to coarse,	rare silt, and rare thin (gravel is fine to coarse, s	<100 mm) beds of silt is micaceous,			-	
			ŀ	2.8	х Х	MH	clasts beds (are angular to sub-rounded s ~50 to 200 mm) dipping very	chist, well graded, dense gently SE	e, poorly developed		LAKE SILT	$\left - \right $	
	lo seepage		-	3.0	××		fine, u develo	USIN grey, SILT WITH Fare S SILT, organic content is Uniform, dilatant, non-pla oped thin to laminated be	Solution and roots, solution, solution, and roots, a	are norizons of caceous, sand is dense, poorly			-	
	No seepa		ŀ	3.0	XX		sandy fine, u devel	SILT, organic content is uniform, dilatant, non-pla- oped thin to laminated be	<5%, silt is highly mi stic, loose to medium dding, sub-horizontal	caceous, sand is dense, poorly				

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EXCAVATION NUMBER:

PROJECT	: Fran	k Cemete		J	lob Number: 890762					
LOCATION	I: Cent	re of Site	j			Inclination:	Vertical		Direction: N/A	
CO-ORDIN	ATES:	S	See sit	e plan	mE	EQUIPMENT: 20T Excavator	OPERAT	OR:	Nigel	
M	ethod:	S	See sit	e plan	mΝ	INFOMAP NO.	COMPA	NY:	Horrell Contracting	
ELEVA	TION:		Cit	356.5	m	DIMENSIONS:	HOLE START	ED:	1-Jul-04	
Me	ethoa:		Site	e pian		EXCAV. DATUM: Ground Level	HULE FINISF	IED:	1-Jui-04	
PENE	TRATIO	ON		-	1	ENGINEERING DESCRIPTION			GEOLOGICAL	
PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRUMENTS	SAMPLES	DEPTH (m)	C GRAPHIC LOG	CLASSIFICATION SYMBOL	browni	SOIL / ROCK CLASSIFICATION, PLASTICIT PARTICLE SIZE CHARACTERISTICS, COLO WEATHERING, SECONDARY AND MINOR COM	TY OR DUR, PONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIG MINERAL COMPOSITION DEFECTS, STRUCTURE FORMATION	IN, N, ,
			<u> </u>	MH	content	t is <5%, silt is highly micaceous, sand is fine, uniform, dilatar	nt, non-plastic, loose	ightly noist		-
		3.4			to med	ium dense, poorly developed thin to laminated bedding, sub-h	orizontal	sli n		_
						lota	al Depth = 3.3 m			
		3.6								
		3.8								
		4.0								
			1							
		4.2								
		4.2	-							-
		4.4	4							_
		4.6								
		4.8								
			1							-
		5.0								
		5.0	1							-
		5.2	-							_
		5.4	4							
		5.6								
			1							
		5.8								
		0.0	1							1 -
		60								
		0.0	1							-
ъ										
spac		6.2	4							_
Se										
2 N		6.4	1							

PURPOSE:	Logged By:	BXB
	Checked Date:	
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EXCAVATION NUMBER:

PROJECT: Frank Cemet	ROJECT: Frank Cemetery												
LOCATION: North Side C	entral	Inclination: Vertical		Direction: N/A									
CO-ORDINATES:	See site plan n	nE EOUIPMENT: 20T Excavator OPE	RATOR	: Nigel									
Method:	See site plan n	nN INFOMAP NO. CC	MPANY:	: Horrell Contracting									
ELEVATION:	356 n	n DIMENSIONS: HOLE ST	ARTED	: 1-Jul-04									
Method:	Site plan	EXCAV. DATUM: Ground Level HOLE FI	ISHED	: 1-Jul-04									
PENETRATION		ENGINEERING DESCRIPTION		GEOLOGICAL									
PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRUMENTS SAMPLES DEPTH (m)	GRAPHIC LOG CLASSIFICATION SYMBOL	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION									
		ark brown, organic SILT with rare sand and gravel, and minor roots, sand	is	TOPSOIL & ROOTS									
0.4		chist, uniform, dilatant, non-plastic, loose, non-stratified, unit is sub-		ΙΔΚΕ STI T									
	יייי ויי	orizontal	oist										
0.8	S S	ILT, organic content is <5%, silt is highly micaceous, sand is fine, uniform	n, Ĕ										
		ilatant, non-plastic, loose to medium dense, poorly developed thin to		-									
1.2		aminated bedding, sub-norizontal											
1.2	SP lig	ght grey, SAND with minor silt, sand is fine to medium, uniform, dilatant,		LAKE SAND									
		requiries area. SILT with rare cand and reasts and rare berizons	of.										
1.6		and SILT, organic content is $<5\%$, silt is highly micaceous, sar	d is	-									
	fi fi	ine, uniform, dilatant, non-plastic, loose to medium dense, poor	/										
2.0	X d	leveloped thin to laminated bedding, sub-horizontal	ist										
		revish brown, sandy GRAVEL with rare silt, and rare thin (<100 mm) beds of sandy SILT, sand is fine	to E										
2.4		parse, gravel is fine to coarse, silt is micaceous, clasts are angular to sub-rounded schist, well graded	htly										
	- 0 • GW *		slig	DELTAIC GRAVEL									
0 20	GW to	ght grey, SAND with minor silt, sand is fine to medium, uniform, dilatant, I p medium dense, non-stratified, unit is sub-horizontal	oose	LAKE SAND DELTAIC GRAVEL									
2.8		revish brown sandy GRAVEL with rare silt and rare thin (<100 mm) bed	of	-									
Seet	S S	andy SILT, sand is fine to coarse, gravel is fine to coarse, silt is micaceou	s,										
3.2	400 C	lasts are angular to sub-rounded schist, well graded, dense, poorly develo	ped	-									
	1-1 <u>8</u> -1	Total Depth = 3	3 m										
3.6		· · · · ·											
4.0													
				-									
4.4													
<u>т.т</u>	-			-									
4.8	4			-									
5.2													
5.6													
	1			-									
60													
	1			-									
6.4				1									

PURPOSE:	Logged By:	BXB
	Checked Date:	
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EXCAVATION NUMBER:

PROJEC	T: F	rank	Cemete	ery							lob Number: 890762	
LOCATION	N: N	lorth	Side					Inclination:	Vertical		Direction: N/A	
CO-ORDIN	NAT	ES:	S	ee site	e plan	mE	EQUIPMENT:	20T Excavator	OPERAT	OR:	Nigel	
М	1eth	od:	S	ee site	e plan	mΝ	INFOMAP NO.		COMPA	ANY:	Horrell Contracting	
ELEVA	ATIO	SN:		C ''	356.5	m DIMENSIONS: HOLE STARTED			TED:	1-Jul-04		
Me	etho	bd:		Site	e plan		EXCAV. DATUM:	Ground Level	HOLE FINISH	IED:	1-Jul-04	
PENE	ETR/	ATIC	N				ENGINEERING	DESCRIPTION			GEOLOGICAL	
PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRLIMENTS	INSIALLEU INSIKUMENIS	SAMPLES	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL		SOIL / ROCK CLASS PARTICLE SIZE CH WEATHERING, SECOND	IFICATION, PLASTICI ARACTERISTICS, COL ARY AND MINOR CON	TY OR OUR, IPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIG MINERAL COMPOSITIO DEFECTS, STRUCTURE FORMATION	IN, N, ,
				\sim	OL	dark b	rown, organic SILT with rare	sand and gravel, and mi	inor roots, sand is	st t∫	TOPSOIL & ROOTS	
.6 m			0.4	X	мн	schist,	uniform, dilatant, non-plasti	c, loose, non-stratified, u	nit is sub-	rligh moi	FTLI	
@ 1				$^{\sim}$		horizoi brown	ntal . SILT with minor sand and c	aravel, and rare roots and	cobbles, sand is			
sdə			0.8	X	MH	fine to	coarse, gravel is fine to coa	rse, cobbles up to 100 m	m, clasts are	noist	LAKE SILT	
r se		Ī		X		angula	r to rounded schist and meta non-stratified	a-sediments, uniform, dil	atant, non-plastic,	2		
inol			1.2	X,		brownis	h grey, SILT with rare sand and	roots, and rare horizons of s	andy silt, organic			
e E		ľ		<u> </u>		to medi	um dense, poorly developed thir	, sand is fine, uniform, dilata i to laminated bedding, sub-l	nt, non-plastic, loose horizontal			
Ra			16		SP	light gi	ey, SAND with minor silt, sa	nd is fine to medium, unit	form, dilatant, loose		LAKE SAND	
		ŀ	1.0	X	МН	to med	lium dense, non-stratified, ur	nit is sub-horizontal			LAKE SILT	-
				\sim		browr	hish grey, SILT with rare	sand and roots, and r	are horizons of			
		-	2.0	\sim		sandy	SILT, organic content is	<5%, silt is highly mi	dense poorly	ist		-
				\sim		devel	oped thin to laminated be	edding, sub-horizontal	dense, poony	mo		
		-	2.4	\sim				5,		htly		_
				X						slig		
			2.8	$\mathbf{\hat{x}}$								
				$\mathcal{O}_{\mathcal{P}}$	GW	greyis	h brown, sandy GRAVEL	with rare silt, and rar	e thin		DELTAIC GRAVEL	
			3.2	۰.D		(<100	o mm) beas of sandy SIL	i, sand is fine to coar asts are angular to sub	se, gravel is fine			
				S.S.		well g	raded, dense, poorly dev	veloped beds (~50 to	200 mm) dipping			
			3.6			very g	jently SE					
		Ī		ိုလ်ို								
			4 0	<u>_ Bi.</u> Ø				Tot	al Depth = 3.8 m			1
		ŀ		1								
			44									
		⊦	т .т	1								
			10									
		ŀ	4.8									-
		┝	5.2									
		ļ	5.6									
			6.0									
			6.4									

	Logged By: BXB	
	Checked Date:	
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EXCAVATION NUMBER:

PROJEC	:T: F	rank	Cemete	ery					J	lob Number: 890762	
LOCATION: Centre of Site Inclination: Vertical								Direction: N/A			
CO-ORDI	-ORDINATES: See site plan mE FOUIPMENT: 2						EOUIPMENT: 20T Excavator	OPERAT	OPERATOR: Nigel		
Method:				See site plan mN		mΝ	INFOMAP NO. COMPA		NY:	NY: Horrell Contracting	
ELEVATION:				-	356	m	DIMENSIONS:	HOLE START	ED:	1-Jul-04	
M	lethc	od:		Site	e plan		EXCAV. DATUM: Ground Level	HOLE FINISH	ED:	1-Jul-04	
PENE	ETR/	ATIC	N				ENGINEERING DESCRIPTION			GEOLOGICAL	
PENETRATION (N) GROUNDWATER / SEEPAGE	INSTALLED INSTRUMENTS	SAMPLES	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL		SOIL / ROCK CLASSIFICATION, PLASTICIT PARTICLE SIZE CHARACTERISTICS, COLO WEATHERING, SECONDARY AND MINOR COM	ry or Our, Ponents	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIG MINERAL COMPOSITION DEFECTS, STRUCTURE FORMATION	IN, I,
				\sim	OL	dark b fine to	rown, organic SILT with rare sand and gravel, and mir	nor roots, sand is		TOPSOIL & ROOTS	
			0.4	X	мн	schist,	uniform, dilatant, non-plastic, loose, non-stratified, ur	nit is sub-		I AKE SILT	
				()×		horizo brown	ntal ish grey, SILT with rare sand and roots, and rare horiz	cons of sandy			
		-	0.8	×		dilatan lamina	it, non-plastic, loose to medium dense, poorly develop ated bedding, sub-horizontal	ed thin to			-
			1.2	X	SP	light g	rey, SAND with minor silt, sand is fine to medium, unif	form, dilatant,		LAKE SAND	1 _
				\sim	МН	loose t	to medium dense, non-stratified, unit is sub-horizontal		st	LAKE SILT	
			1.6	\sim		Iword	high grey, SILT with rare sand and roots, and ra	are horizons of	moi		
				\sim		fine, i	uniform, dilatant, non-plastic, loose to medium	dense, poorly	tly		
			2.0	\times		, devel	oped thin to laminated bedding, sub-horizontal	,, ,	sligh		
					GW	greyish b coarse, c	prown, sandy GRAVEL with rare silt, and rare thin (<100 mm) beds of sand ravel is fine to coarse. silt is micaceous. clasts are angular to sub-rounded	y SILT, sand is fine to schist, well graded,	0,	DELTAIC GRAVEL	
		ŀ	2.4		SP	dense, p	oorly developed beds (~50 to 200 mm) dipping very gently SE	anna dilatant lassa		LAKE SAND	1 -
				n.	GW	to med	dium dense, non-stratified, unit is sub-horizontal	orm, dilatant, loose		DELTAIC GRAVEL	
υ		Ļ	2.8	Å 0		greyisl	h brown, sandy GRAVEL with rare silt, and rare thin (<	100 mm) beds of			
pag				°S%		sandy	SILT, sand is fine to coarse, gravel is fine to coarse, si	ilt is micaceous,			
See			3.2	400		beds (~50 to 200 mm) dipping very gently SE	, poorly developed			
No				စီလုိ							
			3.6				Tota	al Depth = 3.4 m			
		Ī		1							
			4 0								
		ŀ									-
			44								
		ŀ	7.7								_
		-	4.8								-
		-	5.2								-
		ļ	5.6								
			6.0								
			6.4								

PURPOSE:	Logged By: BXB	
	Checked Date:	
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EXCAVATION NUMBER:

PROJECT: Frank Cemetery Job Number: 890762								
LOCATION: Near NE Corner Inclination: Vertical							Direction: N/A	
CO-ORDINATES:	OR:	Nigel						
Method:	See site plan	n mN	INFOMAP NO.	COMPA		NY:	IY: Horrell Contracting	
ELEVATION:	356.5	5 m	DIMENSIONS:		HOLE START	ED:	1-Jul-04	
Method:	Site plar	1	EXCAV. DATUM: (Ground Level	HOLE FINISH	IED:	1-Jul-04	
PENETRATION			ENGINEERING	DESCRIPTION			GEOLOGICAL	
S	L L					-		
PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRUMEN' SAMPLES	DEPTH (m) GRAPHIC LOG CLASSIFICATION SYMBG		SOIL / ROCK CLASSI PARTICLE SIZE CHA WEATHERING, SECONDA	FICATION, PLASTICI ARACTERISTICS, COL ARY AND MINOR COM	TY OR OUR, IPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIGIN MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION	١,
	ູ [~~]^∩∟	dark br coarse, non-pla	own, organic SILT with rare sand gravel is fine to coarse, clasts are stic, loose, non-stratified, unit is s	and gravel, and minor roots angular to sub-rounded scl aub-horizontal	, sand is fine to hist, uniform, dilatant,		TOPSOIL & ROOTS	
	<u>,4 🖌</u> мн	brow	hish arey. SILT with rare s	and and roots and r	are horizons of		Ι ΔΚΕ STI T	_
		sandy	SILT, organic content is	<5%, silt is highly mi	caceous, sand is			
	<u>0.8</u>	fine,	uniform, dilatant, non-plas	stic, loose to medium	dense, poorly			_
	<u> </u>	devel	oped thin to laminated be	dding, sub-horizontal				
	1.2 X							
	ľ X							
	1.6 SP	light g	rey, SAND with minor silt, san	nd is fine to medium, uni	form, dilatant,		LAKE SAND	
		loose	to medium dense, non-stratifie	ed, unit is sub-horizontal		oist		
	ла 🔀 МН	brow	nish arev, SILT with rare s	and and roots, and ra	are horizons of	v n	LAKE SILT	
		sandy	SILT, organic content is	<5%, silt is highly mi	caceous, sand is	ghtl		_
	X 1	fine,	uniform, dilatant, non-plas	stic, loose to medium	dense, poorly	sli		
	2.4 X	devel	oped thin to laminated be	dding, sub-horizontal				_
	X							
	2.8 🗙							
	X	light g	rey, SAND with minor silt, san	nd is fine to medium, uni	form, dilatant,			
	3.2 SP	loose brownish	to medium dense, non-stratifie	ed, unit is sub-norizontal	anic content is <5% silt is			
gge	Х МН	highly m	icaceous, sand is fine, uniform, dilatant, r	non-plastic, loose to medium dens	se, poorly developed thin to		LAKE SILT	-
Se De	O GW	greyish I	prown, sandy GRAVEL with rare silt, and	rare thin (<100 mm) beds of sand	ly SILT, sand is fine to		DELTAIC GRAVEL	
<u> </u>	3.6	coarse, g poorly de	gravel is fine to coarse, silt is micaceous, eveloped beds (~50 to 200 mm) dipping v	clasts are angular to sub-rounder rery gently SE	d schist, well graded, dense	,		_
Ž	:626							
	1.0			lota	al Depth = 3.8 m			_
	1.4							
	4.8							
								-
	5.2							_
	5.6							
	5.0							
	5.4							
	1 1	1						

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	Checked Date:	
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EXCAVATION NUMBER:

PROJECT: Frank Ce	netery					J	lob Number: 890762	
LOCATION: NE Corne	Inclination:	ation: Vertical Direction: N/A						
CO-ORDINATES:	See site plan	mE EQUIPMENT: 20T Excavator OPERATO			ror: Nigel			
ELEVATION:	See site plan	mN	DIMENSIONS			ANY:	IY: Horrell Contracting	
Method:	Site plan		EXCAV. DATUM:	Ground Level	HOLE FINISH	IED:	1-Jul-04	
PENETRATION			ENGINEERING	DESCRIPTION			GEOLOGICAL	
	5		ENGINEERING			-	GLOLOGICAL	
PENETRATION (N) GROUNDWATER / SEEPAGE INSTALLED INSTRUMEN' SAMPLES	GRAPHIC LOG CLASSIFICATION SYMBG	W	SOIL / ROCK CLASS: PARTICLE SIZE CH, EATHERING, SECOND,	IFICATION, PLASTIC ARACTERISTICS, CO ARY AND MINOR CO	ITY OR LOUR, MPONENTS	MOISTURE CONDITION	SOIL / ROCK TYPE, ORIGI MINERAL COMPOSITION DEFECTS, STRUCTURE, FORMATION	N, ,
		dark brow fine to coa	vn, organic SILT with rare arse, gravel is fine to coar	sand and gravel, and m se, clasts are angular to	inor roots, sand is sub-rounded		TOPSOIL & ROOTS	
	.4 🖌 мн	horizontal	l l	z, loose, non-straulied, t	unit is sud-		LAKE SILT	
		brownish sandy SI fine, unif	n grey, SILT with rare s ILT, organic content is form, dilatant, non-pla	sand and roots, and i <5%, silt is highly m stic, loose to medium	rare horizons of licaceous, sand is lidense, poorly			_
	2 X	develope	ed thin to laminated be	dding, sub-horizonta	l			_
	<u>6</u> X					t		
						ly mois		
	×	greyish br sandy SIL	rown, sandy GRAVEL with T, sand is fine to coarse,	rare silt, and rare thin (gravel is fine to coarse,	<100 mm) beds of silt is micaceous,	slight		
	.4 X GW SP	beds (~50 light grey,	angular to sub-rounded s 0 to 200 mm) dipping very , SAND with minor silt, sar	chist, well graded, dens / gently SE nd is fine to medium, un	e, poorly developed iform, dilatant, loose		DELTAIC GRAVEL LAKE SAND	-
	<u>.8</u> 0 GW	to medium	n dense, non-stratified, un rown, sandy GRAVEL with	it is sub-horizontal	(<100 mm) beds of		DELTAIC GRAVEL	-
e	2 400	clasts are beds (~50	angular to sub-rounded s to 200 mm) dipping very	gravel is fine to coarse, schist, well graded, dens gently SE	silt is micaceous, e, poorly developed			_
o Seepa	6							_
Z	· · · · ·	Ì		Tot	tal Depth = 3.8 m			
	r.0							-
	.4							-
	.8							_
	i.2							
	6							
	5.0							-
	.4							

Checked Date: PHOTO REF.: Sheet: 1 of 1	PURPOSE:	Logged By:	BXB
PHOTO REF.: Sheet: 1 of 1		Checked Date:	
	PHOTO REF.:	Sheet:	1 of 1



TONKIN & TAYLOR

SCALA PENETROMETER LOG

Job No:	890762
Project:	Frankton Flats Development

Date: 1/07/2004 Operated by: AB Logged by: AB









TONKIN & TAYLOR

SCALA PENETROMETER LOG

Job No:	890762
Project:	Frankton Flats Development

RL: 0m

Date: 1/07/2004 Operated by: AB Logged by: AB









REFERENCE No. 890762



