



# BOREHOLE LOG

HOLE No.

**BH263**

PROJECT

**NH2**

CO-ORD.

**1743446 E 5919621 N**

R.L.

**9.04 m**

SHEET

**1 of 2**

LOCATION

**See site plan, Don Buck Road, Massey**

REF. GRID

DATUM

**MSL**

HOLE LENGTH

**12.07 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS				DIP degrees 0 90	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING			DEFECT SPACING	RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Fill	SILT; with some clay and minor 1cmØ to 9cmØ angular gravel, brown, firm, slightly plastic, moist, trace rootlets. No more rootlets from 0.45m.																		
Alluvium	Clayey SILT; with trace fine sand, orange brown mottled orange and streaked grey, firm to stiff, brittle but slightly plastic once reworked, moist.	8	1								100	HA	HA						
	SILT; with some clay, orange brown streaked grey, stiff, brittle but slightly plastic once reworked.		2		1/1/1/1/2						100	SPT							
	SILT; with some clay and minor fine sand, grey mottled orange, stiff, brittle but slightly plastic once reworked.		3								57	HQ							
	Fine sandy SILT; with some clay, grey mottled orange, stiff, brittle but slightly plastic once reworked.	6	3								86	PT							
	Silty CLAY; with some fine sand, brownish grey, very soft, slightly plastic, slightly sensitive, trace fibrous organics.		4		0	0/0/0/0/0					76	SPT							
	Fine sandy CLAY; with some silt, grey, very soft, plastic, trace fibrous organics.		4								84	HQ							
	No recovery from 4.5m to 4.95m. Inferred very soft 'fine sandy clay'.		4		0	0/0/0/0/0					0	SPT							
	Silty fine to coarse SAND; with some fine sub-rounded gravel, dark grey, loose, brittle, trace fibrous wood organics.		4	5															
	SILT; with trace fine sand, grey, hard, brittle. Fine to medium grained SANDSTONE; extremely weak, unweathered.						UCS: 860 kPa	EW	UW		81	100	HQ						
MUDSTONE; grey, very weak, unweathered. Gently inclined bedding plane, planar. Fine to medium grained SANDSTONE; with trace fine angular gravel, grey, very weak, unweathered.		6			60+	31//60 for 55mm					100	SPT							
			2	7							100	100	HQ						
					60+	60 for 110mm UCS: 3700 kPa						SC	SPT						
Minor fine to 3cmØ angular gravel from 7.9m.			8				VW	UW			100	100	HQ						
					60+	60 for 70mm						SC	SPT						
			0	9							100	100	HQ						
	Fine to 3cmØ angular gravelly fine to medium grained SANDSTONE; very weak, unweathered.																		

**NOTES**

SWL 19-5-2014 = 1.65m (4.30pm)  
 SWL 20-5-2014 = 2.8m (8am)  
 Single piezometer installed upon completion.  
 Contamination samples taken at 0.1m, 1.0m and 2.5m.

STARTED	19-05-2014	FINISHED	19-05-2014
DRILLER	Billy	DRILLING CO.	DF
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	CAT
LOGGED	T Van Deelen	CHECKED	G Knocker
CLIENT	Watercare Services Limited	JOB No.	1-C0935.46

**BH263**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3 (&PHOTO PAGE) 1-C0935.46 NH2.GPJ OPUS.CHCH.DEC12.GDT 1-8-14



# BOREHOLE LOG

HOLE No.

**BH263**

PROJECT

**NH2**

CO-ORD.

**1743446 E 5919621 N**

R.L.

**9.04 m**

SHEET

**2 of 2**

LOCATION

**See site plan, Don Buck Road, Massey**

REF. GRID

DATUM

**MSL**

HOLE LENGTH

**12.07 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS				DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING			DEFECT SPACING	RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Waitemata Group	Fine to medium grained SANDSTONE; trace fine angular gravel, grey, very weak to weak, unweathered.	-2	11		60+	60 for 100mm	VW	UW	0	Gently inclined, lamanae, carbonaceous organic streaks from 11.0m to 11.1m.	100	100	HQ	HQTT					
	MUDSTONE; grey, very weak, unweathered. Fine to medium grained SANDSTONE; trace fine angular gravel, grey, very weak, unweathered.																		
	End of Borehole at 12.07m.	12			60+	60 for 70mm													
		-4	13																
		-6	15																
		-8	17																
		-10	19																

**NOTES**

SWL 19-5-2014 = 1.65m (4.30pm)  
 SWL 20-5-2014 = 2.8m (8am)  
 Single piezometer installed upon completion.  
 Contamination samples taken at 0.1m, 1.0m and 2.5m.

STARTED	19-05-2014	FINISHED	19-05-2014
DRILLER	Billy	DRILLING CO.	DF
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	CAT
LOGGED	T Van Deelen	CHECKED	G Knocker
CLIENT	Watercare Services Limited	JOB No.	1-C0935.46

**BH263**

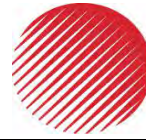


North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 263**



**OPUS**



0.00m – 3.50m

Box 1 of 4



3.50m – 6.90m

Box 2 of 4



North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 263**



**OPUS**



6.90m – 10.00m

Box 3 of 4



10.00m – 12.07m EOH

Box 4 of 4



# BOREHOLE LOG

HOLE No.

**BH264**

PROJECT

**NH2**

CO-ORD.

**1743458 E 5919657 N**

R.L.

**9.72 m**

SHEET

**1 of 2**

LOCATION

**See site plan, Don Buck Road, Massey**

REF. GRID

DATUM

**MSL**

HOLE LENGTH

**12.1 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS				DIP degrees 0 90	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING			DEFECT SPACING	RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS			CASING
Fill	Clayey SILT; brown, firm, slightly plastic, moist, minor rootlets.																		
	CLAY; with some silt and minor 1cmØ to 5cmØ angular gravels, light mottled brown streaked orange, firm, plastic, moist.																		
	Silty CLAY; brownish grey mottled orange, firm, plastic, moist, trace rootlets.		1								100	HA	HA						
Alluvium	SILT; with minor fine sand and trace clay, orange brown, firm, brittle but slightly plastic once reworked.		8			3	2/1/1/0/1				56	SPT							
	Fine sandy SILT; with minor fine angular gravel, orange brown, soft, brittle, slightly sensitive.		2								63	HQ							
	No recovery from 3.5m to 3.95m. Soft material, inferred 'sandy silt'.		6								90	PT							
											0	SPT							
	Fine to medium sandy SILT; with trace fine angular gravels and trace clay, very soft, brittle but slightly plastic once reworked, trace fibrous organics.			4								100	HQ						
	Silty fine to medium SAND; with minor fine angular gravels, very soft, brittle but slightly plastic once reworked.			5								100	SPT						
	Fine angular gravelly fine to medium SAND; with some silt, dark grey, loose, brittle, minor fibrous wood organics. Abundant fibrous wood organics from 5.5m. Poor recovery from 5.5m to 5.9m.			4								52	HQ						
Waitemata Group	Fine sandy SILT; grey, hard, brittle.		6																
	Fine grained SANDSTONE; grey, very weak, unweathered.					60+	36/20/23/17 for 140mm UCS: 1500 kPa												
	MUDSTONE; grey, very weak, unweathered. Gently inclined bedding plane, planar. Alternating sequence of thin to moderately thin bedded fine to medium grained SANDSTONE (90%); grey, very weak, unweathered with MUDSTONE (10%); grey, very weak, unweathered. Gently inclined bedding planes, planar.		2				60+	60 for 100mm											
	Fine to medium grained SANDSTONE; with minor fine angular gravels, grey, very weak, unweathered.			9			60+	29/23/22/15 for 25mm											
	Fine grained SANDSTONE; grey, very weak, unweathered.			0								100	HQ						

**NOTES**

Borehole backfilled upon completion.  
Contamination samples taken at 0.1m, 1.0m and 2.2m.

STARTED	20-05-2014	FINISHED	20-05-2014
DRILLER	Billy	DRILLING CO.	DF
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	CAT
LOGGED	T Van Deelen	CHECKED	G Knocker
CLIENT	Watercare Services Limited	JOB No.	1-C0935.46

**BH264**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3 (&PHOTO PAGE) 1-C0935.46 NH2.GPJ OPUS.CHCH.DEC12.GDT 1-8-14





# BOREHOLE LOG

HOLE No.

**BH264**

PROJECT

**NH2**

CO-ORD.

**1743458 E 5919657 N**

R.L.

**9.72 m**

SHEET

**2 of 2**

LOCATION

**See site plan, Don Buck Road, Massey**

REF. GRID

DATUM

**MSL**

HOLE LENGTH

**12.1 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS				DIP degrees 0 90	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING			DEFECT SPACING	RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Waitemata Group	Fine to medium grained SANDSTONE; with trace fine angular gravels, grey, very weak, unweathered. Trace carbonaceous organics flecks from 10.2m to 10.3m.	11			60+	60 for 80mm	VW	UW			100	100	HQ						
	Occasional carbonaceous flecks from 11.5m.	-2												HQTT	30%				
		12			60+	60 for 100mm													
	End of Borehole at 12.10m.																		
		13																	
		-4																	
		14																	
		15																	
		-6																	
		16																	
		17																	
		-8																	
		18																	
		19																	
		-10																	

**NOTES**

Borehole backfilled upon completion.  
Contamination samples taken at 0.1m, 1.0m and 2.2m.

STARTED	20-05-2014	FINISHED	20-05-2014
DRILLER	Billy	DRILLING CO.	DF
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	CAT
LOGGED	T Van Deelen	CHECKED	G Knocker
CLIENT	Watercare Services Limited	JOB No.	1-C0935.46

**BH264**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 264**



**OPUS**



0.00m – 3.50m

Box 1 of 4



3.50m – 7.60m

Box 2 of 4



North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 264**



**OPUS**



7.60m – 10.80m

Box 3 of 4



10.80m – 12.10m EOH

Box 4 of 4





# BOREHOLE LOG

HOLE No.

**BH265**

PROJECT

**NH2**

CO-ORD.

**1752154 E 5932951 N**

R.L.

**12.98 m**

SHEET

**1 of 1**

LOCATION

**See site plan, Bush Road, Albany**

REF. GRID

DATUM

**MSL**

HOLE LENGTH

**9.11 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees 0 90	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Fill	Clayey SILT; with trace fine to 3cmØ gravel, brown, firm, plastic, most, trace rootlets. Fine sandy SILT; with some clay, light orange, firm, slightly plastic, moist.																		
Waitemata Group	Clayey SILT; with some fine sand, grey mottled orange, stiff, slightly plastic, moist.	12	1									100	HA	HA					
	Fine sandy SILT; with minor clay, light orange brown, stiff, slightly plastic.																		
	Clayey SILT; with some fine sand, grey mottled orange brown, stiff, slightly plastic.		6		1/1/1/2/2							59	SPT						
	Fine SAND; with trace silt, greyish brown, dense, brittle, moderately cemented, trace limonite staining.											100	HQ						
	Fine grained SANDSTONE; grey, extremely weak, moderately weathered.	10	3			60+ <sup>20/18/24/18</sup> for 40mm	EW	MW				100	SPT						
	Fine grained SANDSTONE; grey, weak, slightly weathered, homogenous.		4			UCS: 5400 kPa						91	100	HQ					
				8		60+	60 for 120mm	W	SW					SC	SPT				
				6		60+	60 for 130mm							SC	SPT				
	Fine grained SANDSTONE; grey, very weak to weak, unweathered, homogenous.		6	7			UCS: 5000 kPa					100	100	HQ					
			8		60+	60 for 130mm	VW	UW					SC	SPT					
			4	9		UCS: 4800 kPa							SC	SPT					
	End of Borehole at 9.11m.					60+	60 for 110mm												

**NOTES**

Single piezometer installed upon completion.  
Contamination samples taken at 0.1m, 1.0m and 2.0m.

STARTED	10-06-2014	FINISHED	10-06-2014
DRILLER	Billy	DRILLING CO.	DF
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	CAT
LOGGED	T Van Deelen	CHECKED	G Knocker
CLIENT	Watercare Services Limited	JOB No.	1-C0935.46

**BH265**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3 (&PHOTO PAGE) 1-C0935.46 NH2.GPJ OPUS.CHCH DEC12.GDT 1-8-14

North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 265**



**OPUS**



0.00m – 3.10m

Box 1 of 3



3.10m – 6.00m

Box 2 of 3

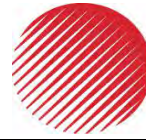


North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 265**



**OPUS**



6.00m – 9.11m EOH

Box 3 of 3



# BOREHOLE LOG

HOLE No.  
**BH268**  
SHEET  
1 of 2  
HOLE LENGTH  
10.62 m

PROJECT  
**NH2**  
LOCATION  
**See site plan, Summerland Drive, Henderson**

CO-ORD.  
**1743456 E 5918064 N**  
R.L.  
**22.10 m**  
REF. GRID  
**MSL**  
DATUM

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS				DIP degrees 90	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING			DEFECT SPACING	RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS		
Fill	Fine to 9cmØ angular GRAVELS in a SILT matrix; brown, medium dense, brittle, moist. CLAY; with trace silt, light brown mottled grey, stiff, plastic, moist. Some sandy silt pockets from 0.5m.	22									100	HA	HA					
	Water seepage into the hand auger hole at 1.0m.	1																
Waitemata Group	CLAY; with trace silt and trace fine sand, grey mottled orange brown, hard, plastic.	18			18	1/1/1/10/6					47	SPT						
	2cmØ to 5cmØ angular GRAVEL in a CLAY matrix; with trace silt and trace fine sand, grey mottled orange brown, hard, plastic. CLAY; with minor silt, light yellowish grey, very stiff, brittle but plastic once reworked.	20									100	HQ						
	Clayey SILT; light grey mottled orange, hard, plastic.	3									56	SPT						
	SILT; with minor clay, grey, hard, slightly plastic.	18									100	HQ						
	Silty fine SAND; grey, medium dense, brittle, weakly cemented.	17									100	SPT						
	Fine SAND; with some silt, grey, medium dense to dense, brittle.	5										100	HQ					
	Becomes moderately cemented at 7.3m.	6										100	SPT					
		7										100	HQ					
Fine grained SANDSTONE; grey, weak, slightly weathered.	14										100	HQ						
Minor fine angular gravel from 9.15m.	9				60+	60 for 130mm	W	SW			SC	SPT						
											100	HQ						

<b>NOTES</b> Single piezometer installed upon completion.	STARTED	24-06-2014	FINISHED	25-06-2014
	DRILLER	Billy	DRILLING CO.	DF
	INCLINATION/ AZIMUTH	-90°	DRILLING RIG	CAT
	LOGGED	T Van Deelen	CHECKED	G Knocker
	CLIENT	Watercare Services Limited	JOB No.	1-C0935.46
LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES		SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS		<b>BH268</b>

BOREHOLE\_LOG\_A3 (&PHOTO PAGE) 1-C0935.46 NH2.GPJ OPUS.CHCH.DEC12.GDT 1-8-14





# BOREHOLE LOG

HOLE No.

**BH268**

PROJECT

**NH2**

CO-ORD.

**1743456 E 5918064 N**

R.L.

**22.10 m**

SHEET

**2 of 2**

LOCATION

**See site plan, Summerland Drive, Henderson**

REF. GRID

DATUM

**MSL**

HOLE LENGTH

**10.62 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL		
	Fine grained SANDSTONE; grey, weak, slightly weathered.	12			60+	UCS: 10000 kPa 60 for 120mm	W	SW		0	Fracture, 42° dip; planar, rough, no coating at 10.2m.	100	HQ	HQTT						
	End of Borehole at 10.62m.		11									SC	SPT							
			12																	
			13																	
			14																	
			15																	
			16																	
			17																	
			18																	
			19																	

**NOTES**

Single piezometer installed upon completion.

STARTED	24-06-2014	FINISHED	25-06-2014
DRILLER	Billy	DRILLING CO.	DF
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	CAT
LOGGED	T Van Deelen	CHECKED	G Knocker
CLIENT	Watercare Services Limited	JOB No.	1-C0935.46

**BH268**

North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 268**



**OPUS**



0.00m – 3.25m

Box 1 of 4



3.25m – 6.45m

Box 2 of 4

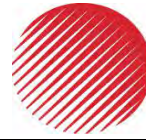


North Harbour No 2 Watermain

1-C0935.46

Watercare Services Limited

**Borehole 268**



**OPUS**



6.45m – 9.00m

Box 3 of 4



9.00m – 10.62m EOH

Box 4 of 4





# LOG OF AUGER HOLE

HOLE No.

**HA201**

PROJECT

**NH2**

CO-ORD.

**1747839 E 5927246 N**

R.L.

**7.52 m**

SHEET

**1 of 1**

LOCATION

**See site plan, SH16, Hobsonville**

REF. GRID

DATUM

**MSL**

TOTAL DEPTH

**5 m**


GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES	
						SCALA PENETROMETER Blows per 100 mm		SHEAR STRENGTH kPa		OTHER TESTS
Topsoil	Silty CLAY; brown, very stiff, moderate plasticity, trace rootlets,									
Fill	Clayey SILT; brown mottled light brown with black flecks, very stiff, low plasticity, sensitive, with trace organics (fresh wood).							186/25		
	Silty CLAY; light brown streaked orange (limonite staining), very stiff, moist, moderate plasticity, sensitive, with trace organics (fresh wood). Becomes very sensitive at 1.0m.  Becomes dry with trace fine sand at 1.4m.		1					103/8		
Alluvium	Silty CLAY; brownish grey streaked brownish orange, hard, moist, moderate plasticity, traces organics (rootlets).		2					219+		
	Silty CLAY; brownish grey with orange streaks, hard, moist, high plasticity.		3					219+	Contamination sample at 3.0m	Bulk sample at 3.0m
Waitemate Group	Clayey SILT with trace fine sand, greyish brown mottled greyish blue with orange limonite streaks, hard, moist, low plasticity. Becomes greyish blue mottled greyish brown at 3.6m.  Becomes grey at 4.0m.		4					219+		
	Silty fine to medium SAND; grey, medium dense, saturated, uniformly graded. Water table at 4.3m		4					219+	Contamination sample at 4.0m	Bulk sample at 4.0m
	End of Hand Auger at 5.0m. Too hard to auger. No scala-penetrometer test undertaken.		5					UTP		

## SKETCH OF EXPOSURE



<b>NOTES</b> Shear vane 1559 Correction factor = 1.563 Contamination samples taken at 0.1m, 1.0m and 2.0m Bulk samples taken at 1.5m, 3.0m and 4.0m	LOGGED	DATE EXCAVATED	
	S Farquhar	29-05-2014	
	CHECKED BY:	EXCAVATOR	
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT	JOB No.	<b>HA201</b>
	Watercare Services Limited	1-C0935.46	



	<b>LOG OF AUGER HOLE</b>			HOLE No. <b>HA202</b>
	PROJECT <b>NH2</b>	CO-ORD. <b>1747864 E 5927250 N</b>	R.L. <b>4.83 m</b>	SHEET <b>1 of 1</b>
	LOCATION <b>See site plan, SH16, Hobsonville</b>	REF. GRID	DATUM <b>MSL</b>	TOTAL DEPTH <b>1.5 m</b>

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS	
Fill	Clayey SILT; with some fine sand, brown mottled greyish brown and orangey brown, hard, moist, low plasticity, trace rootlets.								
	Silty CLAY; grey, hard, moist, moderate plasticity.								
	Clayey SILT; with some fine sand, brown mottled greyish brown and orange brown, hard, dry, low plasticity.						UTP	Contamination sample at 0.1m	Bulk sample at 0.7m
	Trace fine to medium angular gravel at 0.7m.						UTP		
	SILT; with some fine sand and minor clay and traces of gravel, brown, hard, dry, low plasticity with water added. Gravel is fine-medium, angular.								
	End of Hand Auger at 1.5m. Too hard to auger. Multiple attempts. No scala-penetrometer test undertaken due to underground services uncertainty.								

**SKETCH OF EXPOSURE**



<b>NOTES</b> Shear vane 1558 Correction factor = 1.449 Contamination sample taken at 0.1m Bulk sample taken at 0.7m	LOGGED <b>S Farquhar</b>	DATE EXCAVATED <b>30-05-2014</b>
	CHECKED BY:	EXCAVATOR
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT <b>Watercare Services Limited</b>	JOB No. <b>1-C0935.46</b> <b>HA202</b>





# LOG OF AUGER HOLE

HOLE No.  
**HA203**

PROJECT	NH2	CO-ORD.	1747877 E 5927253 N	R.L.	3.72 m	SHEET	1 of 1
LOCATION	See site plan, CH -168:8L (from edge of noise wall)		REF. GRID	DATUM	MSL	TOTAL DEPTH	5.5 m

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES	
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS		
Fill	Silty CLAY; with some coarse sand, fine gravel, boulders, brown, stiff, moist, low plasticity, trace rootlets.									
	Silty CLAY; with some fine sand, brown, stiff, moist, moderate plasticity, trace rootlets.									
	Silty CLAY; with some coarse sand and trace fine sand, light brown mottled orange, moist, moderate plasticity. Becomes stiff, moderately sensitive at 0.5m.						67/20	Contamination sample at 0.0m		
Waitemata Group	Fine SAND; with some clay, light brown, loose, moist, brittle. Becomes medium dense at 1.0m. Becomes light grey streaked orange at 1.2m.	1					203+	Contamination sample at 1.0m		Bulk sample at 1.5m
	Fine sandy CLAY; light grey, hard, moist, moderate plasticity.  Orange staining at 1.9m. Becomes dark bluish grey at 2.1m.	2					203+			
	CLAY; dark bluish grey, stiff, moist, high plasticity, moderately sensitive.	2					UTP	Contamination sample at 2.0m		
	Fine sandy CLAY; dark bluish grey, stiff, moist, high plasticity, moderately sensitive.	3					87/35			
	CLAY; with trace silt, dark bluish grey, very stiff, moist, high plasticity, moderately sensitive.	3					145/55			Bulk sample at 3.0m
		4					107/41			
	Fine sandy CLAY; dark bluish grey, very stiff, moist, low plasticity, moderately sensitive.  Becomes hard at 5.5m.	4					178/65			Bulk sample at 4.0m
	5					UTP				
							138/81			
							203+			
	End of Hand Auger at 5.5m. Gravel blocking hole. No scala-penetrometer test undertaken.	-2								

## SKETCH OF EXPOSURE



<b>NOTES</b> Shear vane 1558 Correction factor = 1.449 Contamination samples taken at 0.1m, 1.0m, 2.0m Bulk samples taken at 1.5m, 3.0m, 4.0m	LOGGED	J Burton	DATE EXCAVATED	29-05-2014
	CHECKED BY:		EXCAVATOR	
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT	Watercare Services Limited	JOB No.	1-C0935.46
				<b>HA203</b>





# LOG OF AUGER HOLE

HOLE No.

**HA204**

PROJECT

**NH2**

CO-ORD.

R.L.

**Approx. 1.1 m**

SHEET

**1 of 1**

LOCATION

**See site plan, CH-150:9L (from noise wall)**

REF. GRID

DATUM

**MSL**

TOTAL DEPTH

**2 m**

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS	
M	Clayey SILT; brown, soft, saturated, low plasticity, some rootlets.								
Alluvium	SILT; with some fine sand and minor clay, light brown, soft, saturated, low plasticity.  No rootlets, and a pungent sulphurous odour at 0.2m.								Contamination sample at 0.0m
Waitemata Group	Silty CLAY; grey, very stiff, wet, moderate plasticity, sensitive.		1						
	End of Hand Auger at 2.0m. Too hard to auger. Scala-penetrometer test undertaken from 2.0 m to 2.5 m.		2						

## SKETCH OF EXPOSURE

### NOTES

Shear vane 1558  
Correction factor = 1.449  
Contamination samples taken at 0.0m (x2), 0.8m  
Bulk samples taken at 0.5m, 1.5m  
M = Marine Sediment

Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005)  
Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2  
Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)

LOGGED

S Farquhar

DATE EXCAVATED

11-06-2014

CHECKED BY:

EXCAVATOR


CLIENT

Watercare Services Limited

JOB No.

1-C0935.46

**HA204**

	<b>LOG OF AUGER HOLE</b>			HOLE No. <b>HA205</b>
	PROJECT <b>NH2</b>	CO-ORD.	R.L. <b>Approx. 0.6 m</b>	SHEET <b>1 of 1</b>
	LOCATION <b>See site plan, CH -140:10L (from noise wall)</b>	REF. GRID	DATUM <b>MSL</b>	TOTAL DEPTH <b>2.4 m</b>

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES	
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS		
Marine Sediment	Fine sandy SILT; light brownish grey, very loose, saturated, brittle, some rootlets and organics. Groundwater level at 0.0m (surface).								Contamination sample at 0.0m	
	Clayey SILT; with minor fine sand, light grey, firm, saturated, low plasticity, sensitive, trace rootlets.									Bulk sample at 0.5m
All.	Silty CLAY; grey, stiff, wet, moderate plasticity, sensitive, trace rootlets.									Contamination sample at 0.6m
Waitemata Group	Silty CLAY; grey, stiff, wet, moderate plasticity, sensitive.									
	Becomes moist, very stiff, sensitive at 1.5m.									Bulk sample at 1.5m
	Becomes grey, streaked blackish grey at 1.9m.									
	End of Hand Auger at 2.4m. Too hard to auger. Scala-penetrometer test undertaken from 0.0m to 0.9m and 2.40m to 3.45m.									

**SKETCH OF EXPOSURE**



<b>NOTES</b> Shear vane 1558 Correction Factor = 1.449 Contamination samples taken at 0.0m (x2), 0.6m Bulk samples taken at 0.3m, 1.5m All. = Alluvium	LOGGED <b>S Farquhar</b>	DATE EXCAVATED <b>12-06-2014</b>	
	CHECKED BY:	EXCAVATOR	
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT <b>Watercare Services Limited</b>	JOB No. <b>1-C0935.46</b>	<b>HA205</b>





# LOG OF AUGER HOLE

HOLE No.

**HA206**

PROJECT

**NH2**

CO-ORD.

R.L.

**Approx. 0.4 m**

SHEET

**1 of 1**

LOCATION

**See site plan, CH -122:13L (from noise wall)**

REF. GRID

DATUM

**MSL**

TOTAL DEPTH

**3 m**

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES
						SCALA PENETROMETER Blows per 100 mm		SHEAR STRENGTH kPa	
Marine Sediment	Fine sandy SILT; light brownish grey, very soft, saturated, brittle, some organics. Groundwater level at 0.0m (surface).  Trace clay, low plasticity at 0.5m. Moderate plasticity at 0.6m.	0	0			0 2 4 6 8 10 12 14 16 18 20	14/3	Contamination sample at 0.0m	Bulk sample at 0.4m
Waitemata Group	Silty CLAY; grey, stiff, wet, low plasticity, sensitive, some rootlets. Trace rootlets at 0.75m.	1	1				72/12	Contamination sample at 0.6m	
	No rootlets at 1.3m.	2	2				148/23		Bulk sample at 1.5m
		3	3				203+		Bulk sample at 2.5m
	End of Hand Auger at 3.0m. Too hard to auger. Scala-penetrometer test undertaken from 0.0m to 0.9m and 3.0m to 3.8m.								

## SKETCH OF EXPOSURE

### NOTES

Shear vane 1558  
Correction factor = 1.449  
Contamination samples taken at 0. m (x2), 0.6m  
Bulk samples taken at 0.4m, 1.5m and 2.5m

LOGGED

S Farquhar

DATE EXCAVATED

12-06-2014

CHECKED BY:

EXCAVATOR

Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005)

Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2

Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)

CLIENT

Watercare Services Limited

JOB No.

1-C0935.46

**HA206**



# LOG OF AUGER HOLE

HOLE No.  
**HA206A**

PROJECT  
**NH2**

LOCATION  
**See site plan, CH -122:22L (from noise wall)**

CO-ORD.  
**REF. GRID**

R.L.  
**Approx. 0.5 m**

DATUM  
**MSL**

SHEET  
**1 of 1**

TOTAL DEPTH  
**3 m**


GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS	
Marine Sediment	SILT; with some fine sand, greyish brown, soft, saturated, brittle, some rootlets. Groundwater level at 0.0m (surface). Fine to medium SAND; minor silt and trace clay, grey, loose, saturated, brittle but low plasticity on remould, trace rootlets. SILT; with minor fine sand, and minor clay, firm, saturated, low plasticity, sensitive, minor rootlets.	0				0 2 4 6 8 10 12 14 16 18 20	42/9	Contamination sample at 0.0m	Bulk sample at 0.4m
Waitemata Group	Clayey SILT; with minor fine sand, grey, stiff, wet, low plasticity, sensitive.  Becomes stiff at 1.0m.	1					58/14	Contamination sample at 0.6m Contamination sample at 0.9m	
	Silty CLAY; with trace fine sand, grey, very stiff, wet, moderate plasticity, moderately sensitive.						100/29		Bulk sample at 1.5m
	Silty CLAY; grey, very stiff, moist, moderate plasticity, sensitive.	2					119/29		
	Becomes hard at 3.0m.	-2					156/43		Bulk sample at 2.5m
	End of Hand Auger at 3.0m. Too hard to auger. Scala-penetrometer test undertaken from 0.0m to 0.9m and 3.0m to 3.9m.	3					203+		

## SKETCH OF EXPOSURE



<b>NOTES</b> Shear vane 1558 Correction Factor 1.449 Contamination samples at 0. m (x2), 0.6m Bulk samples at 0.4m, 1.5m 2.5m	LOGGED S Farquhar	DATE EXCAVATED 12-06-2014
	CHECKED BY:	EXCAVATOR
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT Watercare Services Limited	JOB No. 1-C0935.46 <b>HA206A</b>



	<b>LOG OF AUGER HOLE</b>			HOLE No. <b>HA254</b>
	PROJECT <b>NH2</b>	CO-ORD. <b>1743987 E 5916155 N</b>	R.L. <b>11.68 m</b>	SHEET <b>1 of 1</b>
	LOCATION <b>See site plan, Border Road, Henderson</b>	REF. GRID	DATUM <b>MSL</b>	TOTAL DEPTH <b>4 m</b>

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS	
Alluvium	Silty CLAY; with trace fine sand, brown, stiff, moist, moderate plasticity.  No fine sand from 0.3m.  10mm thick manganese stained layer at 0.9m.		1						Contamination sample at 0.1m  Bulk sample at 0.5m  Bulk sample at 1.0m
	Silty CLAY; with minor fine sand, greyish brown streaked reddish brown, stiff, moist, moderate plasticity.  Becomes moist to wet at 1.6m.		10						Contamination sample at 1.1m  Bulk sample at 1.5m
	Becomes firm at 2.0m. Fine sandy CLAY; with some silt, dark grey, firm, wet, low plasticity.		2						Bulk sample at 2.0m
	Silty CLAY; with minor fine sand, dark grey, firm, moist, moderate plasticity.  Becomes stiff at 2.5m.			3					Contamination sample at 2.2m  Bulk sample at 2.5m
	Becomes very stiff at 3.0m.								Bulk sample at 3.0m
	Silty CLAY; with some fine to medium sand and trace sub-rounded gravel, stiff, saturated, low plasticity, trace fibrous organics.								
	Clayey fine to medium SAND; dark grey, medium dense, saturated, minor organics.								
	Groundwater table at 3.5m. No recovery from 3.5m to 4.0m due to water table. Inferred 'clayey fine to medium sand'.			8					UTP  Bulk sample at 3.5m
End of Hand Auger at 4.0m. Too hard to auger and no recovery. Scala-penetrometer test undertaken from 4.05m to 4.3m.			4					UTP	

**SKETCH OF EXPOSURE**



<b>NOTES</b> Shear vane 1559 Correction factor = 1.563 Contamination samples taken at 0.1m, 1.1m, 2.2m Bulk samples taken at 0.5m, 1.0m, 1.5m, 2.0m, 2.5m, 3.0m, 3.5m	LOGGED <b>S Farquhar</b>	DATE EXCAVATED <b>22-05-2014</b>
	CHECKED BY:	EXCAVATOR
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT <b>Watercare Services Limited</b>	JOB No. <b>1-C0935.46</b> <b>HA254</b>



# LOG OF AUGER HOLE

HOLE No.

**HA255**

PROJECT

**NH2**

CO-ORD.

**1743976 E 5916169 N**

R.L.

**11.06 m**

SHEET

**1 of 1**

LOCATION

**See site plan, Palamino Drive, Henderson**

REF. GRID

DATUM

**MSL**

TOTAL DEPTH

**3.1 m**

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES
						SCALA PENETROMETER Blows per 100 mm		SHEAR STRENGTH kPa	
Fill	Silty CLAY; with minor fine sand and trace fine angular gravel, firm, wet, plastic.					0 2 4 6 8 10 12 14 16 18 20		Contamination sample at 0.0m	
Alluvium	Clayey SILT; with trace fine sand, light brown, stiff, wet, low plasticity. Becomes stiff at 0.5m. Silty CLAY; with trace fine sand, stiff, moist, plastic.						78/36		Bulk sample at 0.5m
	Fine sandy CLAY; with some silt, light orange brown, very stiff, moist, plastic. Perched groundwater level at 1.1m. Poor recovery from 1.2m to 1.5m. Inferred 'fine sandy clay'.	-10	1				127/84	Contamination sample at 1.0m	Bulk sample at 1.0m
	Fine sandy CLAY; with some silt, grey, stiff, moist, plastic. Becomes very stiff at 2.0m.		2				88/28		Bulk sample at 1.5m
							113/38	Contamination sample at 2.0m	
							103/44		
							UTP		
	End of Hand Auger at 3.1m. Too hard to auger. Scala-penetrometer test undertaken from 3.1m to 3.35m.	-8	3						

## SKETCH OF EXPOSURE

### NOTES

Shear vane 1559  
Correction factor = 1.563  
Hole re-attempted 1m from original location (refusal at 3.0m)  
Contamination samples taken at 0.1m, 1.0m, 2.0m  
Bulk samples taken at 0.5m, 1.0m, 1.5m

Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005)  
Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2  
Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)

LOGGED

T Van Deelen

DATE EXCAVATED

23-05-2014

CHECKED BY:

EXCAVATOR

CLIENT

Watercare Services Limited

JOB No.

1-C0935.46

**HA255**





# LOG OF AUGER HOLE

HOLE No.

**HA259**

PROJECT

**NH2**

CO-ORD.

**1743441 E 5918052 N**

R.L.

**17.27 m**

SHEET

**1 of 1**

LOCATION

**See site plan, Summerland Drive, Henderson**

REF. GRID

DATUM

**MSL**

TOTAL DEPTH

**2.8 m**

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS				OTHER TESTS	SAMPLES	
						SCALA PENETROMETER						SHEAR STRENGTH kPa
						Blows per 100 mm						
Alluvium	Silty CLAY; dark greyish brown, stiff, moist, high plasticity, minor rootlets.										Contamination sample at 0.0m	
	CLAY; with some silt, light reddish brown, stiff, saturated, high plasticity, sensitive. Groundwater table at 0.5m.										53/0	
	Silty CLAY; with trace fine sand, light brownish grey, stiff, saturated, high plasticity, sensitive, rootlets and fibrous organics.		1									53/3
	No recovery from 1.5 to 2.1m. Inferred 'silty clay'. Becomes firm and moderately sensitive from 1.5m.											44/3
	Silty fine SAND; with minor clay and trace medium sand, dark bluish grey, medium dense, saturated, poorly graded, trace rootlets.		2									86/27
	No recovery from 2.5m to 2.8m. Inferred 'silty fine sand'. Becomes hard from 2.5m.											207
End of Hand Auger at 2.8m. Too hard to auger. Scala-penetrometer test undertaken from 2.8m to 2.95m.		3										

**SKETCH OF EXPOSURE**



<b>NOTES</b> Shear vane 954 Correction Factor = 1.478 Contamination samples taken at 0.1m, 1.0m Bulk sample taken at 0.5m	LOGGED	DATE EXCAVATED	
	B Mason	23-06-2014	
	CHECKED BY:	EXCAVATOR	
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT	JOB No.	<b>HA259</b>
	Watercare Services Limited	1-C0935.46	





# LOG OF AUGER HOLE

HOLE No.

**HA260**

PROJECT

**NH2**

CO-ORD.

**1743424 E****5918075 N**

R.L.

**17.06 m**

SHEET

**1 of 1**

LOCATION

**See site plan, Munroe Road, Henderson**

REF. GRID

DATUM

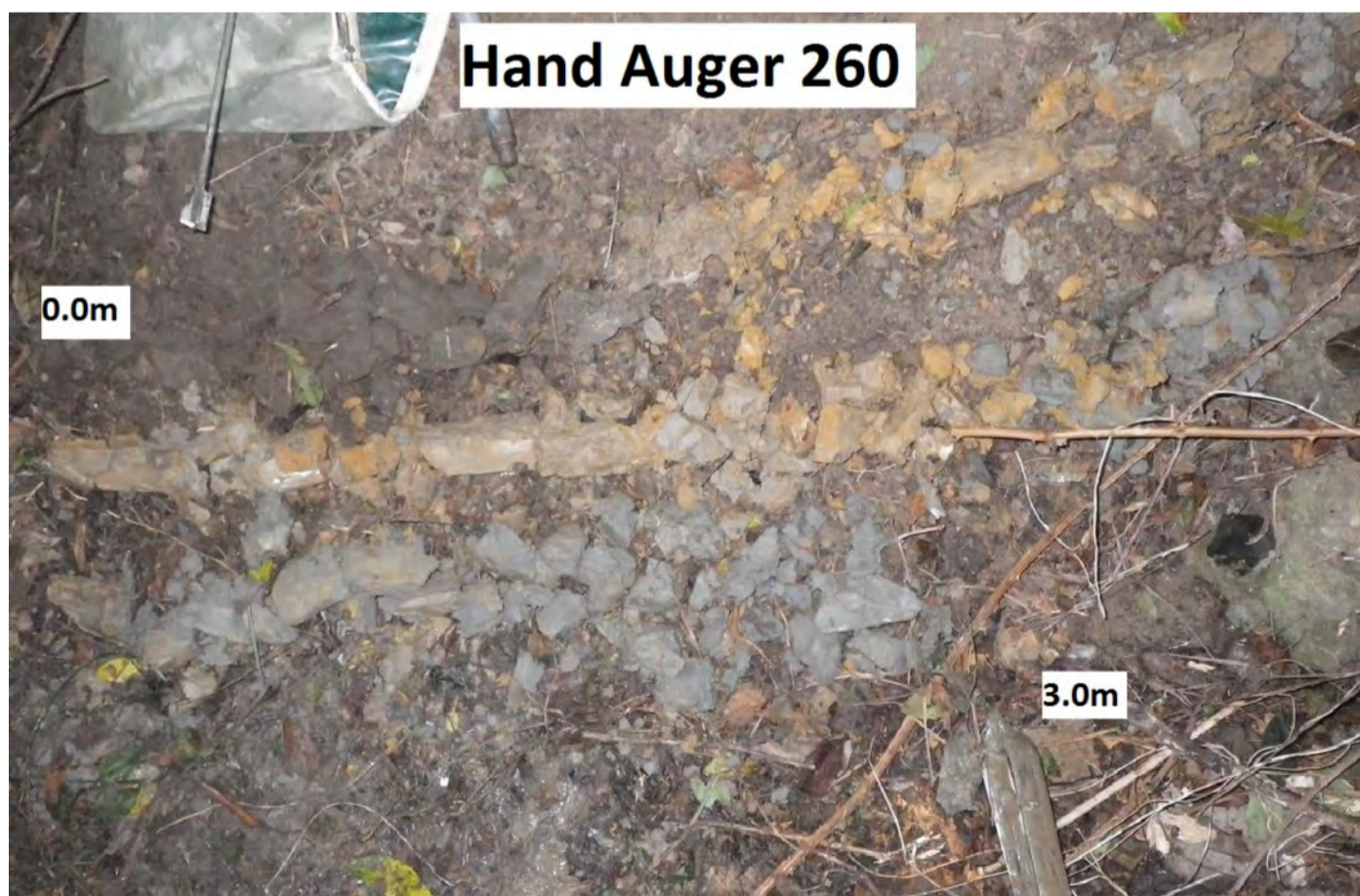
**MSL**

TOTAL DEPTH

**3 m**

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES											
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS												
						0	2	4	6	8	10	12	14	16	18	20				
Alluvium	SILT; with some clay and some fine sand, dark brown, firm, moist, low plasticity, some rootlets.			x x x														Contamination sample at 0.0m		
	Silty CLAY; with some fine sand, dark brown with orange streaks, firm, moist, moderate plasticity, trace rootlets.			x x x																
	Silty CLAY; with some fine sand, light brown mottled orange, very stiff, saturated, moderate plasticity, trace rootlets. Groundwater table at 0.4m.			x x x ▽														203+	Bulk sample at 0.5m	
	Clayey SILT; with trace fine sand and trace fine sub-rounded hard clay fragments, orangey brown, very stiff, moist, moderate plasticity.			x x x															UTP	Contamination sample at 1.0m
	Silty CLAY; with trace fine sand, grey with orange streaks, very stiff, moist, brittle but low plasticity on remould.			x x x															UTP	
Becomes hard from 1.0m.		-16	1	x x x															Bulk sample at 1.5m	
White specks from 1.5m.				x x x																
Clayey SILT; with trace fine sand, orange grey, hard, wet, high plasticity.				x x x																
Trace fine-medium sub-angular gravel at 1.9m.			2	x x x															UTP	Contamination sample at 2.0m
				x x x																Bulk sample at 2.0m
				x x x															UTP	
				x x x																Bulk sample at 3.0m
	End of Hand Auger at 3.0m. Too hard to auger. Scala-penetrometer undertaken from 3.0 m to 3.1 m.	-14	3	x x x															UTP	

## SKETCH OF EXPOSURE



## NOTES

Shear vane 1558  
Correction factor = 1.449  
Contamination samples taken at 0.1m, 1.0m, 2.0m  
Bulk samples at 0.5m, 1.0m, 1.5m, 2.0m, 3.0m

Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005)

Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2  
Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)

LOGGED

J Burton

DATE EXCAVATED

23-06-2014

CHECKED BY:

EXCAVATOR

CLIENT


Watercare Services Limited

JOB No.

1-C0935.46

**HA260**



	<b>LOG OF AUGER HOLE</b>			HOLE No. <b>HA262</b>
	PROJECT <b>NH2</b>	CO-ORD. <b>1743393 E 5918099 N</b>	R.L. <b>25.98 m</b>	SHEET <b>1 of 1</b>
	LOCATION <b>See site plan, Munroe Road, Henderson</b>	REF. GRID	DATUM <b>MSL</b>	TOTAL DEPTH <b>5 m</b>


GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS	
Fill	Silty CLAY; brownish grey, stiff, moist, plastic, moderately sensitive, trace rootlets.  Trace fine angular gravel from 0.5m.								Contamination sample at 0.1m  Bulk sample at 0.5m
Alluvium	CLAY; with trace silt, grey streaked yellowish orange, stiff, moist, plastic, moderately sensitive, homogenous.  Some silt from 1.5m.		1						85/19  114/46  Contamination sample at 1.0m  Bulk sample at 1.5m
	Silty CLAY; with some fine sand, brownish red mottled grey, stiff, moist, plastic, moderately sensitive.  Perched groundwater level at 3.3m.		2						138/74  94/43  Contamination sample at 2.0m  Bulk sample at 2.5m
	Fine sandy CLAY; with some silt, reddish brown mottled grey, stiff, wet, moderately sensitive.		3						100/57  87/41
	Poor recovery from 4.1m to 5.0m. Inferred 'fine sandy clay'.		4						100/36  103/45
	End of Hand Auger at 5.0m. Too hard to auger. Scala-penetrometer test undertaken from 5.0 m to 5.7 m.		5						94/39

**SKETCH OF EXPOSURE**



<b>NOTES</b> Shear vane 1558 Correction factor = 1.449 Contamination samples taken at 0.1m, 1.0m, 2.0m Bulk Samples taken at 0.5m, 1.5m, 2.5m, 3.5m	LOGGED T Van Deelen	DATE EXCAVATED 3-07-2014
	CHECKED BY:	EXCAVATOR
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT Watercare Services Limited	JOB No. 1-C0935.46 <b>HA262</b>



	<b>LOG OF AUGER HOLE</b>			HOLE No. <b>HA266</b>
	PROJECT <b>NH2</b>	CO-ORD. <b>1752181 E 5933011 N</b>	R.L. <b>17.08 m</b>	SHEET <b>1 of 1</b>
	LOCATION <b>See site plan, Bush Road, Albany</b>	REF. GRID	DATUM <b>MSL</b>	TOTAL DEPTH <b>4 m</b>


GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES	
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS		
Alluvium	Silty CLAY; light brown, stiff, wet, plastic, sensitive, plastic. Water table at 0.1m (perched).									
	Silty CLAY; with trace fine sand, bluish grey, very stiff, saturated, moderately sensitive.		1				54/10		Contamination sample at 0.1m	Bulk sample at 0.5m
Watemata Group	Fine sandy CLAY; with some silt, orange brown, hard, saturated, plastic.		16				104/49		Contamination sample at 1.0m	Bulk sample at 1.0m
	Fine sandy SILT; with some clay and trace fine angular gravel, grey, hard, saturated, slightly plastic.						UTP			
	Silty fine SAND; with some clay and trace fine angular gravel, grey, loose, saturated, homogenous.		2				UTP		Contamination sample at 2.0m	Bulk sample at 2.0m
			14				UTP			Bulk sample at 3.0m
	End of Hand Auger at 4.0m. Too hard to auger. Scala-penetrometer undertaken from 3.9 m to 4.3 m.		4				UTP			
			5							
			12							

**SKETCH OF EXPOSURE**



<b>NOTES</b> Shear vane 1558 Correction factor = 1.449 Contamination samples taken at 0.1m, 1.0m, 2.0m Bulk Samples taken at 0.5m, 1.0m, 2.0m, 3.0m	LOGGED T Van Deelen	DATE EXCAVATED 2-07-2014
	CHECKED BY:	EXCAVATOR
Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	CLIENT Watercare Services Limited	JOB No. 1-C0935.46
		<b>HA266</b>



	<b>LOG OF AUGER HOLE</b>			HOLE No. <b>HA267</b>
	PROJECT <b>NH2</b>	CO-ORD. <b>1752199 E 5933032 N</b>	R.L. <b>15.50 m</b>	SHEET <b>1 of 1</b>
	LOCATION <b>See site plan, Bush Road, Albany</b>	REF. GRID	DATUM <b>MSL</b>	TOTAL DEPTH <b>4 m</b>

GEOLOGY/UNIT	DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION	SOIL TESTS			SAMPLES	
						SCALA PENETROMETER Blows per 100 mm	SHEAR STRENGTH kPa	OTHER TESTS		
Alluvium	Slightly organic clayey SILT; brownish grey, soft, saturated, slightly plastic, sensitive. Water table at 0.1m (perched).								Contamination sample at 0.1m	Bulk sample at 0.5m
	CLAY; with some silt, grey, soft, saturated, plastic, slightly sensitive.		1				20/9		Contamination sample at 1.0m	Bulk sample at 1.5m
			14				46/12			
	Silty CLAY; with traces of fine sand, grey streaked yellow, stiff, saturated, plastic, slightly sensitive.		2				52/17		Contamination sample at 2.0m	Bulk sample at 2.5m
WG	Silty fine SAND; with minor clay, grey, very stiff, saturated, slightly plastic.		12				64/22		Contamination sample at 2.0m	Bulk sample at 2.5m
	SILT with trace fine sand, grey, saturated, hard, brittle.		3				55/28			Bulk sample at 3.0m
	End of Hand Auger at 4.0m. Too hard to auger. No scala-penetrometer test undertaken (hole collapse).		4				99/55			
							171/70			
							UTP			

**SKETCH OF EXPOSURE**



<b>NOTES</b> Shear vane 1558 Correction factor = 1.449 Contamination samples taken at 0.1m, 1.0m, 2.0m Bulk samples taken at 0.5m, 1.5m, 2.5m, 3.0m W.G = Waitemata Group  Guideline for the field classification of soil and rock for engineering purposes: NZ Geotechnical Society (2005) Determination of penetration resistance of a soil, NZS 4402 : 1988, Test 6.5.2 Shear strength using a hand held shear vane: NZ Geotechnical Society (8/2001)	LOGGED T Van Deelen	DATE EXCAVATED 2-07-2014
	CHECKED BY:	EXCAVATOR
	CLIENT Watercare Services Limited	JOB No. 1-C0935.46

# ANALYSIS REPORT

Page 1 of 1

<b>Client:</b>	OPUS International Consultants	<b>Lab No:</b>	1297182	SDSPV1
<b>Contact:</b>	Tom Van Deelen C/- OPUS International Consultants PO Box 5848 AUCKLAND 1141	<b>Date Registered:</b>	10-Jul-2014	
		<b>Date Reported:</b>	24-Jul-2014	
		<b>Quote No:</b>	62337	
		<b>Order No:</b>		
		<b>Client Reference:</b>	1-C0935.46 NH2	
		<b>Submitted By:</b>	Tom Van Deelen	

## Analysis Results

Sample Name:	Lab Number	Water Soluble Sulphate g/100g dry wt
BH253; 3.0m 09-Jul-2014	1297182.1	< 0.10
BH263; 2.0m 09-Jul-2014	1297182.2	< 0.10
BH264; 4.0m 09-Jul-2014	1297182.3	< 0.10
HA254; 2.0m 09-Jul-2014	1297182.4	< 0.10
BH202; 1.5m 09-Jul-2014	1297182.5	< 0.10
BH202; 4.0m 09-Jul-2014	1297182.6	< 0.10
BH201; 1.5m 09-Jul-2014	1297182.7	< 0.10
HA218; 3.0m 09-Jul-2014	1297182.8	< 0.10
HA255; 1.0m 09-Jul-2014	1297182.9	< 0.10
BH265; 1.5m 09-Jul-2014	1297182.10	< 0.10
BH257; 3.0m 09-Jul-2014	1297182.11	< 0.10
BH268; 1.5m 09-Jul-2014	1297182.12	< 0.10
BH261; 1.5m 09-Jul-2014	1297182.13	< 0.10

## SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-13
Water Soluble Sulphate	Gravimetric after water extn of sub-425um sample, 2:1, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/100g dry wt	1-13

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Graham Corban MSc Tech (Hons)  
Client Services Manager - Environmental Division



## **Appendix C. Borehole Logs and Soil Contamination Assessment (T&T, 2015)**

# REPORT

---

Watercare Services Limited

Northern Interceptor - Phase 1  
Ground contamination assessment

Prepared for:

Watercare Services Limited

Prepared by:

Tonkin & Taylor Ltd

Distribution:

Watercare Services Limited

1 copies

Tonkin & Taylor Ltd (FILE)

1 copy

March 2015

Job No: 28773.34.v1





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WORKING DRAFT

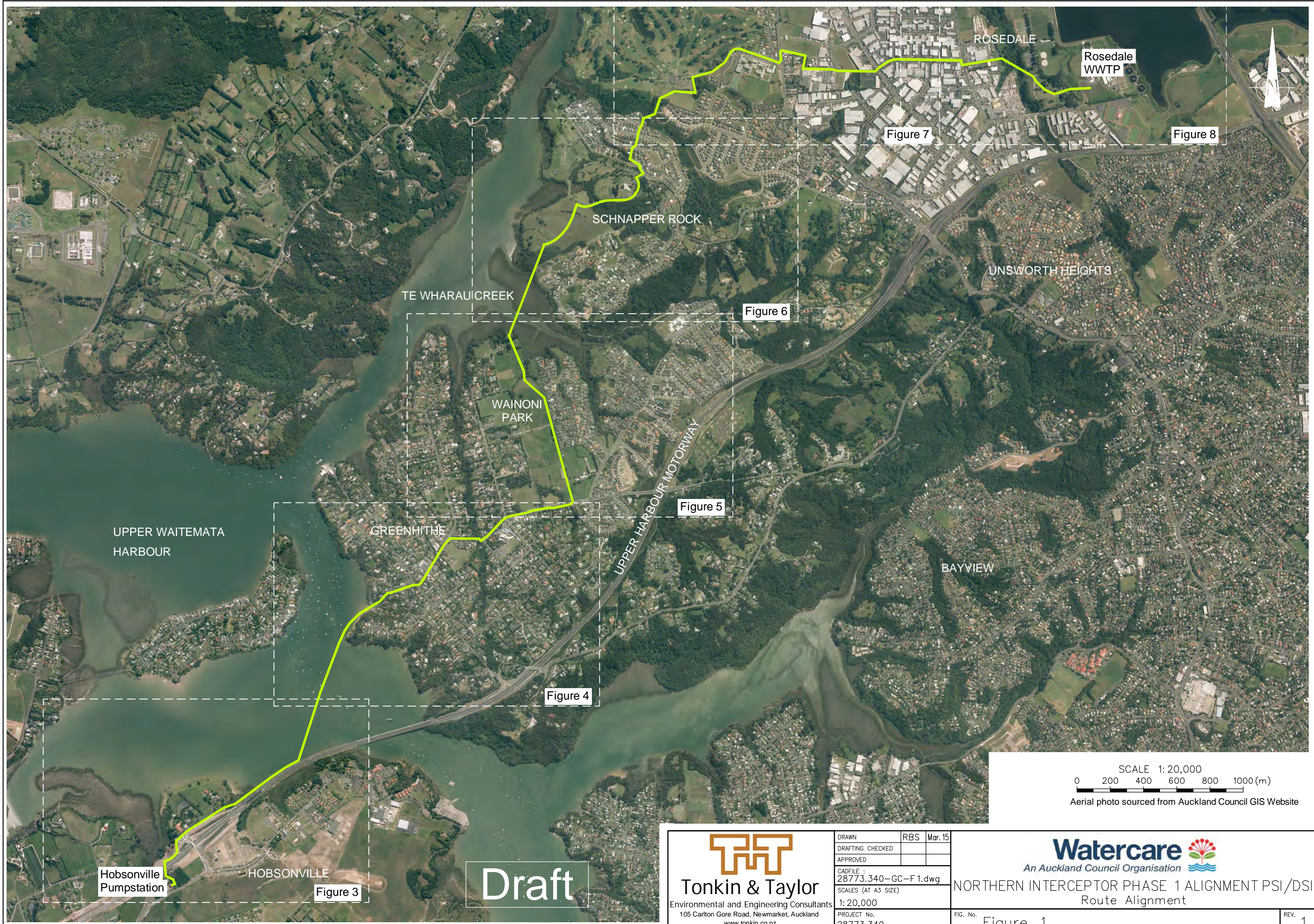


## Table of terms and abbreviations

Abbreviation	Definition
AC	Auckland Council
ACM	Asbestos containing material
AEE	Assessment of Effects on the Environment
ALW Plan	Auckland Council Regional Plan: Air, Land and Water
B(a)P eq.	Benzo(a)pyrene equivalent
DSI	Detailed Site Investigation
ECBF	East Coast Bays Formation
GIS	Geographic Information System
HAIL	Hazardous Activities and Industries List
HDD	Horizontal directional drilling
HDPE	High Density Polyethylene
MfE	Ministry for the Environment
NES Soil	National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health
OCP	Organochlorine pesticides
ONOP	Organonitrogen and organophosphorus pesticides
PA	Permitted activity
PAH	Polycyclic Aromatic Hydrocarbon
PAUP	Proposed Auckland Unitary Plan
PE	Polyethelene
Phase 1	To be completed in 2020, Phase 1 transfers the existing Hobsonville Pump Station flows to Rosedale WWTP through a 600mm ID rising main crossing the Upper Harbour, and through Greenhithe, The North Shore Memorial Park, the North Shore Golf Club and Rosedale Industrial areas. The majority of the construction will be open trench.
PSI	Preliminary Site Investigation
RMA	Resource Management Act 1991
SMP	Site Management Plan / Remedial Action Plan
TPH	Total Petroleum Hydrocarbon
T&T	Tonkin & Taylor Ltd
WWTP	Wastewater Treatment Plant
UCL	Upper confidence limit



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Hobsonville Pumpstation

HOBSONVILLE

Figure 3

Draft

Figure 4

GREENHITHE

Figure 5

UPPER HARBOUR MOTORWAY

WAINONI PARK

Figure 6

SCHNAPPER ROCK

Figure 7

ROSEDALE

Rosedale WWTP

Figure 8

UNSWORTH HEIGHTS

BAYVIEW

UPPER WAITEMATA HARBOUR

SCALE 1: 20,000  
0 200 400 600 800 1000 (m)

Aerial photo sourced from Auckland Council GIS Website



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Environmental and Engineering Consultants  
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NORTHERN INTERCEPTOR PHASE 1 ALIGNMENT PSI/DSI  
Route Alignment

FIG. No. Figure 1

REV. 1



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SCALE 1: 5000  
0 50 100 150 200 250 (m)

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Property boundaries sourced from Land Information New Zealand data as at 10-Nov-2014 (Crown Copyright Reserved).

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**NORTHERN INTERCEPTOR PHASE 1 ALIGNMENT PSI/DSI  
Potential HAIL Activities – Hobsonville**





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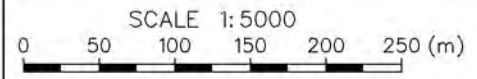
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**LEGEND**

-  BH-1 Borehole location (T&T, Dec. 2014)
-  HA-1 Handauger location (T&T, Dec. 2014)
-  Minor surface contamination Refer Section 7.3 of PSI/DSI Report.
-  A10 MFE HAIL ID reference.



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**NORTHERN INTERCEPTOR PHASE 1 ALIGNMENT PSI/DSI**  
 Potential HAIL Activities – Rosedale

FIG. No. **Figure 7** REV. **1**

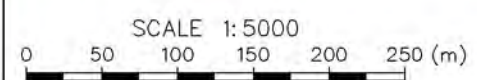
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**LEGEND**

- BH-1 Borehole location (T&T, Dec. 2014)
- HA-1 Handauger location (T&T, Dec. 2014)
- Minor surface contamination Refer Section 7.3 of PSI/DSI Report.
- MfE HAIL ID reference



Aerial photo sourced from Auckland Council GIS Website  
 Property boundaries sourced from Land Information New Zealand data as at 10-Nov-2014 (Crown Copyright Reserved).

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PROJECT No.	28773.340	

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**NORTHERN INTERCEPTOR PHASE 1 ALIGNMENT PSI/DSI  
 Potential HAIL Activities – Rosedale**

FIG. No. Figure 8

REV. 1

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Table B1 – Final schedule of ground investigations

Borehole Reference	Type	Final Borehole Depth (m bgl)	Final Installations
BH-T1	HQ Coring	16.8m	2 x Piezometers
BH-T2	HQ Coring	12m	2 x Piezometers 1 x Level logger
BH-T3	HQ Coring	7.7m	2 x Piezometers
<del>BH-T4</del>	<del>Deleted</del>	-	<del>Deleted</del>
BH-T5	HQ Coring	15.45m	2 x Piezometers
BH-T6	HQ Coring	15.45m	2 x Piezometers
<del>BH-T7</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>BH-T8</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>BH-T9</del>	<del>Deleted</del>	-	<del>Deleted</del>
BH-T10	HQ Coring	10.5m	2 x Piezometers
<del>BH-T11</del>	<del>Deleted</del>	-	<del>Replaced with CPT-t10 and HA-t28</del>
BH-T12	HQ Coring	15.45m	2 x Piezometers, 1 x level logger, 1x baro
BH-T13	HQ Coring	15m	2 x Piezometers
BH-T14	HQ Coring	15m	2 x Piezometers
BH-T15	HQ Coring	21m	2 x Piezometers, 2 x level loggers
BH-T16	HQ Coring	16.82	2 x Piezometers, 2 x level loggers
BH-T17	HQ Coring	7.5m	2 x Piezometers
CP-T1	CPTu	19.95m	Nil
<del>CP-T2</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>CP-T3</del>	<del>Deleted</del>	-	<del>Deleted</del>
CP-T4	CPTu	12.97m	Nil
CP-T5	CPTu	7.08m	Nil
CP-T6	CPTu	11.82m	Nil
CP-T7	CPTu	14.22m	Nil
CP-T8	CPTu	12.08m	Nil
CP-T9	CPTu	9.9m	Nil
CP-T10	CPTu	9.94m	Nil
HA-T1	Hand Auger	6.1m	Nil
HA-T2	Hand Auger	6.2m	Nil
HA-T3	Hand Auger	6.0m	Nil
<del>HA-T4</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>HA-T5</del>	<del>Deleted</del>	-	<del>Deleted</del>



HA-T6	Hand Auger	6.2m	Nil
HA-T7	Hand Auger	6.0m	Nil
HA-T8	Hand Auger	6.1m	Nil
<del>HA-T9</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>HA-T10</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>HA-T11</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>HA-T12</del>	<del>Deleted</del>	-	<del>Deleted</del>
<del>HA-T13</del>	<del>Deleted</del>	-	<del>Deleted</del>
HA-T14	Hand Auger	6.1m	Nil
HA-T15	Hand Auger	6.15m	Nil
HA-T16	Hand Auger	6.1m	Nil
HA-T17	Hand Auger	6.1m	Nil
HA-T18	Hand Auger	6.05m	Nil
HA-T19	Hand Auger	6.4m	Nil
HA-T20	Hand Auger	6.5m	Nil
HA-T21	Hand Auger	6.4m	Nil
HA-T22	Hand Auger	6.4m	Nil
HA-T23	Hand Auger	6.4m	Nil
HA-T24	Hand Auger	6.0m	Nil
HA-T25	Hand Auger	6.5m	Nil
HA-T26	Hand Auger	5.2m	Nil
HA-T27	Hand Auger	6.2m	Nil
HA-T28	Hand Auger	6.1m	1 x Piezometer



# TONKIN & TAYLOR LTD

## BORE HOLE LOG

BOREHOLE No:  
**BH-t1**

SHEET 1 OF 4

DRILLED BY: McMillan Drilling

LOGGED BY: JWY

CHECKED: *[Signature]*

START DATE: 11/12/14

FINISH DATE: 12/12/14

CONTRACTOR: McMillan Drilling

PROJECT: NI Terrestrial

JOB No: 28773.210

LOCATION: Hobsonville Pump Station

CO-ORDINATES: 5926829.8 mN  
1747471.6 mE

DIRECTION: 0.00°

ANGLE FROM HORIZ.: -90.00°

R.L. GROUND: 7.00m

R.L. COLLAR: 7.00m

DATUM: AUCK1946

SURVEY:

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS									
										Defect Log	Fracture Spacing (cm)	RQD %	Description	Water Loss (%)	Water Level	Casing	Installation	Core Box	
FILL	0m: TOPSOIL																		
	0.1m: Construction Debris: Concrete, cobble sized blocks with steel wire.																		
TAURANGA GROUP	Sandy SILT; light grey. Stiff, wet, low plasticity.					93/6 kPa	6.5	0.5											
	- becomes very stiff.					109/12 kPa in situ	6.0	1.0											
	Clayey SILT, minor medium sand; light brown. Stiff, wet, low plasticity.					194/54 kPa in situ	5.5	1.5											
	- becomes firm.					54/34 kPa in situ	5.0	2.0											
	3-4.3m: CORE LOSS. Very soft zone, very poor recovery. Colour on drill rods is dark - suggests peat.					38/30 kPa in situ	4.5	2.5											
	SILT, with some organics, minor gravels; brown, mottled light greyish brown. Soft, wet, low plasticity.					47/28 kPa in situ	4.0	3.0											
							3.5	3.5											
							3.0	4.0											
							2.5	4.5											

12/12/2014

T-T DATA TEMPLATE.GDT prmm

COMMENTS:





# TONKIN & TAYLOR LTD

## BORE HOLE LOG

BOREHOLE No:  
**BH-t1**

SHEET 2 OF 4

DRILLED BY: McMillan Drilling  
LOGGED BY: JWY

CHECKED: *[Signature]*

START DATE: 11/12/14

FINISH DATE: 12/12/14

CONTRACTOR: McMillan Drilling

PROJECT: NI Terrestrial

JOB No: 28773.210

LOCATION: Hobsonville Pump Station

CO-ORDINATES: 5926829.8 mN  
1747471.6 mE

DIRECTION: 0.00°

ANGLE FROM HORIZ.: -90.00°

R.L. GROUND: 7.00m

R.L. COLLAR: 7.00m

DATUM: AUCK1946

SURVEY:

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering		Rock Strength		Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Water Loss (%)	Water Level	Casing	Installation	Core Box
		UW	HW	US	SS						Defect Log	Fracture Spacing (cm)	RQD %					
TAURANGA GROUP	Clayey SILT, trace organics; light brownish grey. Firm, wet, moderate plasticity.					SPT	00 00 12 N=3		0.0									
	- becomes minor organics, organic bands every 50mm, 5mm thick.					HQ3		1.5										
						SPT	00 00 00 N=0		39/9 kPa in barrel	6.0								
	Silty CLAY, minor organics; light brownish grey. Firm, wet, moderate to high plasticity.					HQ3		0.5										
						PUSH TUBE		31/8 kPa in barrel	7.0									
	PEAT, some clayey silt, wood (decomposed); brownish black. Firm, wet.					SPT	00 00 12 N=3		-0.5									
	Silty CLAY, minor fine sand, trace organics; light greyish brown. Stiff, wet, low plasticity.					HQ3		-1.5										
Silty CLAY, trace fine sand and organics; light greyish brown. Stiff, wet, low to moderate plasticity.					SPT	00 00 12 N=3		90/12 kPa in barrel	-2.0									
Clayey SILT, trace fine sand and organics; greenish grey. Stiff, wet, low plasticity.					HQ3		-2.5											
Fine SAND, minor silt, trace organics; dark brown. Loose, wet.					HQ3		-9.5											
								10.0										

COMMENTS:

T-T DATATEMPLATE.GDT pmm

Log Scale 1:25

GENERAL LOG 28773.210.GPJ 4-Feb-2015

Box 1

Box 2



# TONKIN & TAYLOR LTD

## BORE HOLE LOG

BOREHOLE No:  
**BH-t1**

SHEET 3 OF 4

DRILLED BY: McMillan Drilling  
LOGGED BY: JWY

CHECKED: *[Signature]*  
START DATE: 11/12/14

FINISH DATE: 12/12/14  
CONTRACTOR: McMillan Drilling

PROJECT: NI Terrestrial  
JOB No: 28773.210  
LOCATION: Hobsonville Pump Station

CO-ORDINATES: 5926829.8 mN  
1747471.6 mE  
R.L. GROUND: 7.00m  
R.L. COLLAR: 7.00m  
DIRECTION: 0.00°  
ANGLE FROM HORIZ.: -90.00°  
DATUM: AUCK1946  
SURVEY:

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS				Water Loss (%)	Water Level	Casing	Installation	Core Box
									Defect Log	Fracture Spacing (cm)	RQD %	Description					
TAURANGA GROUP	- grades siltier.			HQ3	100												
	- grades sandier, becomes trace silt.			SPT	100	22/ 34 45 N=16											
	11-11.15m: CORE LOSS																
	Silty, fine SAND, trace medium sand and organics; dark greyish brown. Medium dense, wet.			HQ3	90												
EAST COAST BAYS FORMATION	Silty, fine SAND, some organics and decomposed wood; greyish brown. Medium dense, wet.																
	Sandy SILT, minor clay and organics; greyish brown. Stiff, wet, low plasticity.																
	Highly weathered, greenish grey SANDSTONE, interbeds of siltstone. Extremely weak			SPT	100	37/ 813 1316 N=50											
	12.5-12.7m: CORE LOSS																
	Highly weathered, grey SILTSTONE. Extremely weak, uncemented.			HQ3	80												
	Highly weathered, dark grey SILTSTONE, minor carbonaceous lenses. Extremely weak																
	Highly weathered, dark grey SANDSTONE. Extremely weak			SPT	100	47/ 811 1388 N=50											
	Highly weathered, dark grey, medium to fine grained SANDSTONE, small interbeds of siltstone. Extremely weak																
	Moderately weathered, grey, fine SANDSTONE. Very weak, minor carbonaceous material.			HQ3	100												

Bedding 20°, PL, SM, T, CN.

COMMENTS:

T-T DATATEMPLATE.GDT 00mm





# TONKIN & TAYLOR LTD

## BORE HOLE LOG

BOREHOLE No:

**BH-t1**

SHEET 4 OF 4

DRILLED BY: McMillan Drilling

LOGGED BY: JWY

CHECKED: *[Signature]*

START DATE: 11/12/14

FINISH DATE: 12/12/14

CONTRACTOR: McMillan Drilling

PROJECT: NI Terrestrial

JOB No: 28773.210

LOCATION: Hobsonville Pump Station

CO-ORDINATES: 5926829.8 mN  
1747471.6 mE

R.L. GROUND: 7.00m

R.L. COLLAR: 7.00m

DATUM: AUCK1946

SURVEY:

DIRECTION: 0.00°

ANGLE FROM HORIZ.: -90.00°

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS				Water Loss (%)	Water Level	Casing	Installation	Core Box
										Defect Log	Fracture Spacing (cm)	RQD %	Description					
EAST COAST BAYS FORMATION	Moderately weathered, dark grey SANDSTONE, interbeds of siltstone. Very weak	UW	VS	SPT	100	4 9/ 11 15 23 26 N>50	-8.5	-8.5	XXXX									
	Moderately weathered, dark grey SANDSTONE. Very weak	UW	VS				-9.5	-9.5	XXXX									
	Moderately weathered, dark grey SILTSTONE. Very weak	UW	VS	HQ3	100		-10.0	-10.0	XXXX		100							
	- becomes extremely weak. Moderately weathered, dark grey SILTSTONE, interbedded with medium to fine SANDSTONE. Very weak	UW	VS	SPT		40 45 53 for 10mm N>50		-16.5	-16.5	XXXX								
	END OF BOREHOLE AT 16.8m. TARGET DEPTH REACHED. Standpipe piezometers installed in hole, screened from 3m to 6m and 9m to 12m below ground level.						-17.0	-17.0										

COMMENTS:

# BH t1 - Northern Interceptor Phase 1



BH01-3.0-8.45m.jpg



BH01-8.45-10.95m.jpg



# BH t1 - Northern Interceptor Phase 1



BH01-10.95-14.30m.jpg



BH01-14.3-16.8m-E.O.H.jpg