

## Appendix B – Groundwater monitoring bore network

- Bore construction summaries
- Lithological borehole logs
- Bore construction licences

**NOTE: THIS DATA IS PROVIDED ELECTRONICALLY ONLY**

# Engineering Log - Borehole

client: **Metro Trains Melbourne**

principal: **Level Crossing Removal Authority**

project: **LCRP-CTF**

location: **ID47 - Station Street & Eel Race Road, Carrum**

Borehole ID. **ID47-BH18**

sheet: 1 of 6

project no. **GEOTABTF10294AA**

date started: **29 Sep 2016**

date completed: **04 Oct 2016**

logged by: **RL**

checked by: **KJ**

position: E: 335,261.22; N: 5,784,524.22 (MGA94)


surface elevation: 6.10 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted

drilling fluid: Polymer

hole diameter: 100 mm

drilling information						material substance									
method & support	1 penetration	2 penetration	3 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
AD NDD N AD W C	1 2 3			04/10/16 07:00 04/10/16 17:00	E	6	1.0 2.0 3.0 4.0 5.0 6.0 7.0		SP	FILL: ASPHALT: 100mm. FILL: Sandy GRAVEL: fine to coarse grained, angular, brown, with some angular cobbles. SAND: fine to medium grained, dark grey, black.	D	D	100 200 300 400	FILL PID: 0.1 ppm	
					E						MD		QUATERNARY SANDS PID: 0.8 ppm		
					E								PID: 2.9 ppm		
					SPT 1, 2, 3 N*=5						M				
					SPT 1, 4, 4 N*=8										
					SPT 3, 9, 9 N*=18						D				
											VD				
					SPT 20, 27, 27 N*=54										
SPT 15, 30 HB N*=R															
<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit						<b>support</b> M mud C casing N nil  <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow			<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing			<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit		<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	

# Engineering Log - Borehole

client: **Metro Trains Melbourne**

principal: **Level Crossing Removal Authority**

project: **LCRP-CTF**

location: **ID47 - Station Street & Eel Race Road, Carrum**

Borehole ID. **ID47-BH18**

sheet: 2 of 6

project no. **GEOTABTF10294AA**

date started: **29 Sep 2016**

date completed: **04 Oct 2016**

logged by: **RL**

checked by: **KJ**

position: E: 335,261.22; N: 5,784,524.22 (MGA94)



surface elevation: 6.10 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted

drilling fluid: Polymer

hole diameter: 100 mm

drilling information						material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations		
W  C	1			-2			SP	<b>SAND:</b> fine to medium grained, dark grey, black. <i>(continued)</i>	W	VD		<b>QUATERNARY SANDS</b>		
	2													
	3													
				SPT 10, 37 HB N*=R	-3		9.0			D				
				SPT 6, 8, 9 N*=17	-4		10.0			MD				
					-5		11.0							
				SPT 1, 2, 3 N*=5	-6		12.0		CI	<b>Sandy CLAY:</b> medium plasticity, grey, dark grey, fine to medium grained sand.	M		F	
			U63	-7	13.0		SP	<b>SAND:</b> fine to coarse grained, grey, with some medium plasticity clay pockets.	W	VD				
				-8	14.0									
			SPT 15, 20/100mm HB N*=R	-9	15.0									

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne**

principal: **Level Crossing Removal Authority**

project: **LCRP-CTF**

location: **ID47 - Station Street & Eel Race Road, Carrum**

Borehole ID: **ID47-BH18**

sheet: 3 of 6

project no: **GEOTABTF10294AA**

date started: **29 Sep 2016**

date completed: **04 Oct 2016**

logged by: **RL**

checked by: **KJ**

position: E: 335,261.22; N: 5,784,524.22 (MGA94)

surface elevation: 6.10 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted

drilling fluid: Polymer

hole diameter: 100 mm

drilling information					material substance							
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1 2 3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			100 200 300 400	
				-10			SC	CLAYEY SAND: fine to coarse grained, green grey, high plasticity clay.	M	VD		TERTIARY BRIGHTON GROUP
			SPT 10, 20, 31 N*=51		17.0							
				-11								
				-12			CI-CH	CLAY: medium to high plasticity, pale grey, green-grey, grey-brown.		St		
			SPT 6, 6, 10 N*=16		18.0			becoming pale brown				
				-13								
			SPT 20, 30/100mm HB N*=R		20.0		SP	SAND: fine to coarse grained, pale brown.	W	VD		
				-14								
				-15			CH	CLAY: high plasticity, grey.		St - VSt		
			SPT 0, 5, 7 N*=12		21.0							
				-16								
			U63		22.0							
				-17							X	HP 300 kPa
					23.0							
							SP	SAND: fine to coarse grained, pale grey.		D		

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne**

principal: **Level Crossing Removal Authority**

project: **LCRP-CTF**

location: **ID47 - Station Street & Eel Race Road, Carrum**

Borehole ID. **ID47-BH18**

sheet: 4 of 6

project no. **GEOTABTF10294AA**

date started: **29 Sep 2016**

date completed: **04 Oct 2016**

logged by: **RL**

checked by: **KJ**

position: E: 335,261.22; N: 5,784,524.22 (MGA94)

surface elevation: 6.10 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted

drilling fluid: Polymer

hole diameter: 100 mm

drilling information				material substance										
method & support	1 penetration	2 penetration	3 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W C					SPT 10, 17, 21 N*=38	-18			SP	SAND: fine to coarse grained, pale grey. (continued)	W	D		TERTIARY BRIGHTON GROUP
							25.0		SC	CLAYEY SAND: fine grained, pale brown, pale grey, medium plasticity.	M			
					SPT 11, 16, 24 N*=40	-19								
							26.0							
									ML	Clayey SILT: low to medium liquid limit, brown mottled pale grey, trace of fine to medium grained gravel.		VSt		
					SPT 8, 19, 29 N*=48	-21								
							28.0							
					SPT 9, 11, 14 N*=25	-23						H		
										becoming pale brown, with some fine grained sand				
					SPT 5, 32/145mm HB N*=R	-24								

# Engineering Log - Borehole

client: **Metro Trains Melbourne**

principal: **Level Crossing Removal Authority**

project: **LCRP-CTF**

location: **ID47 - Station Street & Eel Race Road, Carrum**

Borehole ID. **ID47-BH18**

sheet: 5 of 6

project no. **GEOTABTF10294AA**

date started: **29 Sep 2016**

date completed: **04 Oct 2016**

logged by: **RL**

checked by: **KJ**

position: E: 335,261.22; N: 5,784,524.22 (MGA94)



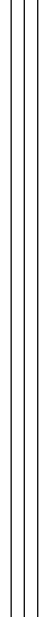

surface elevation: 6.10 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 450P, Track mounted

drilling fluid: Polymer

hole diameter: 100 mm

drilling information					material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1	2	3											
W  C						-26			SC	CLAYEY SAND: fine to coarse grained, pale brown, medium plasticity. (continued)	M	VD		TERTIARY BRIGHTON GROUP
					SPT 14, 7, 6 N*=13	-27	33.0		GP	GRAVEL: Ironstone, red brown, high strength.		D		
									ML	SILT: low liquid limit, pale brown, trace of clay.	W	H		
						-28	34.0							
					SPT 10, 25/100mm HB N*=R	-29	35.0							
						-30	36.0							
					SPT 10, 26, 17 N*=43									
						-31	37.0							
									CI-CH	Silty CLAY: medium to high plasticity, pale grey mottled brown, with some fine to coarse grained sand.		St - VSt		
					SPT 5, 2, 1 N*=3	-32	38.0							
				U63									HP 200 kPa	
						-33	39.0							
				U63									HP 200 kPa	

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing N nil  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne**

principal: **Level Crossing Removal Authority**project: **LCRP-CTF**

location: **ID47 - Station Street & Eel Race Road, Carrum**

Borehole ID. **ID47-BH18**

sheet: 6 of 6

project no. **GEOTABTF10294AA**

date started: **29 Sep 2016**

date completed: **04 Oct 2016**

logged by: **RL**

checked by: **KJ**

position: E: 335,261.22; N: 5,784,524.22 (MGA94 )

surface elevation: 6.10 m (AHD)

angle from horizontal:  $90^\circ$

drill model: Comacchio 450P, Track mounted

drilling fluid: Polymer

hole diameter : 100 mm

drilling information						material substance						
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
				-34			CI-CH	Silty CLAY: medium to high plasticity, pale grey mottled brown, with some fine to coarse grained sand. (continued)	W	St - VSst		TERTIARY BRIGHTON GROUP
					41.0		ML	Clayey SILT: low liquid limit, grey, grey-brown.	M	VSt		GELLIBRAND MARL
			SPT 5, 7, 16 N*=23	-35								
					42.0					H		
			SPT 7, 17, 26 N*=43	-36								
					43.0							
			SPT 7, 14, 29 N*=43	-38					W			
					45.0							
			SPT 10, 15 HB N*=R	-39								
					46.0			Borehole ID47-BH18 terminated at 45.80 m Target depth				
					47.0							
					-41							

**method**

- AD auger drilling\*
- AS auger screwing\*
- HA hand auger
- W washbore
- HA hand auger
- NDD non destructive drilling

\* bit shown by suffix  
e.g.  
B blank bit  
T TC bit  
V hit

**support**

- M mud N nil
- C casing

**penetration**

**water**

- 10-Oct-12 water level on date shown
- water inflow
- water outflow

**samples & field tests**

- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N\* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remoulded (kPa)
- R refusal
- HB hammer bouncing

**classification symbol & soil description**  
based on Unified Classification System

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**moisture**

- D dry
- M moist
- W wet
- Wp plastic limit
- WI liquid limit

**consistency / relative density**

- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

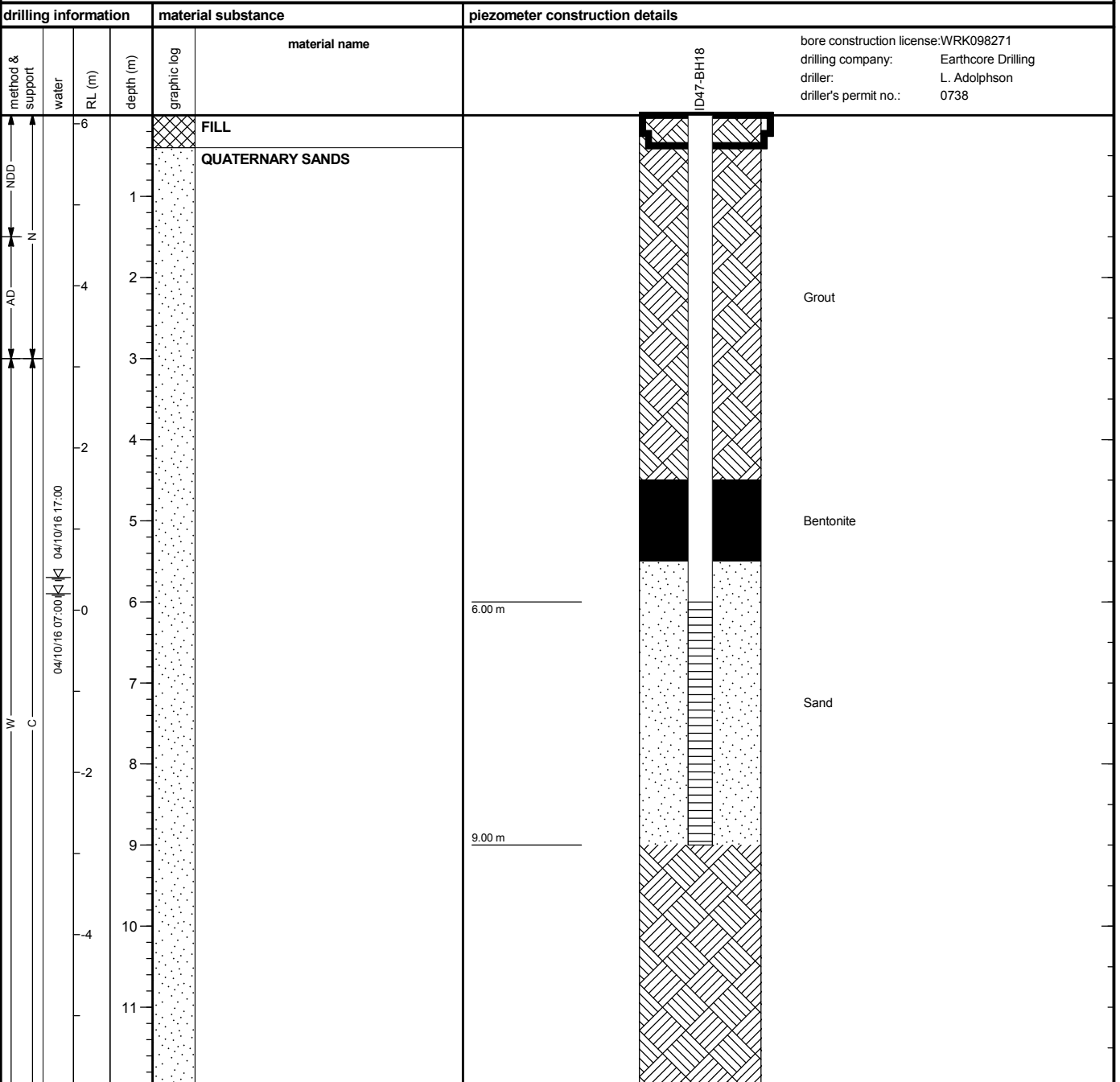


# Piezometer Installation Log

client: **Metro Trains Melbourne**  
principal: **Level Crossing Removal Authority**  
project: **LCRP-CTF**  
location: **ID47 - Station Street & Eel Race Road, Carrum**

Hole ID. **ID47-BH18**  
sheet: 1 of 1  
project no. **GEOTABTF10294AA**  
date started: **29 Sep 2016**  
date completed: **04 Oct 2016**  
logged by: **RL**  
checked by: **KJ**

position: E: 335,261.22; N: 5,784,524.22 (MGA94 ) surface elevation: 6.10 m (AHD) angle from horizontal: 90°  
equipment type: Comacchio 450P, Track mounted drilling fluid: Polymer hole diameter: 100 mm



method & support	graphic log / core recovery	ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD)		
see engineering log for details <b>water</b> 10-Oct-12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	core recovered (graphic symbols indicate material) no core recovered	ID47-BH18	standpipe piezo.	04/10/2016	0.00 m	9.00 m	6.10	-2.90		



# COPY OF RECORD IN THE VICTORIAN WATER REGISTER

## LICENCE TO CONSTRUCT WORKS

*under Section 67 of the Water Act 1989*

*The information in this copy of record is as recorded at the time of printing. Current information should be obtained by a search of the register. The State of Victoria does not warrant the accuracy or completeness of this information and accepts no responsibility for any subsequent release, publication or reproduction of this information.*

*This licence does not remove the need to apply for any authorisation or permission necessary under any other Act of Parliament with respect to anything authorised by the works licence.*

*Water used under this licence is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.*

*This licence is not to be interpreted as an endorsement of the design and/or construction of any works (including dams). The Authority does not accept any responsibility or liability for any suits or actions arising from injury, loss, damage or death to person or property which may arise from the maintenance, existence or use of the works.*

*Each person named as a licence holder is responsible for ensuring all the conditions of this licence are complied with.*

This licence authorises its holders to construct the described works, subject to the conditions.

### Licence Holder(s)

METRO TRAINS MELBOURNE PTY LTD C/- COFFEY of LEVEL 1, 436 JOHNSTON STREET  
ABBOTSFORD VIC 3067

### Licence Contact Details

METRO TRAINS MELBOURNE LEVEL 1, 436 JOHNSTON STREET  
PTY LTD C/- COFFEY ABBOTSFORD VIC 3067

### Licence Details

Expiry date	11 Jan 2018
Status	Active
Authority	Southern Rural Water
Name of waterway or aquifer	NA for construct/decommission
Water system	Frankston (GMU)

### Summary of Licensed Works

The details in this section are a summary only. They are subject to the conditions specified in this licence.

<i>Works ID</i>	<i>Works type</i>	<i>Use of water</i>
WRK095832	Bore	Observation
WRK095833	Bore	Observation
WRK095834	Bore	Observation
WRK095835	Bore	Observation
WRK095836	Bore	Observation
WRK098270	Bore	Observation
WRK098271	Bore	Observation

## Description of Licensed Works

---

### WORKS ID WRK095832

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
335520.312	5783379.030	Zone 55

### Land description

Volume 7410 Folio 898  
Lot 1 of Plan TP533906N

## Description of Licensed Works

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### WORKS ID WRK095833

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
335583.829	5783169.366	Zone 55

### Land description

### Property address

69C YOUNG STREET FRANKSTON 3199

## Description of Licensed Works

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### WORKS ID WRK095834

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
335656.612	5782993.907	Zone 55

### Land description

**Property address**

69C YOUNG STREET FRANKSTON 3199

**Description of Licensed Works**

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**WORKS ID** WRK095835

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

**Works location**

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
335408.316	5783796.679	Zone 55

**Land description****Property address**

1/ STATION STREET CARRUM 3197

**Description of Licensed Works**

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**WORKS ID** WRK095836

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

**Works location**

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
335270.964	5784416.814	Zone 55

**Land description****Property address**

1/ STATION STREET CARRUM 3197

**Description of Licensed Works**

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**WORKS ID** WRK098270

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

**Works location**

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
335455.613	5783550.662	Zone 55

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## Land description

### Property address

1/ STATION STREET CARRUM 3197

## Description of Licensed Works

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### WORKS ID WRK098271

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
335257.861	5784514.546	Zone 55

### Other land description

95 C3

### Property address

Location(s) in or near BONBEACH, Parish: Lyndhurst

## Related Instruments

**Related entitlements** Nil

**Related water-use entities** Nil

## Application History

<i>Reference</i>	<i>Type</i>	<i>Status</i>	<i>Lodged date</i>	<i>Approved date</i>	<i>Recorded date</i>
WLV703729	Modify	Approved	11 Jan 2017	11 Jan 2017	
WLI604791	Issue	Approved	01 Sep 2016	01 Sep 2016	

## Conditions

Licence WLE066488 is subject to the following conditions:

### Siting and construction

- 1 The bore(s) must be drilled at the location specified in the application approved by the Authority.
- 2 If after drilling the bore is considered unsatisfactory a replacement bore may be drilled on the land specified in the licence.

### Preventing pollution

- 3 All earthworks must be carried out, and all drilling fluids and waters produced during construction and development must be disposed of, in ways that avoid contaminating native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.
- 4 Construction must stop immediately if the Authority reasonably believes that fuel, lubricant, drilling fluid, soil or water produced during construction and development is at risk of being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.
- 5 The licence holder must construct and maintain bund walls, in accordance with the timeframe, specifications, guidelines or standards prescribed by the Authority, to prevent fuel, lubricant, drilling fluid, soil or water produced during construction and development from being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.

### Construction standards

- 6 The bore(s) must be constructed, and where relevant decommissioned, in accordance with the Minimum Construction Requirements for Water Bores in Australia, Edition 3 or its successor.

### Drilling licence and supervision requirements

- 7 The bore(s) must be constructed by, or under the direct supervision of, a driller licensed under the Water Act 1989 and endorsed as a [DrillerClass] driller, with appropriate endorsements.
- 8 If artesian pressure is expected or encountered, then a driller licensed under the Water Act 1989, and endorsed as a class 3 driller, must install casing in the bore(s) to a suitable depth, and in a suitable manner, to prevent its outbreak. A suitable valve must also be fitted to the bore.

### Bore completion report

- 9 A Bore Completion Report must be submitted to the Authority within 28 working days of the bore(s) being completed.

### Protecting water resources

- 10 No more than [dspNumberOfWorks] bore(s) may be brought to final development under this licence.
- 11 At the completion of drilling and before the drilling rig leaves the site, all but [dspNumberOfWorks] bore(s) must be decommissioned so as to eliminate physical hazards, conserve aquifer yield, prevent groundwater contamination and prevent the intermingling of desirable and undesirable waters.
- 12 The bore(s) must be located at least 30 metres from any authority's channel, reserve or easement unless authorised by the Authority.

### Protecting water quality

- 13 Drilling must not exceed the maximum depth.
- 14 The bore(s) must be constructed so as to prevent aquifer contamination caused by vertical flow outside the casing.
- 15 If two or more aquifers are encountered, the bore(s) must be constructed to ensure that an impervious seal is made and maintained between each aquifer to prevent aquifer connection through vertical flow outside the casing; under no circumstances are two or more aquifers to be

screened within the one bore or in any other manner to allow connection between them.

- 16 Boreheads must be constructed, to ensure that no flood water, surface runoff or potential subsurface contaminated soakage can enter the bore or bore annulus.

**Protecting other water users**

- 17 The diameter of the drill casing must not exceed 130 millimetres.
- 18 The bore(s) must be constructed so that water levels in the bore(s) can be measured by an airline, a piezometer or a method approved in writing by the Authority.

**Fees and charges**

- 19 The licence holder must, when requested by the Authority, pay all fees, costs and other charges under the Water Act 1989 in respect of this licence.

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END OF COPY OF RECORD

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# BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH13

Page 1 of 1

<b>Client</b> LXRA	<b>Drill Co.</b>	<b>Easting, Northing</b> 335864, 5788587
<b>Project</b> LXRA Level Crossing	<b>Driller</b>	<b>Grid Ref</b> GDA94_MGA_zone_55
<b>Project No.</b> 3133036	<b>Rig Type</b>	<b>Elevation</b>
<b>Site</b> LXRA ID18	<b>Drill Method</b>	<b>Collar RL</b> -
<b>Location</b>	<b>Total Depth (m)</b> 5.00	<b>Logged By</b> Alan Wilson
<b>Date Drilled</b> 01/08/2017 - 01/08/2017	<b>Diameter (mm)</b>	<b>Checked By</b>

B.C.L No. N/A		Casing 50 mm PVC (Class 18)		Screen 0.5mm Slotted PVC (Class 18)		Surface Completion Gatic				
Depth (m)	Drilling Method	Sample ID	Water	ID18-BH13 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	HA   <									

## Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard





# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH10

Page 1 of 3

<b>Client</b> LXRA <b>Project</b> LXRA Level Crossing <b>Project No.</b> 3133036 <b>Site</b> LXRA ID18 <b>Location</b> <b>Date Drilled</b> 31/07/2017 - 01/08/2017				<b>Drill Co.</b> <b>Driller</b> <b>Rig Type</b> <b>Drill Method</b> <b>Total Depth (m)</b> 11.90 <b>Diameter (mm)</b>				<b>Easting, Northing</b> 335346, 5788779 <b>Grid Ref</b> GDA94_MGA_zone_55 <b>Elevation</b> <b>Collar RL</b> 0.22 <b>Logged By</b> Alan Wilson <b>Checked By</b>							
<b>B.C.L No.</b> N/A				<b>Casing</b> 50 mm PVC (Class 18)				<b>Screen</b> 0.5mm Slotted PVC (Class 18)				<b>Surface Completion</b> Gatic			
Depth (m)	Drilling Method	Sample ID	Water	ID18-BH10 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)					
0.2	HA					GRAVEL medium, angular, brown, with silt, trace rock fragments (NATURAL - SOIL)	D	D		-0.2					
0.4						GRAVEL medium, angular, brown, with silt, trace rock fragments (NATURAL - SOIL)	W	D		-0.4					
0.6										-0.6					
0.8										-0.8					
1.0						SAND medium, brown, with rock fragments, with silt (NATURAL - SOIL)	W	D		-1.0					
1.2						SAND medium, grey, with rock fragments, with silt (NATURAL - SOIL)	W	S		-1.2					
1.4										-1.4					
1.6	SFA									-1.6					
1.8										-1.8					
2.0										-2.0					
2.2										-2.2					
2.4										-2.4					
2.6										-2.6					
2.8										-2.8					
3.0	PT									-3.0					
3.2										-3.2					
3.4										-3.4					
3.6										-3.6					
3.8										-3.8					
4.0										-4.0					
4.2										-4.2					
4.4										-4.4					
4.6										-4.6					
4.8										-4.8					
5.0										-5.0					

**Notes**

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



# BOREHOLE LOG

MONITORING WELL ID18-BH10

ENVIRONMENTAL-GROUNDWATER

Page 2 of 3

Depth (m)	Drilling Method	Sample ID	Water	ID18-BH10	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
5.2							CLAY high plasticity, medium, dark grey, trace sand (NATURAL - SOIL)	W	ST		-5.2
5.4											-5.4
5.6											-5.6
5.8											-5.8
6											-6
6.2							Sandy CLAY medium to high plasticity, medium, blue- grey, with fine sand (NATURAL - SOIL)	W	ST		-6.2
6.4											-6.4
6.6											-6.6
6.8							SAND fine, blue- grey, with clay (NATURAL - SOIL)	W	D		-6.8
7											-7
7.2							SAND medium, grey (NATURAL - SOIL) SAND fine, grey (NATURAL - SOIL)	W W	L L		-7.2
7.4											-7.4
7.6											-7.6
7.8											-7.8
8											-8
8.2											-8.2
8.4							Sandy CLAY medium to high plasticity, fine to coarse, blue- grey, with medium to coarse sand (NATURAL - SOIL)	W	D		-8.4
8.6											-8.6
8.8											-8.8
9											-9
9.2											-9.2
9.4											-9.4
9.6											-9.6
9.8											-9.8
10							SAND fine to medium, grey, trace clay (NATURAL - SOIL)	W	D		-10
10.2											-10.2
10.4											-10.4
10.6											-10.6
10.8											-10.8

## Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



# BOREHOLE LOG

MONITORING WELL ID18-BH10

ENVIRONMENTAL-GROUNDWATER

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Depth (m)	Drilling Method	Sample ID	Water	ID18-BH10 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
11.1										-11.1
11.2										-11.2
11.4										-11.4
11.6										-11.6
11.8										-11.8
12						Termination Depth at: 11.90 m. Target depth achieved.				-12
12.2										-12.2
12.4										-12.4
12.6										-12.6
12.8										-12.8
13										-13
13.2										-13.2
13.4										-13.4
13.6										-13.6
13.8										-13.8
14										-14
14.2										-14.2
14.4										-14.4
14.6										-14.6
14.8										-14.8
15										-15
15.2										-15.2
15.4										-15.4
15.6										-15.6
15.8										-15.8
16										-16
16.2										-16.2
16.4										-16.4
16.6										-16.6
16.8										-16.8

## Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH16

Page 1 of 1

<b>Client</b> LXRA	<b>Drill Co.</b>	<b>Easting, Northing</b> 335862, 5788043
<b>Project</b> LXRA Level Crossing	<b>Driller</b>	<b>Grid Ref</b> GDA94_MGA_zone_55
<b>Project No.</b> 3133036	<b>Rig Type</b>	<b>Elevation</b>
<b>Site</b> LXRA ID18	<b>Drill Method</b>	<b>Collar RL</b> 0.916
<b>Location</b>	<b>Total Depth (m)</b> 2.95	<b>Logged By</b> Alan Wilson
<b>Date Drilled</b> 01/08/2017 - 02/08/2017	<b>Diameter (mm)</b>	<b>Checked By</b>

B.C.L No. N/A		Casing 50 mm PVC (Class 18)		Screen 0.5mm Slotted PVC (Class 18)		Surface Completion Monument				
Depth (m)	Drilling Method	Sample ID	Water	ID18-BH16 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	HA			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><di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<b>Notes</b>			
<b>GHD Soil Classifications</b> The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.			
<b>Drilling Abbreviations</b>		<b>Moisture Abbreviations</b>	<b>Consistency Abbreviations</b>
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Push tube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler		D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH14

Page 1 of 1

<b>Client</b> LXRA <b>Project</b> LXRA Level Crossing <b>Project No.</b> 3133036 <b>Site</b> LXRA ID18 <b>Location</b> <b>Date Drilled</b> 31/07/2017 - 01/08/2017			<b>Drill Co.</b> <b>Driller</b> <b>Rig Type</b> <b>Drill Method</b> <b>Total Depth (m)</b> 2.15 <b>Diameter (mm)</b>			<b>Easting, Northing</b> 335365, 5788641 <b>Grid Ref</b> GDA94_MGA_zone_55 <b>Elevation</b> <b>Collar RL</b> 0.066 <b>Logged By</b> Alan Wilson <b>Checked By</b>					
<b>B.C.L No.</b> N/A			<b>Casing</b> 50 mm PVC (Class 18)			<b>Screen</b> 0.5mm Slotted PVC (Class 18)			<b>Surface Completion</b> Monument		
Depth (m)	Drilling Method	Sample ID	Water	ID18-BH14 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)	
0.2	HA					CLAY high plasticity, very fine, pale brown with mottled orange, trace rootlets (NATURAL - SOIL)	M	F		-0.2	
0.4						SILT high plasticity, very fine, black, trace rootlets (NATURAL - SOIL)	M	F	weak organic odour	-0.4	
0.6						CLAY high plasticity, very fine, uniform, dark grey (NATURAL - SOIL)	W	F		-0.6	
0.8										-0.8	
1										-1	
1.2										-1.2	
1.4										-1.4	
1.6										-1.6	
1.8										-1.8	
2										-2	
2.2						Termination Depth at: 2.15 m. Target depth achieved.				-2.2	
2.4										-2.4	
2.6										-2.6	
2.8										-2.8	
3										-3	
3.2										-3.2	
3.4										-3.4	
3.6										-3.6	
3.8										-3.8	
4										-4	
4.2										-4.2	
4.4										-4.4	
4.6										-4.6	
4.8										-4.8	

**Notes**

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard





# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH11

Page 1 of 2

Client LXRA Project LXRA Level Crossing Project No. 3133036 Site LXRA ID18 Location Date Drilled 31/07/2017 - 31/07/2017				Drill Co. Driller Rig Type Drill Method Total Depth (m) 5.50 Diameter (mm)				Easting, Northing 335347, 5788774 Grid Ref GDA94_MGA_zone_55 Elevation Collar RL 0.253 Logged By Alan Wilson Checked By					
B.C.L No. N/A		Casing 50 mm PVC (Class 18)				Screen 0.5mm Slotted PVC (Class 18)				Surface Completion Gatic			
Depth (m)	Drilling Method	Sample ID	Water	ID18-BH11 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.		Elevation (m)		
0.2	HA			<div>Grout</div>		GRAVEL medium, angular, brown, with silt, trace rock fragments (NATURAL - SOIL)	D	D			-0.2		
0.4						GRAVEL medium, angular, brown, with silt, trace rock fragments (NATURAL - SOIL)	W	VD			-0.4		
0.6											-0.6		
0.8											-0.8		
1											-1		
1.2	SFA			<div>Bentonite</div>		SILT fine, dark brown- black, trace rootlets (NATURAL - SOIL)	W	S	distinct organic odour		-1.2		
1.4											-1.4		
1.6											-1.6		
1.8											-1.8		
2											-2		
2.2											-2.2		
2.4											-2.4		
2.6											-2.6		
2.8											-2.8		
3											-3		
3.2					SILT fine, dark brown- black (NATURAL - SOIL)	W	S	distinct organic odour		-3.2			
3.4				<div>Sand</div>							-3.4		
3.6											-3.6		
3.8						CLAY high plasticity, very fine, grey, trace sand (NATURAL - SOIL)	W	S			-3.8		
4											-4		
4.2											-4.2		
4.4											-4.4		
4.6											-4.6		
4.8											-4.8		
5						CLAY high plasticity, very fine, grey, with sand	W	S	High permeability, sloppy.		-5		
Notes													
GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.													
Drilling Abbreviations						Moisture Abbreviations		Consistency Abbreviations					
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler						D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated		Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense		Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard			






# BOREHOLE LOG

MONITORING WELL ID18-BH11

ENVIRONMENTAL-GROUNDWATER

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Depth (m)	Drilling Method	Sample ID	Water	ID18-BH11 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
5.2				 Sand		(NATURAL - SOIL)				-5.2
5.4						CLAY high plasticity, very fine, grey, trace sand (NATURAL - SOIL)	W	H		-5.4
5.6						Termination Depth at: 5.50 m				-5.6
5.8										-5.8
6										-6
6.2										-6.2
6.4										-6.4
6.6										-6.6
6.8										-6.8
7										-7
7.2										-7.2
7.4										-7.4
7.6										-7.6
7.8										-7.8
8										-8
8.2										-8.2
8.4										-8.4
8.6										-8.6
8.8										-8.8
9										-9
9.2										-9.2
9.4										-9.4
9.6										-9.6
9.8										-9.8
10										-10
10.2										-10.2
10.4										-10.4
10.6										-10.6
10.8										-10.8

## Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Push tube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard





# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH17

Page 1 of 1

<b>Client</b> LXRA	<b>Drill Co.</b>	<b>Easting, Northing</b> 335199, 5789018
<b>Project</b> LXRA Level Crossing	<b>Driller</b>	<b>Grid Ref</b> GDA94_MGA_zone_55
<b>Project No.</b> 3133036	<b>Rig Type</b>	<b>Elevation</b>
<b>Site</b> LXRA ID18	<b>Drill Method</b>	<b>Collar RL</b> 0.76
<b>Location</b>	<b>Total Depth (m)</b> 5.00	<b>Logged By</b> Alan Wilson
<b>Date Drilled</b> 03/08/2017 - 03/08/2017	<b>Diameter (mm)</b>	<b>Checked By</b>

B.C.L No.		N/A		Casing		50 mm PVC (Class 18)		Screen		0.5mm Slotted PVC (Class 18)		Surface Completion		Monument	
Depth (m)	Drilling Method	Sample ID	Water	ID18-BH17	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)				
0.2	HA						Silty SAND fine, dark grey- brown (NATURAL - SOIL)	W	S		-0.2				
0.4											-0.4				
0.6					Grout						-0.6				
0.8											-0.8				
1											-1				
1.2											-1.2				
1.4					Bentonite						-1.4				
1.6	SFA										-1.6				
1.8											-1.8				
2											-2				
2.2											-2.2				
2.4											-2.4				
2.6											-2.6				
2.8											-2.8				
3					Sand						-3				
3.2											-3.2				
3.4											-3.4				
3.6											-3.6				
3.8											-3.8				
4											-4				
4.2											-4.2				
4.4					Backfill						-4.4				
4.6							CLAY high plasticity, dark grey (NATURAL - SOIL)		ST		-4.6				
4.8											-4.8				
5							Termination Depth at: 5.00 m				-5				
5.2											-5.2				

<b>Notes</b>			
<b>GHD Soil Classifications</b> The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.			
<b>Drilling Abbreviations</b>		<b>Moisture Abbreviations</b>	<b>Consistency Abbreviations</b>
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler		D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH18

Page 1 of 1

<b>Client</b> LXRA <b>Project</b> LXRA Level Crossing <b>Project No.</b> 3133036 <b>Site</b> LXRA ID18 <b>Location</b> <b>Date Drilled</b> 03/08/2017 - 03/08/2017			<b>Drill Co.</b> <b>Driller</b> <b>Rig Type</b> <b>Drill Method</b> <b>Total Depth (m)</b> 3.00 <b>Diameter (mm)</b>			<b>Easting, Northing</b> 334833, 5789358 <b>Grid Ref</b> GDA94_MGA_zone_55 <b>Elevation</b> <b>Collar RL</b> 0.325 <b>Logged By</b> Alan Wilson <b>Checked By</b>					
<b>B.C.L No.</b> N/A			<b>Casing</b> 50 mm PVC (Class 18)			<b>Screen</b> 0.5mm Slotted PVC (Class 18)			<b>Surface Completion</b> Monument		
<b>Depth (m)</b>	<b>Drilling Method</b>	<b>Sample ID</b>	<b>Water</b>	<b>ID18-BH18 Well Details</b>	<b>Graphic Log</b>	<b>LITHOLOGICAL DESCRIPTION</b> Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	<b>Moisture</b>	<b>Consistency</b>	<b>COMMENTS/ CONTAMINANT INDICATORS</b> Odours, staining, waste materials, separate phase liquids, imported fill, ash.	<b>Elevation (m)</b>	
0.2	HA			Grout		Silty SAND fine, dark brown (NATURAL - SOIL)	M	S		-0.2	
0.4										-0.4	
0.6				Bentonite		Silty SAND fine, dark brown (NATURAL - SOIL)	W	S		-0.6	
0.8										-0.8	
1										-1	
1.2										-1.2	
1.4										-1.4	
1.6	HFA									-1.6	
1.8										-1.8	
2				Sand						-2	
2.2										-2.2	
2.4										-2.4	
2.6										-2.6	
2.8										-2.8	
3						Termination Depth at: 3.00 m. Target depth achieved.				-3	
3.2										-3.2	
3.4										-3.4	
3.6										-3.6	
3.8										-3.8	
4										-4	
4.2										-4.2	
4.4										-4.4	
4.6										-4.6	
4.8										-4.8	
<b>Notes</b>											
<b>GHD Soil Classifications</b> The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.											
<b>Drilling Abbreviations</b>						<b>Moisture Abbreviations</b>		<b>Consistency Abbreviations</b>			
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler						D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated		Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense		Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard	



# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH12

Page 1 of 3

Client LXRA Project LXRA Level Crossing Project No. 3133036 Site LXRA ID18 Location Date Drilled 01/08/2017 - 01/08/2017			Drill Co. Driller Rig Type Drill Method Total Depth (m) 12.00 Diameter (mm)			Easting, Northing 335866, 5788585 Grid Ref GDA94_MGA_zone_55 Elevation Collar RL 1.828 Logged By Alan Wilson Checked By					
B.C.L No. N/A			Casing 50 mm PVC (Class 18)			Screen 0.5mm Slotted PVC (Class 18)			Surface Completion Monument		
Depth (m)	Drilling Method	Sample ID	Water	ID18-BH12 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)	
0.2	HA					CLAY medium plasticity, very fine, dark brown with mottled orange, trace rootlets, trace sand (NATURAL - SOIL)	M	ST		-0.2	
0.4										-0.4	
0.6										-0.6	
0.8										-0.8	
1										-1	
1.2										-1.2	
1.4										-1.4	
1.6						CLAY medium plasticity, very fine, pale grey, trace rootlets, trace fine sand (NATURAL - SOIL)	M	ST		-1.6	
1.8	PT									-1.8	
2										-2	
2.2										-2.2	
2.4										-2.4	
2.6										-2.6	
2.8										-2.8	
3										-3	
3.2						SAND fine, pale grey (NATURAL - SOIL)	M			-3.2	
3.4						Silty CLAY medium plasticity, very fine, dark brown (NATURAL - SOIL)	M	ST	distinct organic odour	-3.4	
3.6										-3.6	
3.8										-3.8	
4						CLAY high plasticity, very fine, dark brown (NATURAL - SOIL)	M	ST	distinct organic odour	-4	
4.2						SAND fine, dark grey (NATURAL - SOIL)	M	MD		-4.2	
4.4										-4.4	
4.6										-4.6	
4.8						SAND fine, pale grey (NATURAL - SOIL)	W	L		-4.8	
5										-5	
Notes											
GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.											
Drilling Abbreviations					Moisture Abbreviations			Consistency Abbreviations			
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler					D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated			Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense			
								Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard			



# BOREHOLE LOG

MONITORING WELL ID18-BH12

ENVIRONMENTAL-GROUNDWATER

Page 2 of 3

Depth (m)	Drilling Method	Sample ID	Water	ID18-BH12	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
5.2							CLAY high plasticity, very fine, pale brown- grey (NATURAL - SOIL)	W	ST		-5.2
5.4											-5.4
5.6											-5.6
5.8											-5.8
6											-6
6.2							Sandy CLAY high plasticity, very fine, blue- grey (NATURAL - SOIL)	W	ST		-6.2
6.4											-6.4
6.6											-6.6
6.8											-6.8
7											-7
7.2							Sandy CLAY high plasticity, very fine, blue- grey (NATURAL - SOIL)	W	ST		-7.2
7.4											-7.4
7.6											-7.6
7.8							SAND fine to medium, pale blue- grey, trace clay (NATURAL - SOIL)	W	F		-7.8
8											-8
8.2											-8.2
8.4											-8.4
8.6							SAND fine to medium, pale grey- green (NATURAL - SOIL)	W	F		-8.6
8.8											-8.8
9											-9
9.2	SFA						SAND low plasticity, fine to medium, green, trace clay (NATURAL - SOIL)	W	F		-9.2
9.4											-9.4
9.6											-9.6
9.8											-9.8
10											-10
10.2											-10.2
10.4											-10.4
10.6							SAND fine to medium, green (NATURAL - SOIL)	W	F		-10.6
10.8											-10.8

## Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Push tube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



# BOREHOLE LOG

MONITORING WELL ID18-BH12

ENVIRONMENTAL-GROUNDWATER

Page 3 of 3

Depth (m)	Drilling Method	Sample ID	Water	ID18-BH12 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
11.0										-11.0
11.2										-11.2
11.4										-11.4
11.6										-11.6
11.8										-11.8
12.0										-12.0
12.2						Termination Depth at: 12.00 m. Target depth achieved.				-12.2
12.4										-12.4
12.6										-12.6
12.8										-12.8
13.0										-13.0
13.2										-13.2
13.4										-13.4
13.6										-13.6
13.8										-13.8
14.0										-14.0
14.2										-14.2
14.4										-14.4
14.6										-14.6
14.8										-14.8
15.0										-15.0
15.2										-15.2
15.4										-15.4
15.6										-15.6
15.8										-15.8
16.0										-16.0
16.2										-16.2
16.4										-16.4
16.6										-16.6
16.8										-16.8

## Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard





# BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL ID18-BH15

Page 1 of 1

<b>Client</b> LXRA	<b>Drill Co.</b>	<b>Easting, Northing</b> 334995, 5789167
<b>Project</b> LXRA Level Crossing	<b>Driller</b>	<b>Grid Ref</b> GDA94_MGA_zone_55
<b>Project No.</b> 3133036	<b>Rig Type</b>	<b>Elevation</b>
<b>Site</b> LXRA ID18	<b>Drill Method</b>	<b>Collar RL</b> 0.707
<b>Location</b>	<b>Total Depth (m)</b> 4.00	<b>Logged By</b> Alan Wilson
<b>Date Drilled</b> 03/08/2017 - 03/08/2017	<b>Diameter (mm)</b>	<b>Checked By</b>

<b>B.C.L No.</b> N/A	<b>Casing</b> 50 mm PVC (Class 18)	<b>Screen</b> 0.5mm Slotted PVC (Class 18)	<b>Surface Completion</b> Monument
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Depth (m)	Drilling Method	Sample ID	ID18-BH15 Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	HA				Silty SAND fine, dark grey (NATURAL - SOIL)	M	S		-0.2
0.4									-0.4
0.6					Silty SAND fine, pale grey, with shells (NATURAL - SOIL)	M	S		-0.6
0.8									-0.8
1.0					SAND fine, uniform, white (NATURAL - SOIL)	M	S		-1.0
1.2									-1.2
1.4									-1.4
1.6					SAND fine, uniform, white (NATURAL - SOIL)	W	S		-1.6
1.8	HFA				SAND fine, uniform, pale grey (NATURAL - SOIL)	W	S		-1.8
2.0									-2.0
2.2									-2.2
2.4									-2.4
2.6									-2.6
2.8									-2.8
3.0									-3.0
3.2									-3.2
3.4									-3.4
3.6									-3.6
3.8									-3.8
4.0					Termination Depth at: 4.00 m. Target depth achieved.				-4.0
4.2									-4.2
4.4									-4.4
4.6									-4.6
4.8									-4.8

**Notes**

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	<b>Granular Soils</b> VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  <b>Cohesive Soils</b> VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

# **COPY OF RECORD IN THE VICTORIAN WATER REGISTER LICENCE TO CONSTRUCT WORKS**

## ***under Section 67 of the Water Act 1989***

*The information in this copy of record is as recorded at the time of printing. Current information should be obtained by a search of the register. The State of Victoria does not warrant the accuracy or completeness of this information and accepts no responsibility for any subsequent release, publication or reproduction of this information.*

*This licence does not remove the need to apply for any authorisation or permission necessary under any other Act of Parliament with respect to anything authorised by the works licence.*

*Water used under this licence is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.*

*This licence is not to be interpreted as an endorsement of the design and/or construction of any works (including dams). The Authority does not accept any responsibility or liability for any suits or actions arising from injury, loss, damage or death to person or property which may arise from the maintenance, existence or use of the works.*

*Each person named as a licence holder is responsible for ensuring all the conditions of this licence are complied with.*

This licence authorises its holders to construct the described works, subject to the conditions.

### **Licence Holder(s)**

DALE SCOTT MCKENZIE of LEVEL 1, 436 JOHNSTON STREET ABBOTSFORD VIC 3067

### **Licence Contact Details**

DS MCKENZIE

LEVEL 1, 436 JOHNSTON STREET  
ABBOTSFORD VIC 3067

### **Licence Details**

Expiry date	10 Feb 2018
Status	Active
Authority	Southern Rural Water
Name of waterway or aquifer	NA for construct/decommission
Water system	Unincorporated (GMU)

### **Summary of Licensed Works**

The details in this section are a summary only. They are subject to the conditions specified in this licence.

<i>Works ID</i>	<i>Works type</i>	<i>Use of water</i>
WRK098877	Bore	Investigation
WRK098878	Bore	Investigation
WRK098879	Bore	Investigation
WRK098880	Bore	Investigation
WRK098881	Bore	Investigation
WRK098882	Bore	Investigation
WRK098883	Bore	Investigation



## Description of Licensed Works

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### WORKS ID WRK098877

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
334853.420	5786207.099	Zone 55

### Other land description

95 C2

### Property address

Location(s) in or near CHELSEA, Parish: Lyndhurst

## Description of Licensed Works

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### WORKS ID WRK098878

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
334786.573	5786571.717	Zone 55

### Land description

### Property address

STATION STREET CHELSEA 3196

## Description of Licensed Works

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### WORKS ID WRK098879

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
334691.810	5786792.714	Zone 55

### Land description

**Property address**

STATION STREET CHELSEA 3196

**Description of Licensed Works**

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**WORKS ID** WRK098880

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

**Works location**

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
334523.899	5787206.168	Zone 55

**Land description****Property address**

STATION STREET CHELSEA 3196

**Description of Licensed Works**

---

**WORKS ID** WRK098881

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

**Works location**

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
333463.556	5789401.734	Zone 55

**Land description****Property address**

STATION STREET ASPENDALE 3195

**Description of Licensed Works**

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**WORKS ID** WRK098882

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

**Works location**

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
333370.330	5789597.763	Zone 55

---

## Land description

### Property address

STATION STREET ASPENDALE 3195

## Description of Licensed Works

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### WORKS ID WRK098883

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	Unrestricted

### Works location

<i>Easting</i>	<i>Northing</i>	<i>Zone MGA</i>
333582.506	5789172.252	Zone 55

### Other land description

95 C2

### Property address

Location(s) in or near CHELSEA, Parish: Lyndhurst

## Related Instruments

**Related entitlements** Nil

**Related water-use entities** Nil

## Application History

<i>Reference</i>	<i>Type</i>	<i>Status</i>	<i>Lodged date</i>	<i>Approved date</i>	<i>Recorded date</i>
WLI605559	Issue	Approved	10 Feb 2017	10 Feb 2017	

## **Conditions**

Licence WLE067645 is subject to the following conditions:

### **Siting and construction**

- 1 The bore(s) must be drilled at the location specified in the application approved by the Authority.
- 2 If after drilling the bore is considered unsatisfactory a replacement bore may be drilled on the land specified in the licence.

### **Preventing pollution**

- 3 All earthworks must be carried out, and all drilling fluids and waters produced during construction and development must be disposed of, in ways that avoid contaminating native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.
- 4 Construction must stop immediately if the Authority reasonably believes that fuel, lubricant, drilling fluid, soil or water produced during construction and development is at risk of being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.
- 5 The licence holder must construct and maintain bund walls, in accordance with the timeframe, specifications, guidelines or standards prescribed by the Authority, to prevent fuel, lubricant, drilling fluid, soil or water produced during construction and development from being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.

### **Construction standards**

- 6 The bore(s) must be constructed, and where relevant decommissioned, in accordance with the Minimum Construction Requirements for Water Bores in Australia, Edition 3 or its successor.

### **Drilling licence and supervision requirements**

- 7 The bore(s) must be constructed by, or under the direct supervision of, a driller licensed under the Water Act 1989 and endorsed as a Class 1, 2, or 3 driller, with appropriate endorsements.
- 8 If artesian pressure is expected or encountered, then a driller licensed under the Water Act 1989, and endorsed as a class 3 driller, must install casing in the bore(s) to a suitable depth, and in a suitable manner, to prevent its outbreak. A suitable valve must also be fitted to the bore.

### **Bore completion report**

- 9 A Bore Completion Report must be submitted to the Authority within 28 working days of the bore(s) being completed.

### **Protecting water resources**

- 10 At the completion of drilling, and before the drilling rig leaves the site, all bore(s) must be decommissioned so as to eliminate physical hazards, conserve aquifer yield, prevent groundwater contamination and prevent the intermingling of desirable and undesirable waters.
- 11 The bore(s) must be located at least 30 metres from any authority's channel, reserve or easement unless authorised by the Authority.

### **Protecting water quality**

- 12 Drilling must not exceed the maximum depth.
- 13 The bore(s) must be constructed so as to prevent aquifer contamination caused by vertical flow outside the casing.
- 14 If two or more aquifers are encountered, the bore(s) must be constructed to ensure that an impervious seal is made and maintained between each aquifer to prevent aquifer connection through vertical flow outside the casing; under no circumstances are two or more aquifers to be screened within the one bore or in any other manner to allow connection between them.
- 15 Boreheads must be constructed, to ensure that no flood water, surface runoff or potential subsurface contaminated soakage can enter the bore or bore annulus.

**Fees and charges**

- 16 The licence holder must, when requested by the Authority, pay all fees, costs and other charges under the Water Act 1989 in respect of this licence.

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END OF COPY OF RECORD

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# Engineering Log - Borehole



Borehole ID.	<b>ASPEN-BH01</b>
sheet:	1 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>20 Feb 2017</b>
date completed:	<b>22 Feb 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333471; N: 5789390 (MGA94 )	surface elevation: 6.56 m (AHD)	angle from horizontal: 90°
drill model: Xplora 50, Truck mounted	drilling fluid: Polymer	casing diameter : HW

drilling information							material substance							
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1	2	3											
NDD					E					FILL: ASPHALT: 100mm.	D	VD		FILL
					E	6			SP	FILL: CLAYEY GRAVEL: medium to coarse grained, dark grey, orange.	M	L - MD		QUATERNARY SANDS duplicate and triplicate environmental samples (QC3 & QC4)
					E				SP	SAND: fine to coarse grained, dark grey, trace of fines.	M	L - MD		
							1.0			SAND: fine to coarse grained, grey. becoming pale grey				
					E	5					M	L - MD		
					SPT 0, 1, 2 N*=3		2.0			becoming brown, pale brown, grey				
								4			M	L - MD		
					SPT 2, 4, 3 N*=7	3	3.0							
										becoming brown, orange-brown, trace of fines	W	D		
					SPT 8, 9, 11 N*=20	2	5.0							
										W	VD			
				SPT 9, 9, 15 N*=24	1	6.0			becoming grey, trace of quartz gravel, fine to coarse grained					
					SPT 20/125mm/ HB N=R	-1	7.0							

PDF 0 9 06 LIBRARY.GLB rev:AU Log COF BOREHOLE: NON CORED GEOTABTF10294AA CHELSPEN.GPJ <<DrawingFile>> 05-07-2017 14:40

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling	<b>support</b> M mud N nil C casing  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>water</b> 		<b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	

Borehole ID.	<b>ASPEN-BH01</b>
sheet:	2 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>20 Feb 2017</b>
date completed:	<b>22 Feb 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

from horizontal:  $90^\circ$   
q diameter : HW

drilling information					material substance								
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations	
<div>W</div> <div>AD</div> <div>AS</div> <div>HA</div> <div>W</div> <div>HA</div> <div>N</div> <div>NDD</div>							SP	SAND: fine to coarse grained, grey. (continued)	W	D		QUATERNARY SANDS	
			SPT 14, 12, 10 N*=22	-2	9.0								
				-3	10.0					VD			
			SPT 12, 21, 29 N*=50	-4	11.0								
				-5	12.0								
				SPT 10, 10/50mm N*=R	-6	13.0							
				SPT 4, 3, 4 N*=7	-7	14.0		CH	CLAY: high plasticity, green, grey, trace of sand.	M	F		TERTIARY BRIGHTON GROUP
					-8	15.0							
				SPT 4, 12, 15 N*=27	-9			SC	CLAYEY SAND: fine to coarse grained, green-grey, mottled orange-brown, medium plasticity.		D		
<div><div><div>method</div><div>AD auger drilling*</div><div>AS auger screwing*</div><div>HA hand auger</div><div>W washbore</div><div>HA hand auger</div><div>NDD non destructive drilling</div></div><div><div>* bit shown by suffix</div><div>e.g. AD/T</div><div>B blank bit</div><div>T TC bit</div><div>V V hit</div></div></div> <div><div><div>support</div><div>M mud</div><div>C casing</div></div><div><div>penetration</div><div><div>1 2 3</div><div>no resistance ranging to refusal</div></div><div><div>water</div><div><div>10-Oct-12 water level on date shown</div><div>water inflow</div><div>water outflow</div></div></div></div></div> <div><div><div>samples &amp; field tests</div><div>B bulk disturbed sample</div><div>D disturbed sample</div><div>E environmental sample</div><div>SS split spoon sample</div><div>U## undisturbed sample ##mm diameter</div><div>HP hand penetrometer (kPa)</div><div>N standard penetration test (SPT)</div><div>N* SPT - sample recovered</div><div>Nc SPT with solid cone</div><div>VS vane shear; peak/remoulded (kPa)</div><div>R refusal</div><div>HB hammer bouncing</div></div></div> <div><div><div>classification symbol &amp; soil description</div><div>based on Unified Classification System</div></div><div><div>moisture</div><div>D dry</div><div>M moist</div><div>W wet</div><div>Wp plastic limit</div><div>WI liquid limit</div></div></div> <div><div><div>consistency / relative density</div><div>VS very soft</div><div>S soft</div><div>F firm</div><div>St stiff</div><div>VSt very stiff</div><div>H hard</div><div>Fb friable</div><div>VL very loose</div><div>L loose</div><div>MD medium dense</div><div>D dense</div><div>VD very dense</div></div></div>													



# Engineering Log - Borehole

Borehole ID. **ASPEN-BH01**  
sheet: 3 of 6  
project no. **GEOTABTF10294AA**  
date started: **20 Feb 2017**  
date completed: **22 Feb 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333471; N: 5789390 (MGA94 ) surface elevation: 6.56 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer casing diameter : HW

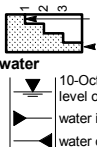
drilling information					material substance							
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W HW casing	1		SPT 5, 8, 13 N*=21				SC	<b>CLAYEY SAND:</b> fine to coarse grained, green-grey, mottled orange-brown, medium plasticity. <i>(continued)</i>	M	D		<b>TERTIARY BRIGHTON GROUP</b>
	2			-10	17.0			becoming yellow-brown, with some fine grained gravel		VD		
	3		SPT 16/70mm N*=R	-11	18.0							
				-12	19.0		CH	<b>Sandy CLAY:</b> high plasticity, brown, mottled pale-grey, fine to medium grained sand.		VSt		
			U63	-13	20.0			becoming pale grey				
			SPT 3, 5, 8 N*=13	-14	21.0							
				-15	22.0		SC	<b>CLAYEY SAND:</b> fine to medium grained, pale grey, mottled green-grey, brown, low plasticity, with some pockets of fine to medium grained gravel.		MD		
			SPT 5, 9, 8 N*=17	-16	23.0							
				-17								
			SPT 7, 16, 18 N*=34									
											HP 350 - 450 kPa	

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole ID.	<b>ASPEN-BH01</b>
sheet:	4 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>20 Feb 2017</b>
date completed:	<b>22 Feb 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

from horizontal:  $90^\circ$   
 diameter : HW

drilling information					material substance										
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations			
method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	support M mud C casing  penetration 	water 10-Oct-12 water level on date shown water inflow water outflow	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System  moisture D dry M moist W wet Wp plastic limit WI liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	1 2 3									
						U63	-18	25.0	SC	CLAYEY SAND: fine to medium grained, pale grey, mottled green-grey, brown, low plasticity, with some pockets of fine to medium grained gravel. (continued)	M	MD		TERTIARY BRIGHTON GROUP	
							-19								
						SPT 3, 11, 7 N*=18	-20	26.0	SM	SILTY SAND: fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets.				GELLIBRAND MARL	
							-21	27.0		becoming dark green-grey					
						SPT 7, 2, 4/70mm N*=R	-22	28.0						SPT refusal on gravel band	
							-23	29.0							
						SPT 21, 9, 11 N*=20	-24	30.0		trace of shell fragments					
							-25	31.0							
									SPT 8, 7, 9 N*=16						

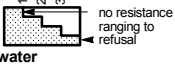
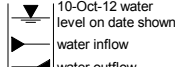
# Engineering Log - Borehole

Borehole ID. **ASPEN-BH01**  
sheet: 5 of 6  
project no. **GEOTABTF10294AA**  
date started: **20 Feb 2017**  
date completed: **22 Feb 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333471; N: 5789390 (MGA94 ) surface elevation: 6.56 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer casing diameter : HW

drilling information						material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
W  HW casing	1	2	3						SM	<b>SILTY SAND:</b> fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets. <i>(continued)</i>	M	MD	100	GELLIBRAND MARL	
					SPT 12, 14, 17 N*=31	-26							200		
							33.0								300
						-27									400
					U63		34.0								
						-28									
							35.0								
					SPT 11, 20, 18 N*=38	-29									
							36.0								
						-30		becoming green-grey, mottled dark green							D
							37.0								
					SPT 20, 26, 23 N*=49	-31									MD
							38.0								
					SPT 9, 15, 22 N*=37	-32									
							39.0								
					-33										

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WI liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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
# Engineering Log - Borehole



Borehole ID. **ASPEN-BH01**  
sheet: 6 of 6  
project no. **GEOTABTF10294AA**  
date started: **20 Feb 2017**  
date completed: **22 Feb 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333471; N: 5789390 (MGA94 ) surface elevation: 6.56 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer casing diameter : HW

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W HW casing	1	2	3		SPT 15, 18, 25 N*=43				SM	<b>SILTY SAND:</b> fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets. <i>(continued)</i> Borehole ASPEN-BH01 terminated at 40.45 m Target depth Standpipe installation Backfill details 0.0m-8.5m: grout 8.5m-9.5m: bentonite 9.5m-13.0m: sand 13.0-40.45m: grout  Standpipe details 0.0m-10.0m: unslotted 50mm PVC, Class 18 10.0m-13.0m: machine slotted, 50mm PVC, Class 18 End caps and flush mounted gatic cover	M	MD	100 200 300 400	<b>GELLIBRAND MARL</b>
						-34								
							41.0							
						-35								
							42.0							
						-36								
							43.0							
						-37								
							44.0							
						-38								
							45.0							
						-39								
							46.0							
						-40								
							47.0							
						-41								

<b>method</b> AD    auger drilling* AS    auger screwing* HA    hand auger W     washbore HA    hand auger NDD   non destructive drilling  *     bit shown by suffix e.g. AD/T B     blank bit T     TC bit V     V bit	<b>support</b> M    mud                    N    nil C    casing  <b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B     bulk disturbed sample D     disturbed sample E     environmental sample SS    split spoon sample U##   undisturbed sample ##mm diameter HP    hand penetrometer (kPa) N     standard penetration test (SPT) N*    SPT - sample recovered Nc    SPT with solid cone VS    vane shear; peak/remoulded (kPa) R     refusal HB    hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D    dry M    moist W    wet Wp   plastic limit Wl   liquid limit	<b>consistency / relative density</b> VS    very soft S     soft F     firm St    stiff VSt   very stiff H     hard Fb    friable VL    very loose L     loose MD    medium dense D     dense VD    very dense
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method	support	samples & field tests	classification symbol & soil description	consistency / relative density
AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling	M mud C casing  penetration  water  10-Oct-12 water level on date shown water inflow water outflow	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	based on Unified Classification System  moisture D dry M moist W wet Wp plastic limit WL liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

\* bit shown by suffix  
e.g. AD/T  
B blank bit  
T TC bit  
V V bit

Borehole ID.	<b>ASPEN-BH02</b>
sheet:	1 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>02 Mar 2017</b>
date completed:	<b>08 Mar 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

diameter : 150 mm

drilling information						material substance						
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
								FILL: ASPHALT: 150mm.	M	VD		FILL
			E	-6				FILL: Sandy GRAVEL: fine to coarse grained, orange-brown.				
			E					FILL: SAND: fine to coarse grained, dark grey, black, with some fines.		L - MD		QUATERNARY SANDS
			E		1.0		SP	SAND: fine to medium grained, dark grey, grey.				
			E					becoming pale grey		MD		
			SPT 3, 4, 4 N*=8	-5	2.0			becoming pale brown				
			E									
			SPT 2, 4, 4 N*=8	-4	3.0							
										D		
					4.0							
			SPT 3, 8, 10 N*=18	-3	5.0			becoming fine to coarse grained, brown, trace of fines	W			
			SPT 3, 7, 13 N*=20	-1	6.0			becoming grey, pale grey, trace of fine grained quartz gravel		VD		
			SPT 5, 13, 18 N*=31	-0	7.0							
				-1								

**method**

AD auger drilling\*

AS auger screwing\*

HA hand auger

W washbore

HA hand auger

NDD non destructive drilling

\* bit shown by suffix

e.g. AD/T

B blank bit

T TC bit

V v-bit

**support**

M mud

C casing

N nil

**penetration**

no resistance ranging to refusal

**water**

10-Oct-12 water level on date shown

water inflow

water outflow

**samples & field tests**

B bulk disturbed sample

D disturbed sample

E environmental sample

SS split spoon sample

U## undisturbed sample ##mm diameter

HP hand penetrometer (kPa)

N standard penetration test (SPT)

N\* SPT - sample recovered

Nc SPT with solid cone

VS vane shear; peak/remoulded (kPa)

R refusal

HB hammer bouncing

**classification symbol & soil description**

based on Unified Classification System

**moisture**

D dry

M moist

W wet

Wp plastic limit

WI liquid limit

**consistency / relative density**

VS very soft

S soft

F firm

St stiff

VSt very stiff

H hard

Fb friable

VL very loose

L loose

MD medium dense

D dense

VD very dense

# Engineering Log - Borehole

Borehole ID: **ASPEN-BH02**  
sheet: 2 of 6  
project no: **GEOTABTF10294AA**  
date started: **02 Mar 2017**  
date completed: **08 Mar 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333586; N: 5789170 (MGA94 ) surface elevation: 6.72 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 150 mm

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1 2 3							<b>SOIL TYPE:</b> plasticity or particle characteristic, colour, secondary and minor components			100 200 300 400	
			SPT 13, 23, 5/20mm HB N*=R	-2	9.0		SP	<b>SAND:</b> fine to medium grained, dark grey, grey. (continued)	W	VD		<b>QUATERNARY SANDS</b>  HP 100 kPa
			U63	-3	10.0		CH	<b>Sandy CLAY:</b> high plasticity, dark grey, fine to coarse grained sand, grading to clayey sand, sulfuric odour.		F - St		
			SPT 6, 12, 17 N*=29	-5	11.0		SP	<b>SAND:</b> fine to medium grained, brown, dark brown, with some fines.		D		
			SPT 18, 6/30mm HB N=R	-6	13.0					VD		
			SPT 0, 3, 4 N*=7	-8	15.0		CH	<b>Sandy CLAY:</b> high plasticity, grey, mottled orange-brown, fine to medium grained sand.	M	F - St		<b>TERTIARY BRIGHTON GROUP</b>
			U63	-9				becoming grey, mottled dark grey		VSt		

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing N nil  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

Borehole ID. **ASPEN-BH02**  
sheet: 3 of 6  
project no. **GEOTABTF10294AA**  
date started: **02 Mar 2017**  
date completed: **08 Mar 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333586; N: 5789170 (MGA94 ) surface elevation: 6.72 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 150 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W	1	2	3						CH	<b>Sandy CLAY:</b> high plasticity, grey, mottled orange-brown, fine to medium grained sand. <i>(continued)</i>	M	VSt	X-X	<b>TERTIARY BRIGHTON GROUP</b>  HP 200 - 300 kPa
						-10								
						17.0			SC	<b>CLAYEY SAND:</b> fine grained, pale grey, mottled green-brown, low plasticity.		MD		
				SPT 3, 6, 7 N*=13		-11	18.0							
						-12				becoming mottled green-brown and pale grey		L		
				SPT 2, 2, 3 N*=5		-13	19.0							
						-14	20.0							
				U63		-15	21.0							
						-16	22.0					MD		
				SPT 1, 3, 7 N*=10		-17	23.0			becoming mottled orange-brown and pale grey				
			SPT 6, 5, 5 N*=10											

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole ID.	<b>ASPEN-BH02</b>
sheet:	4 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>02 Mar 2017</b>
date completed:	<b>08 Mar 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333586; N: 5789170 (MGA94 )	surface elevation: 6.72 m (AHD)	angle from horizontal: 90°
drill model: Xplora 50, Truck mounted	drilling fluid: Polymer	hole diameter : 150 mm

drilling information						material substance						
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1 2 3						ML	<b>Sandy SILT:</b> medium liquid limit, pale brown, fine to coarse grained sand.	M	VSt - H	100 80 60 40	<b>TERTIARY BRIGHTON GROUP</b>
			U63	-18	25.0						>>X HP >600 kPa	
			SPT 2, 5/70mm HB N*=R	-19	26.0		SC	<b>CLAYEY SAND:</b> fine to coarse grained, brown, low plasticity, with some pockets of fine to medium grained gravel.  becoming fine grained, dark green-grey		VD		<b>GELLIBRAND MARL</b>
			SPT 16, 5/50mm HB N*=R	-20	27.0							
				-21	28.0							
			SPT 7, 8, 9 N*=17	-22	29.0		SM	<b>SILTY SAND:</b> fine grained, green-grey, with some pockets of sandy clay and fine grained gravel, trace of shell fragments.		MD		
				-23	30.0							
				-24	31.0							
			SPT 5, 12, 15 N*=27	-25								

**method**  
AD auger drilling\*  
AS auger screwing\*  
HA hand auger  
W washbore  
HA hand auger  
NDD non destructive drilling

\* bit shown by suffix  
e.g. AD/T  
B blank bit  
T TC bit  
V V hit

**support**  
M mud N nil  
C casing

**penetration**

**water**  
10-Oct-12 water level on date shown  
water inflow  
water outflow

**samples & field tests**  
B bulk disturbed sample  
D disturbed sample  
E environmental sample  
SS split spoon sample  
U## undisturbed sample ##mm diameter  
HP hand penetrometer (kPa)  
N standard penetration test (SPT)  
N\* SPT - sample recovered  
Nc SPT with solid cone  
VS vane shear; peak/remoulded (kPa)  
R refusal  
HB hammer bouncing

**classification symbol & soil description**  
based on Unified Classification System

**moisture**  
D dry  
M moist  
W wet  
Wp plastic limit  
WL liquid limit

**consistency / relative density**  
VS very soft  
S soft  
F firm  
St stiff  
VSt very stiff  
H hard  
Fb friable  
VL very loose  
L loose  
MD medium dense  
D dense  
VD very dense




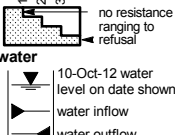
# Engineering Log - Borehole

Borehole ID. **ASPEN-BH02**  
sheet: 5 of 6  
project no. **GEOTABTF10294AA**  
date started: **02 Mar 2017**  
date completed: **08 Mar 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

position: E: 333586; N: 5789170 (MGA94 ) surface elevation: 6.72 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 150 mm

drilling information						material substance											
method & support	penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations				
W	1	2						SM	<b>SILTY SAND:</b> fine to coarse grained, green-grey, mottled yellow-brown, low plasticity.	M	MD	100	<b>GELLIBRAND MARL</b>				
				SPT 11, 12, 14 N*=26	-26												
						33.0											
					-27									becoming grey, mottled yellow-brown, with some pockets of sandy clay, medium plasticity			
				SPT 5, 5, 6 N*=11	-28	34.0											
						35.0											
				SPT 8, 11, 17 N*=28	-29									trace of shell fragments			
						36.0											
					-30												
				SPT 8, 9, 16 N*=25	-31	37.0											
						38.0											
				SPT 11, 13, 20 N*=33	-32												
				39.0													
				-33													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WI liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole ID.	<b>ASPEN-BH02</b>
sheet:	6 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>02 Mar 2017</b>
date completed:	<b>08 Mar 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Aspendale**

diameter : 150 mm

drilling information					material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
↓	1	2	3							SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components			100 200 300 400	
					SPT 10, 12, 17 N*=29				SM		M	MD		GELLIBRAND MARL
										Borehole ASPEN-BH02 terminated at 40.25 m Target depth Standpipe installation Backfill details 0.0m-9.5m: grout 9.5m-10.5m: bentonite 10.5m-14.0m: sand 14.0-40.25m: grout  Standpipe details 0.0m-11.0m: unslotted 50mm PVC, Class 18 11.0m-14.0m: machine slotted, 50mm PVC, Class 18 End caps and flush mounted gatic cover				
							-34							
							41.0							
							-35							
							42.0							
							-36							
							43.0							
							-37							
							44.0							
							-38							
							45.0							
							-39							
							46.0							
							-40							
							47.0							
							-41							

method	support	samples & field tests	classification symbol & soil description	consistency / relative density
AD AS WA W HA NDD	M mud C casing  penetration  water	B D E SS U## HP N N* Nc VS R HB	based on Unified Classification System  moisture D dry M moist W wet Wp plastic limit WI liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* e.g. B T V	bit shown by suffix AD/T blank bit TC bit V hit	10-Oct-12 water level on date shown water inflow water outflow		

Borehole ID.	<b>CHEL-BH01</b>
sheet:	1 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>06 Feb 2017</b>
date completed:	<b>08 Feb 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

diameter : 100 mm

drilling information						material substance						
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
								FILL: ASPHALT: 100mm.	D	VD		FILL
			E	-6				FILL: Sandy GRAVEL: medium to coarse grained, sub-angular to angular, grey.		MD		
			E					FILL: CLAYEY SAND: medium to coarse grained, grey, mottled orange.	M	L - MD		QUATERNARY SANDS
			E		1.0		SP	SAND: fine to coarse grained, grey, dark grey.				
								becoming pale grey, pale brown		MD		
			SPT 2, 4, 5 N*=9	-5	2.0							
			SPT 2, 4, 5 N*=9	-4	3.0			becoming pale brown, mottled dark brown				
				-3	4.0					D		
			SPT 4, 9, 9 N*=18	-2	5.0			becoming dark brown, trace of fines	W			
				-1	6.0							
			SPT 4, 8, 12 N*=20	0	7.0			becoming brown, grey, fine to medium grained	M	MD		
				-1								
			SPT 9, 10, 6 N*=16									

**method**  
AD auger drilling\*  
AS auger screwing\*  
HA hand auger  
W washbore  
HA hand auger  
NDD non destructive drilling

\* bit shown by suffix  
e.g. AD/T  
B blank bit  
T TC bit  
V V hit

**support**  
M mud      N nil  
C casing

**penetration**

**water**

- 10-Oct-12 water level on date shown
- water inflow
- water outflow

**samples & field tests**

- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N\* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remoulded (kPa)
- R refusal
- HB hammer bouncing

**classification symbol & soil description**  
based on Unified Classification System

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**moisture**

- D dry
- M moist
- W wet
- Wp plastic limit
- WI liquid limit

**consistency / relative density**

- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

# Engineering Log - Borehole

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

Borehole ID: **CHEL-BH01**  
sheet: 2 of 6  
project no: **GEOTABTF10294AA**  
date started: **06 Feb 2017**  
date completed: **08 Feb 2017**  
logged by: **BP**  
checked by: **KJ**

position: E: 334777; N: 5786594 (MGA94 ) surface elevation: 6.63 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
	1	2	3											
W  C									SP	<b>SAND:</b> fine to coarse grained, grey, dark grey. <i>(continued)</i> becoming grey, mottled black	M	MD		<b>QUATERNARY SANDS</b>
				SPT 7, 9, 9 N*=18	-2									
						9.0								
							-3			becoming grey, trace of shell fragments		D		
				SPT 10, 17, 18 N*=35		10.0								
							-4							
						11.0		SP	<b>SAND:</b> fine to coarse grained, grey, trace of fine grained gravel.					
				SPT 15, 16, 13 N*=29										
						12.0								
							-6		SP	<b>SAND:</b> fine to medium grained, pale grey, trace of fines.		D - VD		<b>TERTIARY BRIGHTON GROUP</b>
			SPT 15, 27, 5/25mm HB N*=R		13.0									
						-7								
					14.0		CL	<b>Sandy CLAY:</b> low plasticity, grey, fine to coarse grained sand, trace of sand pockets.		VSt				
			U63				-8							
					15.0							⌗	HP 300 - 375 kPa	
						-9		CI-CH	<b>CLAY:</b> medium to high plasticity, dark grey, with some sand, with some pockets of sandy clay.		F			

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**

Borehole ID. **CHEL-BH01**

sheet: 3 of 6

project no. **GEOTABTF10294AA**

date started: **06 Feb 2017**

date completed: **08 Feb 2017**

logged by: **BP**

checked by: **KJ**

position: E: 334777; N: 5786594 (MGA94 ) surface elevation: 6.63 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
<div>W</div> <div>C</div>	1	2	3											
					SPT 2, 1, 3 N*=4 U63	-10			CI-CH	<b>CLAY:</b> medium to high plasticity, dark grey, with some sand, with some pockets of sandy clay. <i>(continued)</i> becoming pale grey, with some pockets of green, low plasticity fines	M	F		TERTIARY BRIGHTON GROUP  HP 150 - 250 kPa   <

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  no resistance ranging to refusal  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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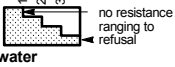
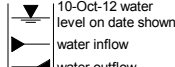
# Engineering Log - Borehole

Borehole ID. **CHEL-BH01**  
sheet: 4 of 6  
project no. **GEOTABTF10294AA**  
date started: **06 Feb 2017**  
date completed: **08 Feb 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334777; N: 5786594 (MGA94 ) surface elevation: 6.63 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support	1 penetration	2 penetration	3 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
W  C									SC	CLAYEY SAND: fine to medium grained, pale grey, pale red, brown, low plasticity, with some cemented sand recovered as medium to coarse grained gravel. (continued)	M	D		TERTIARY BRIGHTON GROUP
					SPT 9, 15, 22 N*=37	-18	25.0							
						-19	26.0			becoming pale green-brown, mottled pale red, trace of fine grained gravel				
					SPT 7, 18, 20 N*=38	-20	27.0							
						-21	28.0			becoming pale green-brown, bands of pale grey, mottled pale red				
						-22	29.0							No recovery in U63
					U63	-23	30.0							
						-24	31.0							
						-25			SM	SILTY SAND: fine to coarse grained, green-grey, low plasticity, with some pockets of fine to medium grained gravel & high plasticity clay.				GELLIBRAND MARL
					U63									

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**

Borehole ID. **CHEL-BH01**

sheet: 5 of 6

project no. **GEOTABTF10294AA**

date started: **06 Feb 2017**

date completed: **08 Feb 2017**

logged by: **BP**

checked by: **KJ**

position: E: 334777; N: 5786594 (MGA94 )

surface elevation: 6.63 m (AHD)

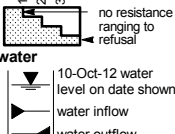
angle from horizontal: 90°

drill model: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter : 100 mm

drilling information						material substance							
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
W C	1		SPT 8, 10, 15/70mm HB N*=R	-26			SM	SILTY SAND: fine to coarse grained, green-grey, low plasticity, with some pockets of fine to medium grained gravel & high plasticity clay. (continued)	M	D		GELLIBRAND MARL	
	2												
	3												
W N			SPT 7, 11, 3 N*=14	-27			SC	CLAYEY SAND: fine to coarse grained, grey, low plasticity, with some pockets of fine to medium grained gravel.  becoming green-grey trace of clay bands, <20mm thick		D			
			U63	-29			SM	SILTY SAND: fine to coarse grained, green-grey, medium plasticity.		MD			
			SPT 4, 6, 26 N*=32	-31									
			SPT 3, 3, 7 N*=10	-32									
				-33									

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing N nil  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WI liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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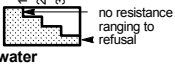
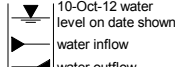
# Engineering Log - Borehole

Borehole ID. **CHEL-BH01**  
sheet: 6 of 6  
project no. **GEOTABTF10294AA**  
date started: **06 Feb 2017**  
date completed: **08 Feb 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334777; N: 5786594 (MGA94 ) surface elevation: 6.63 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information					material substance												
method & support		penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)				structure and additional observations
W	N	1	2										3	100	200	300	
W	N				SPT 10, 12, 18 N*=30	-34			SM	<b>SILTY SAND:</b> fine to coarse grained, green-grey, medium plasticity. <i>(continued)</i> becoming green-grey, mottled green-brown	M	MD					<b>GELLIBRAND MARL</b>
							41.0			Borehole CHEL-BH01 terminated at 40.75 m Target depth Standpipe installation Backfill details 0.0m-9.5m: grout 9.5m-10.5m: bentonite 10.5m-14.0m: sand 14.0-40.75m: grout  Standpipe details 0.0m-11.0m: unslotted 50mm PVC, Class 18 11.0m-14.0m: machine slotted, 50mm PVC, Class 18 End caps and flush mounted gatic cover							
							-35										
							42.0										
							-36										
							43.0										
							-37										
							44.0										
							-38										
							45.0										
							-39										
							46.0										
							-40										
							47.0										
							-41										




<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WI liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole ID.	<b>CHEL-BH02</b>
sheet:	1 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>16 Mar 2017</b>
date completed:	<b>20 Mar 2017</b>
logged by:	<b>SS/LW</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

diameter : 100 mm

drilling information						material substance						
method & support	1 penetration	2 water	3 samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
NDD ADV N W	1 2 3		E m E 6 E 5 2.0 4 3 SPT 2, 4, 5 N*=9 3 SPT 1, 4, 5 N*=9 2 5.0 1 6.0 0 SPT 12, 12, 5 N*=17 -1				SP	FILL: SILTY SAND: fine to coarse grained, dark brown. SAND: fine to medium grained, brown, grey.	D	L		FILL QUATERNARY SANDS
			MD									
									M			
									W			
										D		
method			support			samples & field tests			classification symbol & soil description based on Unified Classification System		consistency / relative density	
AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling			M mud N nil C casing			B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing			D dry M moist W wet Wp plastic limit Wi liquid limit		VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit			<b>penetration</b>  no resistance ranging to refusal									
			<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow									

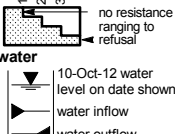
# Engineering Log - Borehole

Borehole ID. **CHEL-BH02**  
sheet: 2 of 6  
project no. **GEOTABTF10294AA**  
date started: **16 Mar 2017**  
date completed: **20 Mar 2017**  
logged by: **SS/LW**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334685; N: 5786811 (MGA94 ) surface elevation: 6.58 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W N	1	2	3						SP	<b>SAND:</b> fine to medium grained, brown, grey. <i>(continued)</i>  becoming grey-brown	W	D	100 200 300 400	<b>QUATERNARY SANDS</b>
				SPT 7, 12, 9 N*=21	-2									
						9.0								
					-3						MD			
				SPT 5, 4, 6 N*=10		10.0							<b>TERTIARY BRIGHTON GROUP</b>	
					-4									
						11.0		CL	<b>Sandy CLAY:</b> low plasticity, grey-green, fine grained sand.		F			
				U63	-5									
				SPT 2, 3, 5 N*=8		12.0								
					-6			SP	<b>SAND:</b> fine to medium grained, yellow-brown.		VD			
			SPT 17, 32, 36 N*=68		13.0								HP 150 - 200 kPa	
				-7										
					14.0		CI	<b>Sandy CLAY:</b> medium plasticity, grey, fine grained sand.		St				
			U63	-8										
			SPT 3, 3, 4 N*=7		15.0									
									CH	<b>CLAY:</b> high plasticity, grey-green.				

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing N nil  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**

Borehole ID. **CHEL-BH02**

sheet: 3 of 6

project no. **GEOTABTF10294AA**

date started: **16 Mar 2017**

date completed: **20 Mar 2017**

logged by: **SS/LW**

checked by: **KJ**

position: E: 334685; N: 5786811 (MGA94 ) surface elevation: 6.58 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
<div>W</div> <div>N</div>	1	2	3		U63				CH	CLAY: high plasticity, grey-green. (continued)	W	St - VS	100 200 300 400	TERTIARY BRIGHTON GROUP	
						-10								HP 150 - 200 kPa	
					SPT 2, 5, 5 N*=10	-11	17.0								
							-12	18.0							
					SPT 10, 9/20mm HB N*=R	-13	19.0		SP	SAND: fine to medium grained, pale brown.		VD			
						-14	20.0								
					SPT 10, 7, 40 N*=47	-15	21.0			cemented sand band, 200mm					
							-16	22.0		SC	CLAYEY SAND: fine to coarse grained, pale grey, mottled orange-brown, medium plasticity.		L		SPT sank 370mm under self weight
					SPT 0, 0, 0 N*=0	-17	23.0								
					U63										

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WI liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**

Borehole ID. **CHEL-BH02**

sheet: 4 of 6

project no. **GEOTABTF10294AA**

date started: **16 Mar 2017**

date completed: **20 Mar 2017**

logged by: **SS/LW**

checked by: **KJ**

position: E: 334685; N: 5786811 (MGA94 )

surface elevation: 6.58 m (AHD)

angle from horizontal: 90°

drill model: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter : 100 mm

drilling information						material substance									
method & support	1 penetration	2 penetration	3 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
									SC	CLAYEY SAND: fine to coarse grained, pale grey, mottled orange-brown, medium plasticity.	W	L		TERTIARY BRIGHTON GROUP	
					SPT 0, 0, 0 N*=0	-18			SC	band of fragmented cemented sands		VL			SPT sank 500mm under self weight, possibly disturbed during drilling
					SPT 4, 9, 11 N*=20		25.0			becoming fine grained, orange-brown		MD			
						-19								SPT refusal on gravel band	
							26.0								
					SPT 7, 18/110mm HB N*=R	-20				gravel band, fine to coarse grained					
							27.0								
						-21									
					SPT 3, 5, 5 N*=10		28.0								
						-22								GELLIBRAND MARL	
							29.0		SM	SILTY SAND: fine to medium grained, grey, green, low plasticity.		L			
					SPT 4, 2, 4 N*=6	-23									
							30.0								
						-24									
					SPT 4, 0, 2 N*=2		31.0			with some cemented sand nodules					
						-25									

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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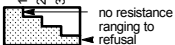
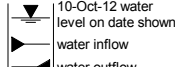
# Engineering Log - Borehole

Borehole ID. **CHEL-BH02**  
sheet: 5 of 6  
project no. **GEOTABTF10294AA**  
date started: **16 Mar 2017**  
date completed: **20 Mar 2017**  
logged by: **SS/LW**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334685; N: 5786811 (MGA94 ) surface elevation: 6.58 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm


drilling information						material substance								
method & support	1 penetration	2 penetration	3 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W   														

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole ID.	<b>CHEL-BH02</b>
sheet:	6 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>16 Mar 2017</b>
date completed:	<b>20 Mar 2017</b>
logged by:	<b>SS/LW</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

diameter : 100 mm

drilling information						material substance								
method & support		penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W	N	1	2											
					N*=18					Borehole CHEL-BH02 terminated at 40.15 m Target depth Standpipe installation Backfill details 0.0m-5.0m: grout 5.0m-7.4m: bentonite 7.4m-11.0m: sand 11.0-40.15m: grout  Standpipe details 0.0m-8.0m: unslotted 50mm PVC, Class 18 8.0m-11.0m: machine slotted, 50mm PVC, Class 18 End caps and flush mounted gatic cover				
							-34							
							41.0							
							-35							
							42.0							
							-36							
							43.0							
							-37							
							44.0							
							-38							
							45.0							
							-39							
							46.0							
							-40							
							47.0							
							-41							
<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit					<b>support</b> M mud N nil C casing  <b>penetration</b>  no resistance ranging to refusal <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow			<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing			<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WI liquid limit		<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	

# Engineering Log - Borehole

Borehole ID. **CHEL-BH03**  
sheet: 1 of 6  
project no. **GEOTABTF10294AA**  
date started: **10 Mar 2017**  
date completed: **15 Mar 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334538; N: 5787182 (MGA94 ) surface elevation: 6.42 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
NDD  AD/V  W C	1	2	3							FILL: SAND: fine to coarse grained, dark brown, with some fines, trace of concrete, trace of rootlets.	M	MD	100 200 300 400	FILL
				E	6				SP	SAND: fine to coarse grained, pale grey, grey.		L		QUATERNARY SANDS
				E			1.0							
				E								MD		
				SPT 1, 2, 3 N*=5 E			2.0			becoming pale brown, pale grey				
				SPT 2, 4, 6 N*=10			3.0			becoming fine to medium grained, brown, mottled orange-brown		D		
				SPT 5, 11, 8 N*=19			4.0							
						5.0				becoming dark brown, trace of fines	W	MD		
				SPT 3, 6, 9 N*=15			6.0							
				SPT 4, 4, 12 N*=16			7.0		SP	SAND: fine to coarse grained, grey, with some pockets of clayey sand.				

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  no resistance ranging to refusal 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

Borehole ID. **CHEL-BH03**  
sheet: 2 of 6  
project no. **GEOTABTF10294AA**  
date started: **10 Mar 2017**  
date completed: **15 Mar 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334538; N: 5787182 (MGA94 ) surface elevation: 6.42 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1	2	3											
W  C									SP	<b>SAND:</b> fine to coarse grained, grey, with some pockets of clayey sand. <i>(continued)</i>	W	MD		QUATERNARY SANDS
				SPT 7, 9, 4 N*=13	-2									
						9.0				becoming fine to medium grained				
				SPT 3, 2, 5 N*=7		10.0								
				SPT 1, 1, 3 N*=4	-5	11.0		SC	<b>CLAYEY SAND:</b> fine to medium grained, grey, low plasticity.	M	L		TERTIARY BRIGHTON GROUP	
						12.0								
				SPT 20/120mm HB N*=R		13.0		SP	<b>SAND:</b> fine to coarse grained, grey, with some fines.		VD			
				SPT 11, 21, 26 N*=47	-8	14.0								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

Borehole ID. **CHEL-BH03**  
sheet: 3 of 6  
project no. **GEOTABTF10294AA**  
date started: **10 Mar 2017**  
date completed: **15 Mar 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334538; N: 5787182 (MGA94 ) surface elevation: 6.42 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations		
W  C	1		SPT 2, 5, 9 N*=14	-10	17.0		SC	CLAYEY SAND: fine to coarse grained, grey. (continued)	M	MD		TERTIARY BRIGHTON GROUP		
	2													
	3													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**

Borehole ID. **CHEL-BH03**

sheet: 4 of 6

project no. **GEOTABTF10294AA**

date started: **10 Mar 2017**

date completed: **15 Mar 2017**

logged by: **BP**

checked by: **KJ**

position: E: 334538; N: 5787182 (MGA94 )


surface elevation: 6.42 m (AHD)

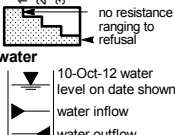
angle from horizontal: 90°

drill model: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter : 100 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1	2	3											
W C						-18			SC	<b>CLAYEY SAND:</b> fine to medium grained, pale grey, orange-brown, bands of red, low plasticity. <i>(continued)</i>  becoming mottled red, mottled orange-brown	M	MD		TERTIARY BRIGHTON GROUP
						25.0					L			
				SPT 0, 1, 1 N*=2	-19								no recovery in U63	
						26.0			SM	<b>SILTY SAND:</b> fine to coarse grained, dark green-grey, medium plasticity, grading to clayey sand in parts.  becoming dark grey, dark green-grey		VL - L		GELLIBRAND MARL
						-20								
				SPT 2, 0, 1 N*=1		27.0								
						-21								
						28.0								
				SPT 0, 0, 4 N*=4	-22									
						29.0								
					-23									
			U63		30.0									
					-24									
					31.0									
			SPT 0, 0, 0 N*=0	-25										

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**Borehole ID. **CHEL-BH03**

sheet: 5 of 6

project no. **GEOTABTF10294AA**

date started: **10 Mar 2017**

date completed: **15 Mar 2017**

logged by: **BP**

checked by: **KJ**

position: E: 334538; N: 5787182 (MGA94 )

surface elevation: 6.42 m (AHD)

angle from horizontal:  $90^\circ$

drill model: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter : 100 mm

drilling information					material substance																			
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations												
<div>method</div> <div>AD auger drilling*</div> <div>AS auger screwing*</div> <div>HA hand auger</div> <div>W washbore</div> <div>HA hand auger</div> <div>NDD non destructive drilling</div> <div>* bit shown by suffix</div> <div>e.g. AD/T</div> <div>B blank bit</div> <div>T TC bit</div> <div>V V hit</div>	<div>1</div> <div>2</div> <div>3</div>	<div>water</div> <div>10-Oct-12 water level on date shown</div> <div>water inflow</div> <div>water outflow</div>	<div>samples &amp; field tests</div> <div>B bulk disturbed sample</div> <div>D disturbed sample</div> <div>E environmental sample</div> <div>SS split spoon sample</div> <div>U## undisturbed sample ##mm diameter</div> <div>HP hand penetrometer (kPa)</div> <div>N standard penetration test (SPT)</div> <div>N* SPT - sample recovered</div> <div>Nc SPT with solid cone</div> <div>VS vane shear; peak/remoulded (kPa)</div> <div>R refusal</div> <div>HB hammer bouncing</div>	<div>support</div> <div>M mud</div> <div>C casing</div> <div>N nil</div> <div>penetration</div> <div>no resistance ranging to refusal</div>	<div>RL (m)</div> <div>depth (m)</div>	<div>graphic log</div>	<div>classification symbol</div> <div>SM</div> <div>SC</div>	<div>material description</div> <div>SILTY SAND: fine to coarse grained, dark green-grey, medium plasticity, grading to clayey sand in parts. (continued)</div> <div>with some pockets of fine to coarse grained gravel</div> <div>becoming green-grey</div> <div>with some pockets of clayey sand</div> <div>CLAYEY SAND: fine to medium grained, dark green-grey, medium plasticity. becoming dark green-grey</div> <div>with some pockets of gravel</div>	<div>moisture condition</div> <div>M</div>	<div>consistency / relative density</div> <div>VL - L</div> <div>L</div>	<div>hand penetrometer (kPa)</div> <div>100</div> <div>200</div> <div>300</div> <div>400</div>	<div>structure and additional observations</div> <div>GELLIBRAND MARL</div> <div>no recovery in U63</div> <div>no recovery in U63</div>												

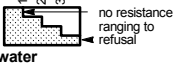
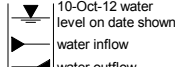
# Engineering Log - Borehole

Borehole ID. **CHEL-BH03**  
sheet: 6 of 6  
project no. **GEOTABTF10294AA**  
date started: **10 Mar 2017**  
date completed: **15 Mar 2017**  
logged by: **BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334538; N: 5787182 (MGA94 ) surface elevation: 6.42 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support		penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W	C	1	2		U63				SC	CLAYEY SAND: fine to medium grained, dark green-grey, medium plasticity. (continued)	M	L	100 200 300 400	GELLIBRAND MARL
						-34				Borehole CHEL-BH03 terminated at 40.35 m Target depth Standpipe installation Backfill details 0.0m-5.5m: grout 5.5m-6.5m: bentonite 6.5m-10.0m: sand 10.0-40.35m: grout  Standpipe details 0.0m-7.0m: unslotted 50mm PVC, Class 18 7.0m-10.0m: machine slotted, 50mm PVC, Class 18 End caps and flush mounted gatic cover				
						41.0								
						-35								
						42.0								
						-36								
						43.0								
						-37								
						44.0								
						-38								
						45.0								
						-39								
						46.0								
						-40								
						47.0								
						-41								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**

sheet: 1 of 6

project no. **GEOTABTF10294AA**

date started: **09 Feb 2017**

date completed: **14 Feb 2017**

logged by: **AO/BP**

checked by: **KJ**

position: E: 334853; N: 5786206 (MGA94 )

surface elevation: 5.80 m (AHD)

angle from horizontal:  $90^\circ$

drill model: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter : 100 mm



drilling information					material substance									
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations		
<div><div><div>NDD</div><div>N</div><div>AD/V</div><div>W</div><div>C</div></div></div>			E					FILL: ASPHALT: 50mm.	D	D		FILL		
			E				SP	FILL: Sandy GRAVEL: fine to coarse grained, angular, grey, brown, fine grained sand.	D - M	MD		QUATERNARY SANDS		
			E		5	1.0		SAND: fine to medium grained, grey, pale grey, pale brown-grey.						
			E											
			E		4									
			SPT 2, 3, 5 N*=8		2.0									
					3	3.0		becoming fine to coarse grained, brown, pale brown		D				
			SPT 2, 8, 10 N*=18		2	4.0								
								becoming brown, trace of shell fragments	M - W W	VD				
			SPT 12, 25, 30 N*=55		0	6.0		SP	SAND: fine grained, pale grey, trace of fines, trace of shell fragments.					
							SP	SAND: fine to medium grained, pale grey, mottled pale brown, trace of fines, trace of shell fragments.						
			SPT 15, 30/140mm HB N*=R		-1 7.0 -2									
<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit			<b>support</b> M mud N nil C casing  <b>penetration</b>  no resistance ranging to refusal  <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow			<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing			<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit Wl liquid limit			<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense		

Borehole ID.	<b>CHEL-BH04</b>
sheet:	2 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>09 Feb 2017</b>
date completed:	<b>14 Feb 2017</b>
logged by:	<b>AO/BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

diameter : 100 mm

drilling information						material substance						
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
W C							SP	<b>SAND:</b> fine to medium grained, pale grey, mottled pale brown, trace of fines, trace of shell fragments. <i>(continued)</i>	W	VD		<b>QUATERNARY SANDS</b>
			SPT 13, 22, 19 N*=41	-3	9.0							
							SC	<b>CLAYEY SAND:</b> fine to medium grained, dark grey, high plasticity, trace of shell fragments.		VL		
			SPT 0, 0, 1 N*=1	-4	10.0							
			U63	-5			CH	<b>CLAY:</b> high plasticity, dark grey, black, trace of shell fragments.	M - W	S - F		
							ML	<b>Clayey SILT:</b> low liquid limit, dark grey, black, with some fine grained sand, trace of shell fragments.			X	
			SPT 10, 8, 9 N*=17	-6	11.0		SM	<b>SILTY SAND:</b> fine to medium grained, grey, trace of fine to coarse grained, sub-angular gravel.		MD		
			SPT 13/100mm HB N*=R	-7	12.0		SP	<b>SAND:</b> fine to coarse grained, sub-rounded to sub-angular, pale grey.	M	VD		
												<b>TERTIARY BRIGHTON GROUP</b> HP 40 kPa HP 50 kPa
							CH	<b>CLAY:</b> high plasticity, pale grey, with some coarse grained sand.		VSt		
			SPT 6, 7, 8 N*=15	-9	14.0			becoming grey, mottled orange				
				-10	15.0							

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
<b>penetration</b>  no resistance ranging to refusal	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>moisture</b> D dry M moist W wet Wp plastic limit Wi liquid limit		

\* bit shown by suffix  
e.g. AD/T  
B blank bit  
T TC bit  
V V bit



# Engineering Log - Borehole

Borehole ID: **CHEL-BH04**  
sheet: 3 of 6  
project no: **GEOTABTF10294AA**  
date started: **09 Feb 2017**  
date completed: **14 Feb 2017**  
logged by: **AO/BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334853; N: 5786206 (MGA94 ) surface elevation: 5.80 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W  C	1	2	3										100 200 300 400	TERTIARY BRIGHTON GROUP
				SPT 9, 18, 22 N*=40				CH		M	VSt			
					-11	17.0		SP	SAND: fine to medium grained, grey, pale grey, with some fines.		D			
								CH	CLAY: high plasticity, grey, mottled orange, with some pockets of coarse grained sand.		VSt			
				SPT 4, 6, 11 N*=17	-12	18.0								
					-13	19.0			becoming grey, medium to high plasticity, trace of coarse grained sand		St			
				SPT 0, 3, 3 N*=6	-14	20.0			becoming grey, mottled orange		St - VSt			
					-15	21.0								
				SPT 0, 5, 5 N*=10	-16	22.0		SC	CLAYEY SAND: fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.		D			
				SPT 14, 12, 10/115mm HB N*=R	-17	23.0			becoming medium plasticity		MD			
			SPT 7, 16, 13 N*=29	-18				becoming green-brown becoming yellow-brown				SPT refusal on coarse grained gravel		

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole ID.	<b>CHEL-BH04</b>
sheet:	4 of 6
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>09 Feb 2017</b>
date completed:	<b>14 Feb 2017</b>
logged by:	<b>AO/BP</b>
checked by:	<b>KJ</b>

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

diameter : 100 mm

drilling information					material substance							
method & support	1 penetration	2 water	3 samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W C			<div>SPT 0, 10, 15/70mm HB N*=R</div>	-19	25.0		SC	CLAYEY SAND: fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel. <i>(continued)</i>	M	VD	<div><div>100</div><div>200</div><div>300</div><div>400</div></div>	TERTIARY BRIGHTON GROUP
								with some bands of cemented sand, up to 300mm thick, recovered as fine to coarse grained gravel				
			<div>SPT 5/10mm HB N*=R</div>	-21	26.0		SC	becoming mottled brown, mottled red, with some cemented sand, recovered as fine to medium grained gravel		L		GELLIBRAND MARL
			<div>SPT 10, 15/130mm HB N*=R</div>	-22	27.0		SC	CLAYEY SAND: fine to medium grained, grey, green-grey, pale grey, low plasticity, trace of fine grained gravel.				
			<div>SPT 6, 6, 3 N*=9</div>	-24	30.0		SC	becoming green-brown, brown				
			<div>SPT 2, 6, 5 N*=11</div>	-25	31.0		SC					
			<div>SPT 2, 6, 5 N*=11</div>	-26			SC					

method

AD auger drilling\*

AS auger screwing\*

HA hand auger

W washbore

HA hand auger

NDD non destructive drilling

support

M mud

C casing

penetration

no resistance ranging to refusal

water

10-Oct-12 water level on date shown

water inflow

water outflow

samples & field tests

B bulk disturbed sample

D disturbed sample

E environmental sample

SS split spoon sample

U## undisturbed sample ##mm diameter

HP hand penetrometer (kPa)

N standard penetration test (SPT)

N\* SPT - sample recovered

Nc SPT with solid cone

VS vane shear; peak/remoulded (kPa)

R refusal

HB hammer bouncing

classification symbol & soil description

based on Unified Classification System

moisture

D dry

M moist

W wet

Wp plastic limit

WI liquid limit

consistency / relative density

VS very soft

S soft

F firm

St stiff

VSt very stiff

H hard

Fb friable

VL very loose

L loose

MD medium dense

D dense

VD very dense

\* bit shown by suffix

e.g. AD/T

B blank bit

T TC bit

V V bit



# Engineering Log - Borehole

Borehole ID. **CHEL-BH04**  
sheet: 5 of 6  
project no. **GEOTABTF10294AA**  
date started: **09 Feb 2017**  
date completed: **14 Feb 2017**  
logged by: **AO/BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334853; N: 5786206 (MGA94 ) surface elevation: 5.80 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information						material substance						
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description  SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1 2 3										100 200 300 400	
							SM	SILTY SAND: fine to coarse grained, dark grey, low plasticity.	M	L		GELLIBRAND MARL
			U63	-27								
					33.0							
				-28								
			SPT 6, 6, 4 N*=10		34.0							
				-29								
					35.0							
			U63	-30								
					36.0							
				-31				becoming medium plasticity		VD		
			SPT 5, 11/135mm HB N*=R		37.0							
				-32								
					38.0			trace of fine grained				
				-33								
			SPT 11/135mm HB N*=R		39.0							
				-34				becoming green-grey, mottled green-brown, with some pockets of coarse grained sand				

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud C casing N nil  <b>penetration</b>  <b>water</b> 10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WL liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Borehole

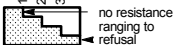
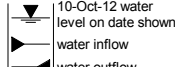
Borehole ID. **CHEL-BH04**  
sheet: 6 of 6  
project no. **GEOTABTF10294AA**  
date started: **09 Feb 2017**  
date completed: **14 Feb 2017**  
logged by: **AO/BP**  
checked by: **KJ**

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

position: E: 334853; N: 5786206 (MGA94 ) surface elevation: 5.80 m (AHD) angle from horizontal: 90°  
drill model: Xplora 50, Truck mounted drilling fluid: Polymer hole diameter : 100 mm

drilling information				material substance										
method & support		penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
W	N	1	2		SPT 1, 7, 20 N*=27				SM	SILTY SAND: fine to coarse grained, dark grey, low plasticity. (continued)	M	VD	100 200 300 400	GELLIBRAND MARL
		3												
						-35	41.0			Borehole CHEL-BH04 terminated at 40.75 m Target depth Standpipe installation Backfill details 0.0m-3.5m: grout 3.5m-4.5m: bentonite 4.5m-8.0m: sand 8.0-40.75m: grout				
						-36	42.0			Standpipe details 0.0m-5.0m: unslotted 50mm PVC, Class 18 5.0m-8.0m: machine slotted, 50mm PVC, Class 18 End caps and flush mounted gatic cover				
						-37	43.0							
						-38	44.0							
						-39	45.0							
						-40	46.0							
						-41	47.0							
						-42								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  <b>water</b>  water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger NDD non destructive drilling  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud N nil C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>classification symbol &amp; soil description</b> based on Unified Classification System  <b>moisture</b> D dry M moist W wet Wp plastic limit WI liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: ***Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea***

location: ***Station Street, Aspendale***

sheet: 1 of 1

project no. **GEOTABTF10294AA**

date started: **20 Feb 2017**

date completed: **22 Feb 2017**

logged by: **BP**

checked by: **KJ**

position: E: 333471; N: 5789390 (MGA94 )

surface elevation: 6.56 m (AHD)

angle from horizontal:  $90^\circ$

equipment type: Xplora 50, Truck mounted

drilling fluid: Polymer

casing diameter : HW

[illegible]

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: ***Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea***

location: ***Station Street, Aspendale***

sheet: 1 of 1

project no. **GEOTABTF10294AA**

date started: **02 Mar 2017**

date completed: **08 Mar 2017**

logged by: **BP**

checked by: **KJ**

position: E: 333586; N: 5789170 (MGA94 )

surface elevation: 6.72 m (AHD)

angle from horizontal:  $90^\circ$

equipment type: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter : 150 mm

drilling information				material substance		piezometer construction details				
method & support	water	RL (m)	depth (m)	graphic log	material name					
HA	ADV	W	06/03/17		FILL	bore construction license: WRK098883				
						drilling company: EARTHCORE				
						driller: L. Adolphson				
						driller's permit no.: 738				
						Grout				
						Bentonite				
						Gravel				
						11.00 m				
						14.00 m				
						TERTIARY BRIGHTON GROUP				

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

Hole ID.	<b>CHEL-BH01</b>
sheet:	1 of 1
project no.	<b>GEOTABTF10294AA</b>
date started:	<b>06 Feb 2017</b>
date completed:	<b>08 Feb 2017</b>
logged by:	<b>BP</b>
checked by:	<b>KJ</b>

angle from horizontal:  $90^\circ$

hole diameter : 100 mm

[illegible]

client: **Metro Trains Melbourne Pty. Ltd.**  
principal: **Level Crossing Removal Authority**  
project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**  
location: **Station Street, Chelsea**

Hole ID.	<b>CHEL-BH02</b>
sheet:	1 of 1
project no.	<b>GEOTABTF10294AA</b>
<hr/>	
date started:	<b>16 Mar 2017</b>
date completed:	<b>20 Mar 2017</b>
logged by:	<b>SS/LW</b>
checked by:	<b>KJ</b>

position: E: 334685; N: 5786811 (MGA94 )	surface elevation: 6.58 m (AHD)	angle from horizontal: 90°
equipment type: Xplora 50. Truck mounted	drilling fluid: Polymer	hole diameter : 100 mm

drilling information				material substance		piezometer construction details					
method & support	water	RL (m)	depth (m)	graphic log	material name						
<div style="display: flex;"> <div style="flex: 1;"> <p>NDD ADV N W</p> </div> <div style="flex: 1;"> <p><b>FILL</b></p> <p><b>QUATERNARY SANDS</b></p> <p><b>TERTIARY BRIGHTON GROUP</b></p> </div> </div>						<p>CHEL-BH02</p> <p>bore construction license: WRK098879 drilling company: EARTHCORE driller: L. Adolphson driller's permit no.: 738</p> <p>Grout</p> <p>Bentonite</p> <p>Sand</p> <p>8.00 m</p> <p>11.00 m</p>					
<b>method &amp; support</b> see engineering log for details		<b>graphic log / core recovery</b> 		ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD)	
water 10-Oct-12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown				CHEL-BH02	standpipe piezo.		0.00 m	11.00 m		6.58	-4.42

# Piezometer Installation Log

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: **Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

location: **Station Street, Chelsea**

Hole ID. **CHEL-BH03**

sheet: 1 of 1

project no. **GEOTABTF10294AA**

date started: **10 Mar 2017**

date completed: **15 Mar 2017**

logged by: **BP**

checked by: **KJ**

position: E: 334538; N: 5787182 (MGA94 )

surface elevation: 6.42 m (AHD)

angle from horizontal: 90°

equipment type: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter: 100 mm

drilling information			material substance	piezometer construction details	
method & support	water	RL (m)	depth (m)	graphic log	material name
    		-6			FILL
			1		QUATERNARY SANDS
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			10		
			11		TERTIARY BRIGHTON GROUP
			12		
			13		
			14		
			15		
			7.00 m		Grout
			10.00 m		Bentonite
					Sand

method & support	graphic log / core recovery	ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD)		
see engineering log for details <b>water</b>     	 core recovered (graphic symbols indicate material)  no core recovered	CHEL-BH03	standpipe piezo.		0.00 m	10.00 m		stickup	tip	water level
								6.42	-3.58	

# Piezometer Installation Log

client: **Metro Trains Melbourne Pty. Ltd.**

principal: **Level Crossing Removal Authority**

project: ***Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea***

location: **Station Street, Chelsea**Hole ID. **CHEL-BH04**

sheet: 1 of 1

project no. **GEOTABTF10294AA**

date started: **09 Feb 2017**

date completed: **14 Feb 2017**

logged by: **AO/BP**

checked by: **KJ**

position: E: 334853; N: 5786206 (MGA94 )

surface elevation: 5.80 m (AHD)

angle from horizontal:  $90^\circ$

equipment type: Xplora 50, Truck mounted

drilling fluid: Polymer

hole diameter : 100 mm

[illegible]