

## **Appendix E** – GHD engineering borehole and monitoring well logs with explanation sheets

# GENERAL NOTES



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Specialist Services in Geotechnical Engineering,  
Geology, Field/Laboratory Testing and Hydrogeology  
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The report contains the results of a geotechnical investigation or study conducted for a specific purpose and client. The results may not be used or relied on by other parties, or used for other purposes, as they may contain neither adequate nor appropriate information. In particular, the investigation does not cover contamination issues unless specifically required to do so by the client.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the report are excluded unless they are expressly stated to apply in the report.

## TEST HOLE LOGGING

The information on the test hole logs (boreholes, test pits, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information. Moreover, the location of test holes should be considered approximate, unless noted otherwise (refer report). Reference should also be made to the relevant standard sheets for the explanation of logging procedures (Soil and Rock Descriptions, Core Log Sheet Notes etc.).

## GROUNDWATER

Unless otherwise indicated, the water levels presented on the test hole logs are the levels of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeabilities (i.e. depending on response time of the measuring instrument). Further, variations of this level could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities. Confirmation of groundwater levels, phreatic surfaces or piezometric pressures can only be made by appropriate instrumentation techniques and monitoring programmes.

## INTERPRETATION OF RESULTS

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data, often with only approximate locations (e.g. GPS). Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

## CHANGE IN CONDITIONS

Local variations or anomalies in ground conditions do occur in the natural environment, particularly between discrete test hole locations or available observation sites. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural processes.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed or reported should be referred to this firm for appropriate assessment and comment.

## GEOTECHNICAL VERIFICATION

Verification of the geotechnical assumptions and/or model is an integral part of the design process - investigation, construction verification, and performance monitoring. Variability is a feature of the natural environment and, in many instances, verification of soil or rock quality, or foundation levels, is required. There may be a requirement to extend foundation depths, to modify a foundation system and/or to conduct monitoring as a result of this natural variability. Allowance for verification by appropriate geotechnical personnel must be recognised and programmed for construction.

## FOUNDATIONS

Where referred to in the report, the soil or rock quality, or the recommended depth of any foundation (piles, caissons, footings etc.) is an engineering estimate. The estimate is influenced, and perhaps limited, by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The material quality and/or foundation depth remains, however, an estimate and therefore liable to variation. Foundation drawings, designs and specifications should provide for variations in the final depth, depending upon the ground conditions at each point of support, and allow for geotechnical verification.

## REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in our geotechnical report, or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions must include at least all of the relevant test hole and test data, together with the appropriate Standard Description sheets and remarks made in the written report of a factual or descriptive nature.

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# SOIL DESCRIPTION



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This procedure involves the description of a soil in terms of its visual and tactile properties, and relates to both laboratory samples and field exposures as applicable. A detailed soil profile description, in association with local geology and experience, will facilitate the initial (and often complete) site assessment for engineering purposes.

The method involves an evaluation of each of the items listed below and is in general agreement with both Australian Standard AS 1726 (the Site Investigation Code) and ASTM D2487 and D2488.

## MOISTURE

The moisture condition of the soil is most applicable for cohesive soils as a precursor to the assessment of consistency and workability. The moisture condition is described as:-

**Dry** (dusty, dry to the touch)    **Slightly Moist**    **Moist** (damp, no visible water)    **Very Moist**    or    **Wet** (visible free water, saturated condition)

In addition, the presence of any seepage or free water is noted on the testhole logs.

## COLOUR

Colour is important for correlation of data between testholes and during subsequent excavation operations. The prominent colour is noted, followed by (spotted, mottled, streaked etc.) then secondary colours as applicable. Colour is usually described at as-received moisture condition, though both wet and dry colours may also be appropriate.

## CONSISTENCY / DENSITY INDEX

This assessment is based on the effort required to penetrate and/or mould the soil, and is an indicator of shear strength.

Granular soils are generally described in terms of density index as listed in AS 1726. These soils are inherently difficult to assess and normally a penetration test procedure (SPT, DCP or CPT) is used in conjunction with published correlations. Alternatively, in-situ density tests can be conducted in association with minimum and maximum densities performed in the laboratory.

Term	Symbol	Density Index (%)
Very Loose	VL	< 15
Loose	L	15 - 35
Medium Dense	MD	35 - 65
Dense	D	65 - 85
Very Dense	VD	>85

Cohesive soils can be assessed by direct measurement (shear vane, CPT etc), or estimated approximately by tactile means and/or the aid of a geological pick as given on the following table. It is emphasised that a "design shear strength" must take cognisance of the mode of testing and the in-situ moisture content with the possible variations of moisture with time.

Term	Symbol	Tactile Properties	Undrained Strength $S_u$ (kPa)
Very Soft	VS	Extrudes between fingers when squeezed in hand	<12
Soft	S	Easily penetrated by thumb about 30-40 mm. Pick head can be pushed in up to shaft.	12-25
Firm	F	Penetrated by thumb 20-30mm with moderate effort. Sharp end of pick pushed in 30-40mm.	25-50
Stiff	St	Indented by thumb about 5mm with moderate effort. Pick pushed in up to 10mm.	50-100
Very Stiff	VSt	Readily indented by thumb nail. Slight indentation produced by pushing pick into soil.	100-200
Hard	H	Difficult to indent with thumb nail. Requires power tools for excavation.	>200

## STRUCTURE/OTHER FEATURES

The soil structure is generally applicable to cohesive soils and mainly refers to the presence or absence of joints and layering. Typical terms use are intact (no joints), fissured (closed joints), shattered (open joints), slickensided (polished joints indicative of movement), and stratified/laminated. In addition, the presence of other features (ferricrete nodules, timber inclusions) should also be noted as applicable.

For granular soils, an assessment of grading (well, uniform or poor), particle size (fine, medium etc.) and angularity and shape may also be given.

## SOIL TYPE

The soil is described in terms of its estimated grain size composition and the tactile behaviour (plasticity of any fines (less than \*0.06 mm)). This system does not differentiate on grading below 0.06 mm, in accordance with the Unified Soil Classification (USC) procedure.

However, in some situations a soil can exhibit different characteristics between the undisturbed and disturbed/remolded condition (eg. 'sand' sized particles which break down a clay). The Soil Type generally relates to the latter state but the former condition should be noted where applicable.

Furthermore, as most natural soils frequently are combinations of various constituents, the primary soil is described and modified by minor components. In brief, the system is as follows:-

Coarse Grained Soils		Fine Grained Soils	
% Fines	Modifier	% Coarse	Modifier
<5	omit, or use "trace"	<15	omit, or use "trace"
5-12	describe as "with clay/silt" as applicable	15-30	described as "with sand/gravel" as applicable
>12	prefix soil as "silty/clayey" as applicable	>30	prefix soil as "sandy/gravelly" as applicable

(\*The 200# sieve (0.075 mm) is commonly used in practice to differentiate between fine and coarse grained soils).

Note: For soils containing both sand and gravel the minor coarse fraction is omitted if less than 15%, or described as "with sand/gravel" as applicable when greater than 15%.

The appropriate USC symbol may also be given after the soil type description in accordance with ASTM D2487 and D2488.

## ORIGIN

An attempt is made, where possible, to assess origin (transported, residual, pedogenic, or fill etc.) since this assists in the judgement of probable engineering behaviour. This assessment is generally restricted to field logging activities. An interpretation of landform is a useful guide to the origin of transported soils (e.g. colluvium, talus, slide debris, slope wash, alluvium, lacustrine, estuarine, aeolian and littoral deposits) while local geology and remnant fabric will assist identification of residual soils.

**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH01**

**SHEET 1 OF 1**

**Position :** 307009.6 E 6185046.1 N M.G.A      **Surface RL:** 5.69m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 7/9/2018      **Date Completed :** 7/9/2018      **Logged by :** JM      **Date:**

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
0.15 (5.54)	AD			0.15 (5.54)		GP	CONCRETE	SM	MD-D	PID reading: <2.0 ppm no odour
1.20 (4.49)				1.20 (4.49)		SP	Gravelly SAND, dark grey, fine to coarse sand, fine to coarse sub-angular gravel, some silt (FILL)	M	MD	PID reading: <2.0 ppm no odour
							lenses of high plasticity clay			PID reading: <2.0 ppm no odour
										PID reading: <2.0 ppm no odour
4.60 (1.09)				4.60 (1.09)		SP	SAND, pale brown, yellow, medium to coarse, trace of fine gravel, silt (possible alluvium)	M	MD	PID reading: <2.0 ppm no odour groundwater inflow at 5.0m
7.00 (-1.31)				7.00 (-1.31)		SM	Silty SAND, dark brown, grey, fine to coarse sand, trace of fine gravel (estaurine)	W	D	PID reading: <2.0 ppm no odour
8.00 (-2.31)				8.00 (-2.31)			End of borehole at 8 metres. Target Depth			PID reading: <2.0 ppm no odour

See standard sheets for details of abbreviations & basis of descriptions



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**Job No.**

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH02**

**SHEET 1 OF 1**

<b>Position :</b> 307020.4 E 6185008.8 N M.G.A	<b>Surface RL:</b> 5.74m	<b>Angle from Horiz. :</b> 90°	<b>Processed :</b> KN
<b>Rig Type :</b> RR510	<b>Mounting:</b> Trailer	<b>Contractor :</b> BG Drilling	<b>Driller :</b> JE
<b>Date Started :</b> 23/8/2018	<b>Date Completed :</b> 23/8/2018	<b>Logged by :</b> IL	<b>Date:</b> 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL				BOREHOLE				
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
0 1 2 3 4 5 6 7 8	AD	HQ		0.15 (5.59)	[Concrete pattern]	SP	CONCRETE	M	MD-D	PID reading: 1.2 ppm no odour		Grout backfill
				0.40 (5.34)	[Gravel pattern]	GW	SANDY GRAVEL, light brown, fine to coarse grained angular to sub-angular gravel, fine to coarse sand, trace of low plasticity brown clay (FILL)	SM	D	PID reading: 0.7 ppm no odour heavy resistance on auger at 0.7m		
				1.00 (4.74)	[Sand pattern]	SP	slow progress SAND, brown, fine to medium grained (FILL) colour change to pale brown	M	MD-D	PID reading: 0.5 ppm no odour		
				4.20 (1.54)	[Clayey sand pattern]	SP	colour change to orange brown, some shell fragments Clayey SAND, black, dark grey, fine to coarse grained, medium to high plasticity clay, trace of silt, shell fragments (possible alluvium)	W	MD	groundwater inflow at 4.2m PID reading: 0.9 ppm no odour		
				4.45 (1.29)	[Clayey sand pattern]	SP	SAND, brown, fine to coarse grained, some shell fragments (possible alluvium)	W	D	PID reading: 0.7 ppm no odour		
				5.00 (0.74)	[Sand pattern]		SAND, brown, fine to coarse grained, some shell fragments (possible alluvium) Hole continued using wash boring to target depth.					
				6.07 (-0.33)			End of borehole at 6.07 metres. Target Depth					

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH03**

**SHEET 1 OF 1**

**Position :** 307024.1 E 6184971.0 N M.G.A      **Surface RL:** 5.84m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 23/8/2018      **Date Completed :** 23/8/2018      **Logged by :** IL      **Date:** 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL				BOREHOLE				
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
0 1 2 3 4 5 6 7 8	AD	HQ casing		0.10 (5.74)	[Cross-hatched]	SP	CONCRETE	SM	MD-D	PID reading: 1.4 ppm no odour	[Cross-hatched]	Grout backfill
				0.40 (5.44)	[Diagonal lines]	GW	SANDY GRAVEL, pale grey, brown, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace of low to medium plasticity clay (FILL)	M	D	PID reading: 1.5 ppm no odour	[Diagonal lines]	
				1.00 (4.84)	[Cross-hatched]	SP	SAND, brown, orange, fine to medium grained, trace of shell fragments (FILL)	M	MD-D	PID reading: 0.5 ppm no odour	[Cross-hatched]	Sand Backfill
					[Diagonal lines]	ES	trace of thin (20mm) layers of fine gravel, shell fragments, silt			PID reading: 0.5 ppm no odour	[Diagonal lines]	
				4.00 (1.84)	[Dotted]	SP	SAND, pale brown, change to fine to coarse grained sand, trace of shell fragments (possible alluvium)	VM	W	PID reading: 1.3 ppm no odour groundwater inflow at 4.0m, collapsing sand	[Dotted]	Sand
	Washbore			5.00 (0.84)			Hole continued using wash boring to target depth.				[Dotted]	Slotted 50mm PVC
6.85 (-1.01)						End of borehole at 6.85 metres. Target Depth						

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH04**

**SHEET 1 OF 1**

**Position :** 307053.3 E 6184728.0 N M.G.A      **Surface RL:** 5.78m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 6/9/2018      **Date Completed :** 6/9/2018      **Logged by :** JM      **Date:**

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
0	AD	Nil					SP	Gravelly SAND, black, fine to coarse grained sand, fine to coarse angular to sub-angular gravel, some silt (FILL)	D	MD-D	
1				ES	0.90 1.00 (4.88) (4.78)		SP	CONCRETE SAND, dark brown, fine to coarse grained sand, some fine to coarse coal gravel, trace of silt (FILL)	M	MD	
2				ES				iron stained sand becoming orange, dark brown			PID reading: <2.0 ppm no odour
3	PT			ES +QC13 +QC13a							PID reading: <2.0 ppm no odour
4				ES							PID reading: <2.0 ppm no odour
5				ES	5.00 (0.78)			End of borehole at 5 metres. Target Depth	W		PID reading: <2.0 ppm no odour
6											
7											
8											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH05**

**SHEET 1 OF 2**

**Position :** 307095.9 E 6184689.3 N M.G.A      **Surface RL:** 5.77m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 30/8/2018      **Date Completed :** 31/8/2018      **Logged by :** JM      **Date:**

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
0	AD				0.05 (5.72)		SP	CONCRETE SAND, brown, fine to medium grained, trace of fine to coarse grained angular to sub-angular gravel, some silt (FILL)	M	MD	PID reading: <2.0 ppm no odour
1				ES							PID reading: <2.0 ppm no odour
2				ES							PID reading: <2.0 ppm no odour
3	PT			ES							PID reading: <2.0 ppm no odour
4		HQ casing		ES				trace of fine black sand bands			PID reading: <2.0 ppm no odour
5				ES	4.60 (1.17)		SP	SAND, brown, fine to medium grained, trace of fine to coarse grained angular to sub-angular gravel, some silt trace of high plasticity clay lenses (possible alluvium)	W	D	PID reading: <2.0 ppm no odour
6											
7	WB + PT			ES + QC11 + QC11a							PID reading: <2.0 ppm no odour
8											

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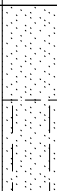


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<b>Client :</b> Australian Industrial Energy		<b>HOLE No. GBH05</b>	
<b>Project :</b> East Coast Gas Pipeline		<b>SHEET 2 OF 2</b>	
<b>Location :</b> Port Kembla Coal Terminal, Port Kembla NSW			
<b>Position :</b> 307095.9 E 6184689.3 N M.G.A	<b>Surface RL:</b> 5.77m	<b>Angle from Horiz. :</b> 90°	<b>Processed :</b> JM
<b>Rig Type :</b> RR510	<b>Mounting:</b> Trailer	<b>Contractor :</b> BG Drilling	<b>Driller :</b> JE
<b>Date Started :</b> 30/8/2018		<b>Date Completed :</b> 31/8/2018	
		<b>Logged by :</b> JM	<b>Date:</b>

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
9	WB + PT ↓	HQ casing		ES + QC12	8.50 (-2.74) 9.00 (-3.24)		SM	Silty SAND, dark brown, fine to medium grained, trace of fine gravel, shells (estaurine)	W	D	PID reading: <2.0 ppm no odour
								End of borehole at 9 metres. Target Depth			
10											
11											
12											
13											
14											
15											
16											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH06**

**SHEET 1 OF 2**

**Position :** 307087.9 E 6184656.8 N M.G.A      **Surface RL:** 6.71m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 29/8/2018      **Date Completed :** 30/8/2018      **Logged by :** JM      **Date:**

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL				BOREHOLE		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Description	Moisture Condition	Consistency / Density Index	Comments/ Observations	Components	
1 2 3 4 5 6 7 8	AD			0.80 (5.91)	Gravelly SAND, black, fine to coarse grained sand, fine to coarse angular to sub-angular gravel, trace of silt (FILL)	D	MD-D	PID reading: <2.0 ppm no odour	Grout backfill	
	PT				SAND, pale brown, fine to coarse grained, trace of silt, fine to coarse gravel (FILL)	M	MD	PID reading: <2.0 ppm no odour	Sand Backfill	
					trace of brown, black fine sand, layered shell fragments			PID reading: <2.0 ppm no odour	Bentonite	
								PID reading: <2.0 ppm no odour		
								PID reading: <2.0 ppm no odour		
								PID reading: <2.0 ppm no odour		
					5.50 (1.21)	SAND, pale brown, medium to coarse grained, trace of silt, fine to coarse gravel, shell fragments (possible alluvium)	W	MD-D	PID reading: <2.0 ppm no odour	Slotted 50mm PVC
								PID reading: <2.0 ppm no odour	Sand	

See standard sheets for details of abbreviations & basis of descriptions



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<b>Client :</b> Australian Industrial Energy		<b>HOLE No. GBH06</b>	
<b>Project :</b> East Coast Gas Pipeline		<b>SHEET 2 OF 2</b>	
<b>Location :</b> Port Kembla Coal Terminal, Port Kembla NSW			
<b>Position :</b> 307087.9 E 6184656.8 N M.G.A	<b>Surface RL:</b> 6.71m	<b>Angle from Horiz. :</b> 90°	<b>Processed :</b> JM
<b>Rig Type :</b> RR510	<b>Mounting:</b> Trailer	<b>Contractor :</b> BG Drilling	<b>Driller :</b> JE
<b>Date Started :</b> 29/8/2018		<b>Date Completed :</b> 30/8/2018	
		<b>Logged by :</b> JM	<b>Date:</b>

DRILLING				MATERIAL				BOREHOLE				
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
9	WB +PT	HQ casing		9.00 (-2.29)		CH	SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	W	MD-D	PID reading: <2.0 ppm no odour		
10				10.00 (-3.29)			CLAY, brown, grey, high plasticity, trace of rounded cobbles, gravel, fine to coarse sand (possible estaurine)	W	D	PID reading: <2.0 ppm no odour		
							End of borehole at 10 metres. Target Depth					
11												
12												
13												
14												
15												
16												

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**Job No.**  
2127477

**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH07**

**SHEET 1 OF 2**

**Position :** 306925.7 E 6185039.8 N M.G.A      **Surface RL:** 5.39m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 10/9/2018      **Date Completed :** 10/9/2018      **Logged by :** JM      **Date:**

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength		Moisture Condition	Consistency / Density Index
0	AD							Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular, fine to coarse grained sand, trace silt (FILL)	M	MD-D	PID reading: <2.0 ppm no odour
1				ES	0.70 (4.69)		SP	SAND, brown, fine to coarse, trace of fine gravel, silt (FILL)	M	MD	PID reading: <2.0 ppm no odour
2				ES				trace of shell fragments			PID reading: <2.0 ppm no odour
3	PT			ES							PID reading: <2.0 ppm no odour
4				ES	3.50 (1.89)		SP	SAND, pale brown, yellow, fine to coarse, trace of fine gravel, silt (possible alluvium)	M	MD-D	PID reading: <2.0 ppm no odour
5				ES					W		PID reading: <2.0 ppm no odour
6											
7	WB + PT			ES							PID reading: <2.0 ppm no odour
8											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH07**

**SHEET 2 OF 2**

**Position :** 306925.7 E 6185039.8 N M.G.A      **Surface RL:** 5.39m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 10/9/2018      **Date Completed :** 10/9/2018      **Logged by :** JM      **Date:**

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition		Consistency / Density Index
9	WB + PT			ES	9.00 (-3.61)			End of borehole at 9 metres. Target Depth	M	MD-D	
10											
11											
12											
13											
14											
15											
16											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH08**

**SHEET 1 OF 1**

**Position :** 306958.0 E 6185045.1 N M.G.A      **Surface RL:** 5.70m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 23/8/2018      **Date Completed :** 23/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL									
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition	Consistency / Density Index	Comments / Observations		
1 2 3 4 5 6 7 8	AD	Nil		ES	0.10 (5.60)		GW	ASPHALT Sandy GRAVEL, black, dark grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace of low to medium plasticity clay (FILL)	M	MD-D	PID reading: 0.9 ppm no odour		
				ES	1.00 (4.70)		SP	SAND, brown, fine to coarse grained, trace of shell fragments, pebbles (FILL)  colour change to pale brown	M	L-MD	PID reading: 0.5 ppm no odour		
				ES						trace black silt in thin (<0.5mm) irregular spaced (50-300mm) layers			PID reading: 0.3 ppm no odour
				ES									PID reading: 0.5 ppm no odour
				ES									
	PT			ES	4.70 (1.00) 5.00 (0.70)		SP	SAND, brown, medium to coarse grained, trace of shell fragments, gravel (possible alluvium)	W	MD	groundwater inflow at 4.8m		
								End of borehole at 5 metres. Target Depth					

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH09**

**SHEET 1 OF 1**

**Position :** 306962.0 E 6185009.7 N M.G.A      **Surface RL:** 5.94m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 23/8/2018      **Date Completed :** 23/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
1 2 3 4 5	AD	Nil		0.10 (5.84)	[Cross-hatched]	GW	CONCRETE	M	MD-D	PID reading: 0.7 ppm no odour
				0.75 (5.19)	[Cross-hatched]	GW	Sandy GRAVEL, pale green, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	D-VD	PID reading: 3.8 ppm no odour heavy resistance on auger at 1.0m
				1.30 (4.64)	[Cross-hatched]	SP	SAND, pale brown, fine to medium grained, trace of shell fragments (FILL)	M	MD	
				4.30 (1.64)	[Cross-hatched]	SP	Silty CLAY/Silty SAND, grey, orange, black, medium plasticity clay, fine to coarse sand (FILL)	W	F-MD	groundwater inflow at 4.3m
				4.50 (1.44)	[Cross-hatched]	SP	SAND, pale brown, fine to coarse grained, trace of shell fragments (possible alluvium)	W	L-MD	PID reading: 0.6 ppm no odour
5				5.00 (0.94)	[Dotted]		End of borehole at 5 metres. Target Depth			

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH10**

**SHEET 1 OF 1**

**Position :** 306967.3 E 6184983.1 N M.G.A      **Surface RL:** 6.11m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 24/8/2018      **Date Completed :** 24/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL				Comments/ Observations					
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index			
1 2 3 4 5 6 7 8	AD	Nil		ES + QC8 + QC8a	0.10 (6.01)	GW	ASPHALT Sandy GRAVEL, pale green, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	SM	D	PID reading: 0.7 ppm no odour			
				ES	0.60 (5.51)	GW	Sandy GRAVEL, black, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	D-VD	PID reading: 1.0 ppm no odour			
					1.30 (4.81)	SP	SAND, pale brown, fine to medium grained, trace of shell fragments (FILL)	M	MD				
										trace of black, orange silt			PID reading: 0.7 ppm no odour
										trace of black, orange silt thin (<10mm) layer of black silty clay trace of black, orange silt			
				ES	4.50 (1.61)	SP	layer of clayey silt, black SAND, pale brown, yellow, fine to coarse grained, trace of shell fragments (possible alluvium)	W	MD	PID reading: 0.8 ppm no odour groundwater inflow at 4.5m			
					5.00 (1.11)		End of borehole at 5 metres. Target Depth						

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH11**

**SHEET 1 OF 1**

**Position :** 306959.3 E 6184883.0 N M.G.A      **Surface RL:** 5.84m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 24/8/2018      **Date Completed :** 24/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
0.05 (5.79)	AD			ES	0.05 (5.79)		GW	ASPHALT	M	MD-D	PID reading: 1.2 ppm no odour
							GW	Sandy GRAVEL, brown, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	D-VD	
0.30 (5.54)					0.30 (5.54)			Sandy GRAVEL, black, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)			
1.60 (4.24)				ES	1.60 (4.24)		SP	SAND, pale brown, fine to medium grained, trace of shell fragments (FILL)	M	MD	PID reading: 1.0 ppm no odour
				ES				colour change to pale brown, some pale grey medium plasticity clay			PID reading: 1.1 ppm no odour
		Nil						colour change to brown	VM		
3.90 (1.94)					3.90 (1.94)		SP	SAND, pale brown, fine to medium grained, trace of shell fragments, trace thin (<20mm) of black silt, trace of fine to medium grained black, orange gravels (possible alluvium)	VM	MD	
5.20 (0.64)				ES	5.20 (0.64)			5.0m to 5.1m: layer of dark grey medium plasticity clay, some silt, sand	W		groundwater inflow at 5.0m PID reading: 1.1 ppm no odour
								End of borehole at 5.2 metres. Target Depth			

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH12**

**SHEET 1 OF 1**

**Position :** 306985.9 E 6184893.7 N M.G.A      **Surface RL:** 6.28m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 27/8/2018      **Date Completed :** 27/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
0.05 (6.23)	AD			0.05 (6.23)		GW	ASPHALT Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace of silt (FILL)	M	D	PID reading: <2.0 ppm no odour
0.85 (5.43)				0.85 (5.43)		SP	SAND, pale brown, fine to coarse grained, trace of silt, fine to coarse angular to sub-angular gravel (FILL)	M	MD	PID reading: <2.0 ppm no odour
		Nil					some silt and clay pockets			PID reading: <2.0 ppm no odour
	PT									PID reading: <2.0 ppm no odour
										PID reading: <2.0 ppm no odour
										PID reading: <2.0 ppm no odour
5.00 (1.28)				5.00 (1.28)			End of borehole at 5 metres. Target Depth	W		PID reading: <2.0 ppm no odour

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH13**

**SHEET 1 OF 1**

**Position :** 306915.0 E 6184925.9 N M.G.A      **Surface RL:** 4.94m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 22/8/2018      **Date Completed :** 22/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations			
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index	
1 2 3 4 5 6 7 8	AD	Nil		ES	0.10 (4.84)		GW	ASPHALT Sandy GRAVEL, grey, fine to coarse grained sub-angular gravel, fine to coarse grained sand (FILL)	SM	D	PID reading: 0.8 ppm no odour	
				ES	1.20 (3.74)		SP	SAND, brown, fine to coarse grained, trace of fine gravel (FILL)	SM	MD	PID reading: 1.0 ppm no odour PID reading: 1.2 ppm no odour	
				ES				trace of black fine to coarse grained sand, silt, charcoal		M	PID reading: 0.8 ppm no odour	
				ES	4.00 (0.94)		SP	SAND, brown, fine to coarse grained, trace of fine gravels, trace of shell fragments (possible alluvium)		W	MD	PID reading: 1.1 ppm no odour
				ES								groundwater inflow at 4.5m PID reading: 0.8 ppm no odour
				ES								PID reading: 0.9 ppm no odour
					6.50 (-1.56)			End of borehole at 6.5 metres. Target Depth				

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**BOREHOLE LOG SHEET**


**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH14**

**SHEET 1 OF 1**

**Position :** 306992.3 E 6184825.1 N M.G.A      **Surface RL:** 6.10m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** Scout      **Mounting:** Truck      **Contractor :** BG Drilling      **Driller :** Tim      **Checked :** CQ  
**Date Started :** 10/9/2018      **Date Completed :** 10/9/2018      **Logged by :** JM      **Date:**

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DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition		Consistency / Density Index
1	AD	Nil			1.00 (5.10)		GP	Sandy GRAVEL, grey, fine to coarse, angular to sub-angular, fine to coarse sand, trace silt (FILL)	M	MD-D	
2				ES							PID reading: <2.0 ppm no odour
3	PT			ES + QC16							PID reading: <2.0 ppm no odour
4				ES							PID reading: <2.0 ppm no odour
5				ES	5.00 (1.10)				W		PID reading: <2.0 ppm no odour
					End of borehole at 5 metres. Target Depth						
6											
7											
8											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH15**

**SHEET 1 OF 1**

**Position :** 306992.3 E 6184825.1 N M.G.A      **Surface RL:** 5.89m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 27/8/2018      **Date Completed :** 27/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
0	AD					GW	Sandy GRAVEL, black, fine to coarse angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	D	
1				0.80 (5.09)		SP	SAND, brown, fine to coarse grained, trace of silt, fine to coarse angular to sub-angular gravel (FILL)	M	MD	PID reading: <2.0 ppm no odour
2							colour change to pale brown			PID reading: <2.0 ppm no odour
3										PID reading: <2.0 ppm no odour
4							trace of silt bands, fine grained brown sand			PID reading: <2.0 ppm no odour
5				4.50 (1.39)		SP	SAND, brown, medium to coarse grained, trace of silt, fine to coarse angular to sub-angular gravel (possible alluvium)	W	MD	PID reading: <2.0 ppm no odour
5				5.00 (0.89)			End of borehole at 5 metres. Target Depth			
6										
7										
8										

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH16**

**SHEET 1 OF 2**

**Position :** 306943.8 E 6185018.0 N M.G.A      **Surface RL:** 5.69m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** Scout      **Mounting:** Truck      **Contractor :** BG Drilling      **Driller :** Tim      **Checked :**  
**Date Started :** 12/9/2018      **Date Completed :** 12/9/2018      **Logged by :** JM      **Date:**

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DRILLING					MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index	
0.10 (5.59)							GP	CONCRETE	M	MD-D	PID reading: <2.0 ppm no odour	
1.20 (4.49)				ES			SP	SAND, pale brown, yellow, fine to coarse grained sand, trace of fine gravel, silt, shell fragments (FILL)	M	MD		PID reading: <2.0 ppm no odour
5.50 (0.19)				ES			SP	SAND, pale brown, yellow, medium to coarse grained sand, trace of fine gravel, silt, shell fragments (possible alluvium)	W	MD		PID reading: <2.0 ppm no odour
0-1	AD											
1-3	PT											
3-5		HQ casing										
5-7												
7-8	WB + PT											

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**Job No.**  
**2127477**

**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH16**

**SHEET 2 OF 2**

**Position :** 306943.8 E 6185018.0 N M.G.A      **Surface RL:** 5.69m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** Scout      **Mounting:** Truck      **Contractor :** BG Drilling      **Driller :** Tim      **Checked :**  
**Date Started :** 12/9/2018      **Date Completed :** 12/9/2018      **Logged by :** JM      **Date:**

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DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition		Consistency / Density Index
9	WB + PT ↓	HQ casing						trace layered shell fragments	W	MD	
10				ES	10.00 (-4.31)			End of borehole at 10 metres. Target Depth			PID reading: <2.0 ppm no odour
11											
12											
13											
14											
15											
16											

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**BOREHOLE LOG SHEET**

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**Client :** Australian Industrial Energy

**HOLE No. GBH17**

**Project :** East Coast Gas Pipeline

**SHEET 1 OF 1**

**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**Position :** 306943.8 E 6185018.0 N M.G.A

**Surface RL:** 5.61m

**Angle from Horiz. :** 90°

**Processed :** KN

**Rig Type :** RR510

**Mounting:** Trailer

**Contractor :** BG Drilling

**Driller :** JE

**Checked :** CQ

**Date Started :** 27/8/2018

**Date Completed :** 27/8/2018

**Logged by :** JM

**Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
1	AD			ES	0.80 (4.81)		GW	Gravelly SAND, dark brown, fine to coarse grained, fine to coarse angular gravel, trace of silt (FILL)	M	D	PID reading: <2.0 ppm no odour
2				ES			SP	SAND, brown, grey, fine to coarse grained, trace of gravel, silt, shell fragments (FILL)	M	MD-D	PID reading: <2.0 ppm no odour
3	PT	Nil		ES							PID reading: <2.0 ppm no odour
4				ES	3.40 (2.21)		SP	SAND, brown, grey, fine to coarse grained, trace of gravel, trace of thin (<10mm) black silty sand bands, shell fragments (possible alluvium)	M	MD	PID reading: <2.0 ppm no odour
5				ES	5.00 (0.61)				W		groundwater inflow at 4.4m PID reading: <2.0 ppm no odour
5								End of borehole at 5 metres. Target Depth			
6											
7											
8											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH18**

**SHEET 1 OF 1**

**Position :** 307001.3 E 6184726.2 N M.G.A      **Surface RL:** 5.46m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 28/8/2018      **Date Completed :** 28/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
0	AD						SP	Gravelly SAND, brown, fine to coarse grained, fine to coarse angular gravel, some silt (FILL)	W	D	
1				ES	0.90 (4.56)		SP	SAND, pale brown, fine to coarse grained, trace of fine grained sub-angular gravel, shell fragments (FILL)	M	MD	PID reading: <2.0 ppm no odour
2				ES							PID reading: <2.0 ppm no odour
3	PT	Nil		ES							PID reading: <2.0 ppm no odour
4				ES							PID reading: <2.0 ppm no odour
5				ES	5.00 (0.46)			trace of wood, silt, charcoal	W		PID reading: <2.0 ppm no odour
5								End of borehole at 5 metres. Target Depth			
6											
7											
8											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH19**

**SHEET 1 OF 1**

**Position :** 307012.2 E 6184686.8 N M.G.A      **Surface RL:** 5.36m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 27/8/2018      **Date Completed :** 27/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING				MATERIAL				Comments/ Observations					
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index			
1 2 3 4 5 6 7 8	AD	Nil		0.00		SP	CONCRETE	W	D	PID reading: <2.0 ppm no odour			
				1.40 (3.96)		SP	SAND, pale brown, fine to coarse grained, trace of silt (FILL)	M	MD-D		PID reading: <2.0 ppm no odour		
						ES							PID reading: <2.0 ppm no odour
						ES							PID reading: <2.0 ppm no odour
						ES							PID reading: <2.0 ppm no odour
	PT			4.50 (0.86)		SP	SAND, pale brown, grey, fine to coarse grained, trace of silt (possible alluvium)	W	MD	groundwater inflow at 4.5m PID reading: <2.0 ppm no odour			
				5.00 (0.36)				End of borehole at 5 metres. Target Depth			no odour		

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH20**

**SHEET 1 OF 2**

**Position :** 307005.2 E 6184629.0 N M.G.A      **Surface RL:** 4.073<<C4.073      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** Scout      **Mounting:** Truck      **Contractor :** BG Drilling      **Driller :** Tim      **Checked :** CQ  
**Date Started :** 10/9/2018      **Date Completed :** 10/9/2018      **Logged by :** JM      **Date:**

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
1	AD	PT	Hq casing	ES	0.50	[Cross-hatched pattern]	GP	Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular, fine to coarse grained sand, trace of silt (FILL)	M	MD-D	PID reading: <2.0 ppm no odour
							SP	SAND, brown, fine to coarse grained, trace of silt, trace fine to coarse gravel, shell fragments (FILL)	M	L-MD	
2				ES							PID reading: <2.0 ppm no odour
3				ES							PID reading: <2.0 ppm no odour
4				ES							PID reading: <2.0 ppm no odour
5				ES	5.00	[Dotted pattern]	SP	SAND, brown, fine to coarse grained, trace of silt, trace fine to coarse gravel, shell fragments (possible alluvium)	W	MD-D	groundwater inflow at 4.5m PID reading: <2.0 ppm
6											
7				ES							no odour PID reading: <2.0 ppm
8											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH20**

**SHEET 2 OF 2**

**Position :** 307005.2 E 6184629.0 N M.G.A      **Surface RL:** 4.073<<C4.073      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** Scout      **Mounting:** Truck      **Contractor :** BG Drilling      **Driller :** Tim      **Checked :** CQ  
**Date Started :** 10/9/2018      **Date Completed :** 10/9/2018      **Logged by :** JM      **Date:**

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DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition		Consistency / Density Index
9	PT ↓ HQ casing			ES	9.00				W	MD-D	no odour PID reading: <2.0 ppm
								End of borehole at 9 metres. Target Depth			
10											
11											
12											
13											
14											
15											
16											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH21**

**SHEET 1 OF 1**

**Position :** 307005.2 E 6184629.0 N M.G.A      **Surface RL:** 4.65m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 22/8/2018      **Date Completed :** 22/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING				MATERIAL				Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
1	AD					GW	Sandy GRAVEL, brown, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace of silt, clay (FILL)	SM	MD	PID reading: 0.8 ppm no odour
1.40 (3.25)				ES		SP	Silty SAND, brown, fine to medium grained sand, trace of clay (FILL)	M	MD	PID reading: 0.6 ppm no odour
2.20 (2.45)				ES		SP	SAND, brown, fine to medium grained, trace of silt, fine to coarse grained angular to sub-angular gravel (FILL)	M	D	
4.00 (0.65)				ES		SP	SAND, brown, fine to medium grained, trace of silt, gravel, shell fragments, black silt layers (possible alluvium)	W	D	PID reading: 0.9 ppm no odour groundwater inflow at 4.0m
5.00 (-0.35)				ES			End of borehole at 5 metres. Target Depth			PID reading: 2.1 ppm no odour

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**BOREHOLE LOG SHEET**


**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH22**

**SHEET 1 OF 1**

**Position :** 306994.3 E 6184656.8 N M.G.A      **Surface RL:** 4.60m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 22/8/2018      **Date Completed :** 22/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
1 2 3 4 5 6 7 8	AD/T / PT PT N/A N/A N/A	N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A	ES ES ES ES ES	2.50 (2.10) 5.50 (-0.90)		SP SP SP	Gravelly SAND, brown, grey, fine to coarse grained sand, fine to coarse grained angular to sub-angular gravel, trace of silt, clay (FILL)	SM	D	PID reading: 0.9 ppm no odour  insufficient sample retrieved from push tube due to cobbles
								trace of cobbles			
								SAND, brown, fine to coarse grained, trace of fine angular to sub-angular gravels (FILL)	M	MD	PID reading: 0.8 ppm no odour
								trace of black sand, fine to medium grained (probable heavy mineral sands)			
								End of borehole at 5.5 metres. Target Depth	W	groundwater inflow at 4.1m PID reading: 1.0 ppm no odour	

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH23**

**SHEET 1 OF 2**

**Position :** 306978.9 E 6184711.9 N M.G.A      **Surface RL:** 4.54m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :**  
**Date Started :** 11/9/2018      **Date Completed :** 11/9/2018      **Logged by :** JM      **Date:**

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DRILLING				MATERIAL					Comments/ Observations				
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index			
1	AD	HQ casing	PT	0.20 (4.34)	[Cross-hatched pattern]	ES	Gravelly SAND, brown, fine to coarse grained angular to sub-angular gravel, trace of silt, coal (FILL)	D	D	PID reading: <2.0 ppm			
				1.00 (3.54)	[Cross-hatched pattern]	SP	Gravelly SAND, black, fine to coarse sand, fine to coarse angular to sub-angular gravel (FILL)	M	MD-D				
													no odour PID reading: <2.0 ppm
													no odour PID reading: <2.0 ppm
2							SAND, brown, fine to coarse sand, trace of fine gravel, silt (FILL)	M	MD				
3							trace of shell fragments						
4													
5				4.50 (0.04)	[Dotted pattern]	SP	SAND, brown, fine to coarse sand, trace of fine gravel, silt, shell fragments (possible alluvium)	W	MD				
6													
7													
8													

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<b>Client :</b> Australian Industrial Energy		<b>HOLE No. GBH23</b>	
<b>Project :</b> East Coast Gas Pipeline		<b>SHEET 2 OF 2</b>	
<b>Location :</b> Port Kembla Coal Terminal, Port Kembla NSW			
<b>Position :</b> 306978.9 E 6184711.9 N M.G.A	<b>Surface RL:</b> 4.54m	<b>Angle from Horiz. :</b> 90°	<b>Processed :</b> KN
<b>Rig Type :</b> RR510	<b>Mounting:</b> Trailer	<b>Contractor :</b> BG Drilling	<b>Driller :</b> JE
<b>Date Started :</b> 11/9/2018		<b>Date Completed :</b> 11/9/2018	
		<b>Logged by :</b> JM	<b>Date:</b>

DRILLING					MATERIAL				Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength		Moisture Condition	Consistency / Density Index
9	PT ↓	HQ casing		ES					W	MD	PID reading: <2.0 ppm no odour
10				ES + QC18 + QC18a	10.00 (-5.46)			End of borehole at 10 metres. Target Depth			PID reading: <2.0 ppm no odour
11											
12											
13											
14											
15											
16											



**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH24**

**SHEET 1 OF 1**

**Position :** 306978.9 E 6184711.9 N M.G.A      **Surface RL:** 4.56m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 21/8/2018      **Date Completed :** 21/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
1	AD					SM	SILT, black, some fine to coarse sand, trace of fine to coarse sub-angular to sub-rounded gravel (FILL)	M	MD	PID reading: 0.9 ppm Coal reject no odour
2		Nil		1.65 (2.91)		SP	trace of medium plasticity clay SAND, pale brown, fine to coarse grained (fill)	M	L-MD	PID reading: 0.8 ppm no odour
4	PT			3.70 (0.86)		SP	SAND, brown, grey, fine to coarse grained (possible alluvium)	W	L-MD	groundwater inflow at 3.7m PID reading: 1.0 ppm no odour
5				5.00 (-0.44)			some fine to medium grained angular to sub-angular gravels, silt, shell fragments some silt, medium to high plasticity clay, trace of fine to medium grained angular to sub-angular gravel			PID reading: 0.8 ppm no odour PID reading: 0.7 ppm no odour
5							End of borehole at 5 metres. Target Depth			

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH25**

**SHEET 1 OF 1**

**Position :** 306969.1 E 6184762.6 N M.G.A      **Surface RL:** 5.68m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 27/8/2018      **Date Completed :** 27/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING				MATERIAL				Comments/ Observations			
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol		Description	Moisture Condition	Consistency / Density Index
1	AD			ES			SP	Gravelly SAND, grey, fine to coarse grained, fine to coarse angular to sub-angular gravel, trace of silt (FILL)	M	D	PID reading: <2.0 ppm no odour
1.50 (4.18)				ES			SP	SAND, pale brown, fine to coarse grained, trace of silt (FILL)	M	MD	PID reading: <2.0 ppm no odour
3	PT	Nil		ES							PID reading: <2.0 ppm no odour
4				ES				trace of shell fragments			PID reading: <2.0 ppm no odour
5					5.00 (0.68)			End of borehole at 5 metres. Target Depth		W	

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**Job No.**  
**2127477**

**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH26**

**SHEET 1 OF 1**

**Position :** 306992.6 E 6184768.8 N M.G.A      **Surface RL:** 4.88m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 21/8/2018      **Date Completed :** 21/8/2018      **Logged by :** IL      **Date:** 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
1	AD	Nil		0.05 (4.83)		GW	ASPHALT	SM	MD-D	PID reading: 0.4 ppm no odour
				0.40 (4.48)		SP	Sandy GRAVEL, black, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace of coal fines / fragments (FILL)	M	L-MD	PID reading: 0.4 ppm no odour
2									L	PID reading: 0.4 ppm no odour
3	PT									PID reading: 0.6 ppm no odour
4							colour change to brown	VM	W	PID reading: 0.6 ppm no odour groundwater inflow at 4.0m
5				4.50 (0.38)		SP	Silty SAND, dark grey, fine to medium grained sand (possible alluvium)	W	L-MD	PID reading: 0.5 ppm no odour
				4.90 (-0.02)		SP	thin layer (10 mm thick) of black fine to medium grained angular to sub-angular gravel	W	L-MD	
				5.00 (-0.12)			layer (40 mm thick) of black, brown, fine to medium grained angular to sub-angular, shell fragments		MD	
							SAND, brown, orange, fine to coarse grained, shell fragments (possible alluvium)			
							End of borehole at 5 metres. Target Depth			

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**BOREHOLE LOG SHEET**




**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH27**

**SHEET 1 OF 2**

**Position :** 306952.2 E 6184807.9 N M.G.A      **Surface RL:** 4.93m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 28/8/2018      **Date Completed :** 28/8/2018      **Logged by :** JM      **Date:** 03/09/2018

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DRILLING					MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index	
1	AD	Nil		ES			SP	SAND, pale brown, fine to coarse grained sand, trace of silt, gravel, wood (FILL)  no wood present	M	MD	PID reading: <2.0 ppm no odour	
2				ES				trace of shell fragments, dark brown, black silty sand			PID reading: <2.0 ppm no odour	
3	PT				ES						PID reading: <2.0 ppm no odour	
4					ES	3.60 (1.33)		SP	SAND, pale brown, medium to coarse grained sand, trace of silt, gravel, (possible alluvium)	M W	MD	PID reading: <2.0 ppm no odour
5					ES							PID reading: <2.0 ppm no odour
6					ES							PID reading: <2.0 ppm no odour
7					ES							PID reading: <2.0 ppm no odour
8	WB + PT				ES	7.70 (-2.77)		SM	Silty SAND, brown, fine to coarse grained sand, trace of shell fragments, fine gravel (Possible Estaurine)	W	MD	PID reading: <2.0 ppm

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH27**

**SHEET 2 OF 2**

**Position :** 306952.2 E 6184807.9 N M.G.A      **Surface RL:** 4.93m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 28/8/2018      **Date Completed :** 28/8/2018      **Logged by :** JM      **Date:** 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition		Consistency / Density Index
9	WB + PT			ES					W	MD	no odour
9.50 (-4.57)							SM	Silty SAND, dark brown, fine to medium grained sand, trace of fine gravel, shell fragments (estaurine)	W	MD	PID reading: <2.0 ppm no odour
10				ES	10.00 (-5.07)			End of borehole at 10 metres. Target Depth			PID reading: <2.0 ppm no odour
11											
12											
13											
14											
15											
16											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH28**

**SHEET 1 OF 1**

**Position :** 306943.3 E 6184837.8 N M.G.A      **Surface RL:** 4.92m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 21/8/2018      **Date Completed :** 21/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
0.05 (4.87)	AD			ES	0.05 (4.87)		GW	ASPHALT Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	SM	MD-D	PID reading: 1.1 ppm no odour
1.00 (3.92)				ES	1.00 (3.92)		SP	SAND, brown, orange, fine to medium grained, trace of shell fragments (FILL)	M	MD	groundwater inflow at 3.9m  PID reading: 0.7 ppm no odour
		Nil		ES				colour change to pale brown, increasing coarse sand fraction		L-MD	PID reading: 0.9 ppm no odour
	PT			ES + QC4	4.20 (0.72)			thin layer (20mm thick) of increased shell, coal fragments 3.8m to 4.0m: layer of shell fragments, black fine to medium grained angular to sub-angular gravel, black silt	W		PID reading: 1.5 ppm no odour
					5.00 (-0.08)		SP	SAND, pale brown, fine to coarse grained, trace of shell fragments (possible alluvium)	W	MD	
								End of borehole at 5 metres. Target Depth			

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH29**

**SHEET 1 OF 1**

**Position :** 306928.2 E 6184877.7 N M.G.A      **Surface RL:** 4.91m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 21/8/2018      **Date Completed :** 21/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
1	AD			ES	0.05 (4.86)		GW	ASPHALT Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	MD	PID reading: 0.8 ppm no odour
					1.15 (3.76)		SP	SAND, brown, orange, fine to coarse grained (FILL)	M	L-MD	
					1.50 (3.41)		SP	Clayey SAND, grey, fine to medium grained sand, medium plasticity clay, trace of fine to coarse grained sub-angular to sub-rounded gravel (FILL)	M	MD	PID reading: 0.6 ppm
2				ES	1.90 (3.01)		SP	SAND, pale brown, fine to coarse grained, trace of shell fragments (FILL)	SM	L	no odour
				ES	2.60 (2.31)			colour change to brown, trace of medium to coarse fragments of bituminous coal (FILL)	M	L-MD	PID reading: 0.6 ppm no odour
3		Nil		ES	3.50 (1.41)		SP	thin layer (20mm) of black coal fragments and shell fragments SAND, pale brown, orange, fine to coarse grained, trace of shell fragments (possible alluvium)	M	MD	
4				ES	5.00 (-0.09)			colour change to brown, orange, increasing fine sand fraction	W		PID reading: 0.8 ppm no odour
5								End of borehole at 5 metres. Target Depth			
6											
7											
8											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH30**

**SHEET 1 OF 1**

**Position :** 306921.4 E 6184901.5 N M.G.A      **Surface RL:** 5.90m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 24/8/2018      **Date Completed :** 24/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
1 2 3 4 5	AD PT	Nil		ES	0.10 (5.80)			ASPHALT			PID reading: 2.0 ppm PID reading: 1.5 ppm no odour no odour
					0.30 (5.60)			Sandy GRAVEL, pale green, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	SM	MD-D	
					1.00 (4.90)			Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	D-VD	PID reading: 1.4 ppm no odour
					1.40 (4.50)		SP	Clayey Gravelly SAND, brown, fine to medium grained, low to medium plasticity clay, fine to coarse grained angular to sub-angular gravel, trace of shell fragments (FILL)	M	MD-D	
					3.80 (2.10)		SP	SAND, pale brown, fine to medium grained, trace of shell fragments (FILL)	M	MD	PID reading: 1.5 ppm no odour
5.00 (0.90)			trace of black silt	W	MD	PID reading: 1.0 ppm no odour					
								End of borehole at 5 metres. Target Depth			

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**BOREHOLE LOG SHEET**




**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH31**

**SHEET 1 OF 1**

**Position :** 306941.8 E 6184966.6 N M.G.A      **Surface RL:** 5.73m      **Angle from Horiz. :** 90°      **Processed :** JM  
**Rig Type :** Scout      **Mounting:** Truck      **Contractor :** BG Drilling      **Driller :** Tim      **Checked :**  
**Date Started :** 10/9/2018      **Date Completed :** 10/9/2018      **Logged by :** JM      **Date:**

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DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
0	AD				0.05 (5.68)		GP	CONCRETE Sandy GRAVEL, grey, fine to coarse angular to sub-angular gravel, fine to coarse sand, trace of silt (FILL)	M	MD-D	
1				ES							
2				ES	1.20 (4.53)		SP	SAND, dark brown, fine to medium grained sand, some silt, trace of fine gravel, clay (FILL)	M	MD	PID reading: <2.0 ppm no odour
3				ES							PID reading: <2.0 ppm no odour
4				ES				some coarse gravel			PID reading: <2.0 ppm no odour
5	PT			ES	5.00 (0.73)			End of borehole at 5 metres. Target Depth	W		PID reading: <2.0 ppm no odour
6											
7											
8											

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**Job No.**  
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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH32**

**SHEET 1 OF 1**

**Position :** 306941.8 E 6184966.6 N M.G.A      **Surface RL:** 5.58m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 23/8/2018      **Date Completed :** 23/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
1 2 3 4 5	AD PT	Nil		0.10 (5.48)		GW	ASPHALT			PID reading: 0.4 ppm no odour
				0.40 (5.18)		GW	Sandy GRAVEL, pale green, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	SM	MD-D	PID reading: 0.5 ppm no odour
				0.80 (4.78)		CL	Gravelly CLAY, black, dark grey, low to medium plasticity clay, fine to coarse grained angular to sub-angular gravel, trace of fine to coarse grained sand (FILL)	M	F-St	PID reading: 0.7 ppm no odour
				1.20 (4.38)		SP	SAND, pale brown, fine to medium grained, trace of shell fragments (FILL)	M	MD	
				4.20 (1.38)		SP	SAND, pale brown, yellow, fine to coarse grained, trace of shell fragments, black silt (possible alluvium)	W	L-MD	PID reading: 0.6 ppm no odour groundwater inflow at 4.2m
5.00 (0.58)							End of borehole at 5 metres. Target Depth			

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH33**

**SHEET 1 OF 1**

**Position :** 306932.5 E 6184992.9 N M.G.A      **Surface RL:** 4.93m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 20/8/2018      **Date Completed :** 20/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL				Comments/ Observations			
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index	
1 2 3 4 5 6 7 8	AD			0.85 0.20 (4.73)		GW SP	ASPHALT Sandy GRAVEL, black, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace coal, low to medium plasticity clay (FILL) SAND, brown, fine to medium grained, trace of shell fragments, trace of fine to coarse sub-angular to sub-rounded gravel (FILL)	M M	MD-D L MD	PID reading: 0.6 ppm no odour PID reading: 0.6 ppm no odour	
							trace pebbles of bituminous coal			PID reading: 0.5 ppm no odour	
										PID reading: 0.5 ppm no odour	
					3.20 (1.73)		SP	SAND, pale brown, fine to medium grained, trace of shell fragments, trace of fine to coarse sub-angular to sub-rounded gravel (possible alluvium)	M	MD	
								change to fine to coarse grained	W		groundwater inflow at 3.8m PID reading: 0.5 ppm no odour
				5.00 (-0.08)						PID reading: 0.6 ppm no odour	
							End of borehole at 5 metres. Target Depth				

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH34**

**SHEET 1 OF 1**

**Position :** 306895.5 E 6184993.8 N M.G.A      **Surface RL:** 4.83m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 20/8/2018      **Date Completed :** 20/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index
1	AD	Nil		ES	0.10 (4.73)		GW	ASPHALT	M	MD-D	PID reading: 0.8 ppm no odour
				ES + QC1	0.40 (4.43)		SP	Sandy GRAVEL, black, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace coal, low to medium plasticity clay (FILL)	M	L-MD	
2				ES				SAND, brown, orange, fine to medium grained, trace of fine to coarse sub-angular to sub-rounded gravel (FILL)			PID reading: 0.7 ppm no odour
								colour change to light grey, trace of shell fragments, fine to coarse grained angular to sub-angular gravel slag cobble encountered			
3	PT	Nil		ES				colour change to light brown, orange colour change to light grey, orange			PID reading: 0.7 ppm no odour
								trace slag pebbles			
5				ES	5.00 (-0.17)			End of borehole at 5 metres. Target Depth			PID reading: 0.9 ppm no odour

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH35**

**SHEET 1 OF 1**

**Position :** 306882.6 E 6185038.9 N M.G.A      **Surface RL:** 6.10m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 24/8/2018      **Date Completed :** 24/8/2018      **Logged by :** IL      **Date:** 03/09/2018

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DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength		Moisture Condition	Consistency / Density Index
1 2 3 4 5	AD PT	Nil		ES	0.05 (6.05)		GW	ASPHALT Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	D-VD	PID reading: 2.1 ppm no odour
				ES	0.60 (5.50)		ML	SILT, black, trace of fine to medium grained angular to sub-angular gravel (FILL)	M	MD-D	PID reading: 1.2 ppm
				ES	1.00 (5.10)		SP	SAND, pale brown, fine to medium grained, trace of shell fragments (FILL)  colour change to pale grey	M	MD	no odour
				ES				trace of pebbles  colour change to brown		L-MD	PID reading: 1.4 ppm no odour
				ES	4.00 (2.10)		SP	SAND, pale brown, yellow, fine to coarse grained, some shell fragments (possible alluvium)	VM	MD	
5				ES	5.00 (1.10)				W	PID reading: 1.4 ppm no odour	
								End of borehole at 5 metres. Target Depth			

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

**Job No.**

**2127477**


GEO BOREHOLE 2127477 BOREHOLE LOGS.GPJ GHD\_TEMPLATE.GDT 24/10/18

**BOREHOLE LOG SHEET**

GEO BOREHOLE 2127477 BOREHOLE LOGS.GPJ GHD\_GEO\_TEMPLATE.GDT 24/10/18

<b>Client :</b> Australian Industrial Energy		<b>HOLE No. GBH36</b>	
<b>Project :</b> East Coast Gas Pipeline		<b>SHEET 1 OF 1</b>	
<b>Location :</b> Port Kembla Coal Terminal, Port Kembla NSW			
<b>Position :</b> 306957.5 E 6184787.5 N M.G.A	<b>Surface RL:</b> 4.85m	<b>Angle from Horiz. :</b> 90°	<b>Processed :</b> KN
<b>Rig Type :</b> RR510	<b>Mounting:</b> Trailer	<b>Contractor :</b> BG Drilling	<b>Driller :</b> JE
<b>Date Started :</b> 21/8/2018		<b>Date Completed :</b> 21/8/2018	
		<b>Logged by :</b> IL	<b>Date:</b> 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index
1	AD	Nil	Groundwater Not Encountered	ES	0.15 (4.70)			Gravelly SAND, dark grey, fine to coarse grained sand, fine to coarse angular to sub-angular gravel, some pebbles, cobbles, slag, trace steel, concrete, wood (FILL) End of borehole at 0.15 metres. Refusal	D	VL-L	PID reading: 0.8 ppm no odour
2											
3											
4											

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH37**

**SHEET 1 OF 1**

**Position :** 306905.1 E 6184961.0 N M.G.A      **Surface RL:** 4.95m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 21/8/2018      **Date Completed :** 21/8/2018      **Logged by :** IL      **Date:** 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL					Comments/ Observations			
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index	
0 1 2 3 4 5 6 7 8	AD PT	Nil		ES	0.05 (4.90)	[Cross-hatched pattern]	GW	ASPHALT	SM	MD-D	no odour	
				ES	0.30 (4.65)	[Cross-hatched pattern]	SP	Sandy GRAVEL, grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand (FILL)	M	L-MD	PID reading: 0.6 ppm no odour	
				ES	1.90 (3.05)	[Cross-hatched pattern]	CL	CLAY, brown, orange mottled, medium plasticity, trace of fine to coarse grained sand (FILL)	M	St	PID reading: 0.5 ppm no odour	
				ES	2.10 (2.85)	[Cross-hatched pattern]	SP	SAND, pale brown, fine to medium grained, trace of shell fragments (FILL)	M	MD	PID reading: 0.6 ppm no odour	
				ES	2.4m to 2.6m	[Cross-hatched pattern]		2.4m to 2.6m: light brown/brown bands (20mm), trace pebble of bituminous coal			PID reading: 0.6 ppm no odour	
				ES		[Cross-hatched pattern]		colour change to brown				
				ES		[Cross-hatched pattern]		3.4m to 4.2m: irregular spaced dark brown/light brown sand bands				
				ES		[Cross-hatched pattern]					W	groundwater inflow at 3.8m PID reading: 0.6 ppm no odour
				ES	4.50 (0.45)	[Cross-hatched pattern]	SP	SAND, pale brown, medium to coarse grained, trace of shell fragments (possible alluvium)	W	MD	PID reading: 0.6 ppm no odour	
				ES	5.00 (-0.05)	[Cross-hatched pattern]						
								End of borehole at 5 metres. Target Depth				

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**BOREHOLE LOG SHEET**

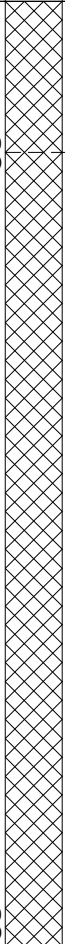
**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH38**

**SHEET 1 OF 1**

**Position :** 306991.0 E 6184866.1 N M.G.A      **Surface RL:** 6.30m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 27/8/2018      **Date Completed :** 27/8/2018      **Logged by :** JM      **Date:** 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL				Comments/ Observations				
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description		Moisture Condition	Consistency / Density Index		
1	AD	Nil		0.80 (5.50)		SP	Sandy GRAVEL, dark grey, fine to coarse grained angular to sub-angular gravel, fine to coarse grained sand, trace of silt (FILL)	M	D	PID reading: <2.0 ppm no odour		
2			ES						clay lenses	M	MD	PID reading: <2.0 ppm no odour
3	PT		ES									PID reading: <2.0 ppm no odour
4			ES									PID reading: <2.0 ppm no odour
5			ES				5.00 (1.30)			End of borehole at 5 metres. Target Depth		
6												
7												
8												

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**BOREHOLE LOG SHEET**

**Client :** Australian Industrial Energy  
**Project :** East Coast Gas Pipeline  
**Location :** Port Kembla Coal Terminal, Port Kembla NSW

**HOLE No. GBH39**

**SHEET 1 OF 1**

**Position :** 306978.9 E 6184917.7 N M.G.A      **Surface RL:** 6.25m      **Angle from Horiz. :** 90°      **Processed :** KN  
**Rig Type :** RR510      **Mounting:** Trailer      **Contractor :** BG Drilling      **Driller :** JE      **Checked :** CQ  
**Date Started :** 24/8/2018      **Date Completed :** 24/8/2018      **Logged by :** IL      **Date:** 03/09/2018

Note: \* indicates signatures on original issue of log or last revision of log

DRILLING				MATERIAL					Comments/ Observations		
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Depth / (RL) metres	Graphic Log	USC Symbol	Description	Moisture Condition		Consistency / Density Index	
1 2 3 4 5	AD	Nil		0.10 (6.15)		ML	ASPHALT SILT, black, trace fine to medium angular to sub-angular gravel (FILL)	M	MD	PID reading: 0.7 ppm no odour	
				0.60 (5.65)		SP	SAND, pale brown, fine to medium grained, trace of shell fragments, pebbles (FILL)	M	MD		
				1.85 (4.40)		SP	Clayey SAND, brown, fine to medium grained, medium plasticity clay, some silt, trace of shell fragments (FILL)	M	MD		
				2.40 (3.85)		SP	becoming dark brown, black SAND, pale brown, fine to coarse grained, trace of shell fragments (FILL)	M	L-MD		
				4.60 (1.65)		SP	SAND, pale brown, fine to coarse grained, trace of shell fragments (possible alluvium)	W	MD		
5				5.00 (1.25)			4.6m to 4.7m: silt/clay banding, dark brown, medium to high plasticity clay End of borehole at 5 metres. Target Depth			PID reading: 0.6 ppm no odour	
6											
7											
8											

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