

APPENDIX D

STANDARD CH2M HILL FIELDWORK AND SAMPLING PROCEDURES

SAMPLING EQUIPMENT

All sampling equipment was decontaminated prior to use (refer to Section 'Equipment Decontamination Procedures' below). Sampling equipment included the following:

- Measuring wheel;
- Push tube sampling tip;
- Sample containers; and
- Stainless Steel Spatula's.

SOIL SAMPLING

Soil samples were collected with the aid of an excavator and push tube sampler lined internally with polyethylene tubing (PET liner) and stainless steel spatula using the following technique.

The excavator extends the test pit to a depth of approximately one metre below ground surface. The hole is then logged to determine the depth intervals for sampling. Soil samples for the first metre of the excavation are collected directly from the test pit walls. The remainder of the test pit is excavated with the test pit logged based on the material excavated. Soil samples from greater than one metre depth are collected directly from the excavator bucket. Generally, the samples are collected towards the rear of the bucket, however, the soil sample location within the bucket is determined on-site.

The push tube is advanced directly downwards at the nominated sample location. After reaching the extent of the tubing the push tube is withdrawn the soil is logged and a sample collected. This process is repeated to achieve soil sampling from increasing depths. This was done by lifting the soil directly from the PET liner into a laboratory prepared 125 mL soil sample container with a decontaminated stainless steel spatula.

A label detailing the following is affixed to all sampling jars:

- Unique sample identifier (including sample location and depth interval from which the sample was collected);
- Sample collection date;
- Sample type;
- Destination of the sample; and
- Sampler initials.

GROUNDWATER SAMPLING

All of the monitoring wells were gauged (static water level measured) prior to the purging of each of the monitoring wells. A bore volume was calculated for each monitoring well to determine the volume of water to be removed prior to the commencement of sampling.

Three monitoring well volumes were removed with field chemical parameters collected after the removal of each of the well volumes. Field chemical parameters collected include, redox, pH, temperature, dissolved oxygen and electrical conductivity.

Groundwater samples were collected using dedicated teflon bailers per each monitoring well.

All of the groundwater removed from the monitoring wells was placed within sealed drums adjacent to the monitoring wells.

Where required (ie. for heavy metal analysis) the groundwater samples were filtered through 45 µm filter paper.

A label detailing the following is affixed to all sampling jars:

- Unique sample identifier (including sample location and depth interval from which the sample was collected);
- Sample collection date;
- Sample type;
- Destination of the sample; and
- Sampler initials.

SOIL AND GROUNDWATER SAMPLE TRANSPORT

The sample container information was recorded on a chain-of-custody form and the samples placed within an ice filled cooler. The samples were transported directly to the nominated laboratory under CH2M HILL's standard chain of custody protocols. The chain of custody forms were produced in triplicate. White and yellow copies were sent in the esky with the samples, the pink copy was retained by CH2M HILL. The white copy was retained by the laboratory and the yellow copy was returned to CH2M HILL with the final laboratory report.

Upon arrival at the laboratory, a laboratory attendant checked the sample package for tampering and checked the seal had not been broken and that all samples received matched those on the chain of custody form. The laboratory attendant then signed and dated the form and faxed the form back to the CH2M HILL Project Manager as acknowledgment of receipt.

EQUIPMENT DECONTAMINATION PROCEDURES

The objective of equipment decontamination is to prevent the introduction of contamination into samples from sampling equipment or other samples.

Decontamination of Hand Equipment

The following procedure was used to clean soil sampling equipment:

- Replacement of disposable outer nitrile gloves and/or;
- An initial rinse and scrub with tap water;
- A scrub with a detergent of known chemical composition (Decon 90);
- A tap water rinse;
- A 10 percent nitric acid rinse; and
- A deionised water rinse.

Decontamination of Groundwater Equipment

As dedicated teflon bailers were used with new cord for each groundwater monitoring well no decontamination of the sampling equipment was required.

Decontamination of Drilling Equipment

As described above the pushtubes were lined internally with PET liners. A new liner was used for each push of the pushtube. Due to a new liner being used for each of the pushtubes the internal tubing did not require decontamination. The tip of the pushtubes underwent decontamination by a scrub in a solution containing detergent of a known chemical composition (Decon 90).

Decontamination of Site Personnel

Sampling personnel were attired in long pants and long sleeved shirts with disposable latex gloves. The gloves were changed and disposed of for every sample collected, thus preventing cross contamination.


APPENDIX E

BOREHOLE LOGS

CH2M HILL CH2M HILL AUSTRALIA Pty Ltd		SOIL BORE LOG		Bore No. 1	
Sheet 1 of 1					
Project No: 110158		Easting (AMG)		317111.994	
Project: Eveleigh Gasworks		Northing (AMG)		1247663.511	
Site: Macdonaldtown Triangle		Elevation (mAHD):		18.37	
Date: 19-Apr-00		Water Level (mbtc):		N/A	
Weather: Sunny		Final Depth (mbgl):		4.5m	
		Equipment:		Push Tube	
		Contractor:		Macquarie Drilling	
		Logged By:		Maria Milos	
		Project Manager:		Lee Moore	
		Checked By:			

Depth (m)	Water Found	Sample		Graphic Log	Soil Description (soil type, colour, moisture content, plasticity, grain size, stiffness, etc.)	Observation/Comments (visual contamination, odour, side collapse, etc.)
		PID	No.			
0.1			1-0.0-0.1		FILL, Dark brown, gravelly fill, gravel fragments less than 3cm, minor fine roots.	Auger
0.2						
0.3						
0.4						
0.5						
0.6						
0.7						
0.8						
0.9						
1.0			1-0.9-1.0			
1.1					FILL, Loose light brown fine sand and rock fragments less than 1cm, dry.	
1.2						
1.3						
1.4						
1.5						
1.6						
1.7						
1.8						
1.9						
2.0						
2.1					FILL, Red/Orange silty clay, hard, minor fine roots, some grey clay.	
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1					FILL, Dark grey silty clay and coke fill (odour) (PAH/BTEX)	
3.2						
3.3			1-3.3-3.4			
3.4						
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						
4.1			1-4.0-4.1		Dark grey plastic silty clay, roots.	
4.2						
4.3						
4.4						
4.5						
4.5						
					EOH @ 4.5m on clay.	

Notes		
mAHD:metres Australian Height Datum	mbgl:metres below ground level	mbtc:metres below top of casing

 CH2M HILL CH2M HILL AUSTRALIA Pty Ltd		SOIL BORE LOG		Bore No. <u>2</u>	
Sheet <u>1</u> of <u>1</u>					
Project No:	<u>110158</u>	Easting (AMG)	<u>317107.419</u>	Equipment:	<u>Push Tube</u>
Project:	<u>Eveleigh Gasworks</u>	Northing (AMG)	<u>1247666.818</u>	Contractor:	<u>Macquarie</u>
Site:	<u>Macdonaldtown Triangle</u>	Elevation (mAHD):	<u>18.42</u>	Logged By:	<u>Maria Milos</u>
Date:	<u>18-Apr-00</u>	Water Level (mbtc):	<u>N/A</u>	Project Manager:	<u>Lee Moore</u>
Weather:	<u>Sunny</u>	Final Depth (mbgl):	<u>4.5m</u>	Checked By:	

Depth (m)	Water Found	Sample		Graphic Log	Soil Description (soil type, colour, moisture content, plasticity, grain size, stiffness, etc.)	Observation/Comments (visual contamination, odour, side collapse, etc.)
		PID	No.			
0.1		1.6	2-0.0-0.1			
0.2		0.8	2-0.2-0.3			
0.3						
0.4						
0.5					Grey/red mottled hard clay, decomposed shale.	
0.6						
0.7						
0.8						
0.9						
1.0						
1.1						
1.2						
1.3						
1.4						
1.5					Red hard clay, slight grey mottling, weathered, shale(red)	
1.6						
1.7						
1.8						
1.9		1.3	2-2.0-2.1		Dark grey silty clay, minor fine rock fragments, strong end hydrocarbon odour.	
2.0						
2.1						
2.2						
2.3		3.3	2-2.5-2.6		Dark grey plastic clay, minor gravel fragments less than 1cm, silty, soft. (odour)	
2.4						
2.5						
2.6						
2.7					Red/orange silty clay, hard, minor fine roots, some grey clay. (odour)	
2.8						
2.9						
3.0						
3.1		1.4	2-3.3-3.4		Red clay, dry rock fragments less than 1cm, compacted, hard.	
3.2						
3.3						
3.4						
3.5					EOH @ 4.5m on clay.	
3.6						
3.7						
3.8						
3.9		1.8	2-4.4-4.5			
4.0						
4.1						
4.2						
4.3						
4.4						
4.5						

Notes		
mAHD:metres Australian Height Datum	mbgl:metres below ground level	mbtc:metres below top of casing

**CH2M HILL**

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SOIL BORE LOG**Bore No. 3**

Sheet 1 of 1

Project No: 110158	Easting (AMG)	317103.713	Equipment:	Push Tube
Project: Eveleigh Gasworks	Northing (AMG)	1247693.358	Contractor:	Macquarie
Site: Macdonaldtown Triangle	Elevation (mAHD):	18.69	Logged By:	Maria Milos
Date: 18-Apr-00	Water Level (mbtc):	N/A	Project Manager:	Lee Moore
Weather: Sunny	Final Depth (mbgl):	4.0m	Checked By:	

Depth (m)	Water Found	Sample		Graphic Log	Soil Description (soil type, colour, moisture content, plasticity, grain size, stiffness, etc.)	Observation/Comments (visual contamination, odour, side collapse, etc.)
		PID	No.			
0.1		2.5	3-0.0-0.1		FILL, Dark brown gravelly soil, fine roots, some glass and rock fragments.	
0.2						
0.3						
0.4						
0.5						
0.6						
0.7						
0.8					Red/grey mottled clay, fine roots, compacted, weathered/decomposed shale(red)	
0.9						
1.0						
1.1		1.1	3-1.0-1.1			
1.2						
1.3						
1.4						
1.5						
1.6						
1.7						
1.8						
1.9						
2.0						
2.1						
2.2					Grey plastic clay, roots, homogeneous.	
2.3						
2.4						
2.5		5.0	3-2.4-2.5			
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4					Red, orange clay, compacted weathered (decomposed shale) minor fine roots.	
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						
		4.8	3-3.9-4.0		EOH @ 4.0m on clay.	

Notes

mAHD:metres Australian Height Datum mbgl:metres below ground level mbtc:metres below top of casing

**CH2M HILL**

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SOIL BORE LOG**Bore No. 4**

Sheet 1 of 1

Project No: 110158	Easting (AMG)	317103.566	Equipment:	Push Tube
Project: Eveleigh Gasworks	Northing (AMG)	1247699.228	Contractor:	Macquarie
Site: Macdonaldtown Triangle	Elevation (mAHD):	18.78	Logged By:	Maria Milos
Date: 18-Apr-00	Water Level (mbtc):	N/A	Project Manager:	Lee Moore
Weather: Sunny	Final Depth (mbgl):	3.0m	Checked By:	

Depth (m)	Water Found	Sample		Graphic Log	Soil Description (soil type, colour, moisture content, plasticity, grain size, stiffness, etc.)	Observation/Comments (visual contamination, odour, side collapse, etc.)
		PID	No.			
0.1		1.3	4-0.0-0.1		FILL, Brown gravelly soil, gravel and shale fragments less than 1cm, glass	
0.2						
0.3					FILL, Grey/red mottled clay, shale fragments less than 1cm, minor gravel and roots.	
0.4						
0.5					FILL, Brown gravelly soil, gravel and shale fragments	
0.6						
0.7		0.3	4-0.7-0.8		FILL, Coal slag fill, coal pieces less than 1cm, coarse sand, roots, gravel and roots.	
0.8		2.7	4-0.8-0.9			
0.9						
1.0						
1.1					Red/grey mottled clay large coal pieces, vossicular, glass fragments, gravel and rock fragments less than 2cm.	
1.2						
1.3						
1.4						
1.5		0.3	4-1.5-1.6			
1.6						
1.7						
1.8						
1.9						
2.0					Dark grey silty clay soft, fine roots.	
2.1						
2.2						
2.3						
2.4						
2.5		0.4	4-2.5-2.6			
2.6						
2.7					Red/tan plastic clay, roots weathered soft shale(red)	
2.8						
2.9						
3.0						
3.1					EOH @ 3m on clay.	
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						

Notes

mAHD:metres Australian Height Datum mbgl:metres below ground level mbtc:metres below top of casing

SOIL BORE LOG

Bore No. 6

Sheet 1 of 1

Project No: 110158	Easting (AMG)	317103.196	Equipment:	Push Tube
Project: Eveleigh Gasworks	Northing (AMG)	1247719.155	Contractor:	Macquarie
Site: Macdonaldtown Triangle	Elevation (mAHD):	18.96	Logged By:	Maria Milos
Date: 18-Apr-00	Water Level (mbtc):	N/A	Project Manager:	Lee Moore
Weather: Sunny	Final Depth (mbgl):	3.1m	Checked By:	

Depth (m)	Water Found	Sample		Graphic Log	Soil Description (soil type, colour, moisture content, plasticity, grain size, stiffness, etc.)	Observation/Comments (visual contamination, odour, side collapse, etc.)
		PID	No.			
0.1					FILL, Bitumen	
0.2					FILL, Brown/black, coke fill, dry, crumbly, light, minor coarse black sand.	
0.3		55.6	6-0.2-0.3			
0.4		3.2	6-0.3-0.4			
0.5						
0.6					FILL, Red/grey, sandy clay, red weathered shale.	
0.7						
0.8						
0.9						
1.0						
1.1		0.3	6-1.0-1.1			
1.2						
1.3						
1.4						
1.5						
1.6					Dark grey plastic silty clay, roots.	
1.7						
1.8						
1.9						
2.0		60.3	6-2.0-2.1			
2.1						
2.2						
2.3						
2.4						
2.5						
2.6					Red, clay, compacted, dry, weathered shale red.	
2.7						
2.8						
2.9						
3.0		16.8	6-3.0-3.1			
3.1					EOH @ 3.1m on clay.	
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						

Notes

mAHD:metres Australian Height Datum mbgl:metres below ground level mbtc:metres below top of casing

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SOIL BORE LOG**Bore No.** 7Sheet **1** of **1**

Project No: 110158	Easting (AMG)	317118.681	Equipment:	Push Tube
Project: Eveleigh Gasworks	Northing (AMG)	1247729.832	Contractor:	Macquarie
Site: Macdonaldtown Triangle	Elevation (mAHD):	18.71	Logged By:	Maria Milos
Date: 18-Apr-00	Water Level (mbtc):	N/A	Project Manager:	Lee Moore
Weather: Sunny	Final Depth (mbgl):	3.0m	Checked By:	

Depth (m)	Water Found	Sample		Graphic Log	Soil Description	Observation/Comments	
		PID	No.		(soil type, colour, moisture content, plasticity, grain size, stiffness, etc.)	(visual contamination, odour, side collapse, etc.)	
0.1		2.5	7-0.0-0.1		FILL, Brown/black, coke fill, dry, crumbly, light, minor coarse black sand.		
0.2							
0.3							
0.4					FILL, Brown plastic clay, weathered shale and rock fragments.		
0.5							
0.6							
0.7							
0.8							
0.9							
1.0							
1.1							
1.2							
1.3							
1.4							
1.5	37.9		7-1.4-1.5				
1.6			Red, clay, compacted, dry, weathered shale red. (napthalene odour)				
1.7							
1.8							
1.9							
2.0							
2.1				Red, clay, compacted, dry, weathered shale red. (napthalene odour)			
2.2							
2.3							
2.4							
2.5							
2.6							
2.7							
2.8							
2.9							
3.0		9.8	7-2.9-3.0		EOH @ 3.0m on clay.		
3.1							
3.2							
3.3							
3.4							
3.5							
3.6							
3.7							
3.8							
3.9							
4.0							

Notes

mAHD:metres Australian Height Datum mbgl:metres below ground level mbtc:metres below top of casing