

[illegible]

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW66d		PAGE 2 of 3		
	NUMBER	TYPE					START DATE: 19/06/98		DRILLING METHOD: Rotary		
							FINISH DATE: 22/06/98		BOREHOLE DIAMETER: 165/115mm		
							DRILLER: R3		SCREEN TYPE & DIAMETER: UPVC 50mm		
						LOGGED BY: SG		APPRD BY:		SCREEN SLOT SIZE: 0.5mm	
						DESCRIPTION		COMMENTS			
						10	Brown very sandy and silty gravelly CLAY	Very strong hydrocarbon odour - similar to plant adjacent to borehole	10		
							Brown very silty gravelly SAND				
						11	Brown very sandy and silty GRAVEL		11		
						12			12		
						13	Grey-brown very sandy and silty gravelly CLAY with cobbles	Dry	13		
						14			14		
						15			15		
						16			16		
						17			17		
						18		Borehole collapsed to 17.9m	18		
						19			19		
						20			20		

LOCATION / NOTES:

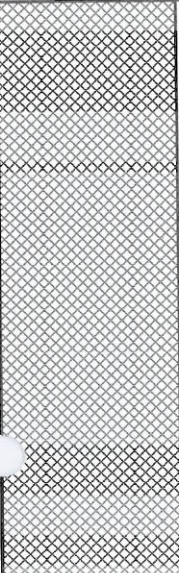
- All measurements in m below ground level (mbgl)
- Water strike at 2.0m, cased out at 2.4m
- Rotary to 24 mbgl with odex to 14 mbgl

LEGEND

- Disturbed Sample
- Undisturbed Sample
- Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

Job Title		SOIL & GROUNDWATER INVESTIGATION	
Location		LLANDARCY REFINERY	
Client		BP LLANDARCY	
Appd	DRAFT	DAMES & MOORE	
Ref.	MC/CR/BRS		
Date	JUL 98		
Job No. 39991-001-401			

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW66d		PAGE 3 of 3		
	NUMBER	TYPE					START DATE: 19/06/98	DRILLING METHOD: Rotary	FINISH DATE: 22/06/98	BOREHOLE DIAMETER: 165/115mm	DRILLER: R3
							DESCRIPTION	COMMENTS			
							20 21 22 23 24 25 26 27 28 29 30	ROCKHEAD: Grey fine to medium grained SANDSTONE (BEDROCK)	No odour	20 21 22 23 24 25 26 27 28 29 30	
							Borehole terminated at 24 mbgl				
LOCATION / NOTES: 1. All measurements in m below ground level (mbgl) 2. Borehole collapsed to 17.9 mbgl 3. Rotary to 24 mbgl with odex to 14 mbgl							LEGEND  Disturbed Sample  Undisturbed Sample  Headspace Analysis  Down Borehole Analysis  Groundwater Table  Perched Water Table		BOREHOLE LOG Job Title SOIL & GROUNDWATER INVESTIGATION Location LLANDARCY REFINERY Client BP LLANDARCY Appd DRAFT Ref. MC/CR/BRS Date JUL 98 Job No. 39991-001-401		



DAMES & MOORE

BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW069S2/D2		PAGE 1 of 4	
		NUMBER	TYPE					START DATE: 27/4/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 27/4/99	BOREHOLE DIAMETER: 200/150 mm
S2	D2					0		DESCRIPTION		COMMENTS	
						0.0		Loose coarse GRAVEL with black slag (MADE GROUND)		Poor returns	
						1.0					
						2.0					
						3.0		Light grey very silty CLAY (BOULDER CLAY)		Damp	
						4.0				Slight hydrocarbon odour	
						5.0				Wet from 4.5m at rod connection	
						6.0		Soft to medium firm light orange-brown very gravelly CLAY (BOULDER CLAY)		Damp	
						7.0					
						8.0		Hard light grey sandstone BOULDERS with silt		Dry	
						9.0		Loose light brown very silty and gravelly CLAY (BOULDER CLAY)		Dry	
						10.0		Loose brown, very silty fine sandy CLAY with minor gravel (BOULDER CLAY)		Slight 'sweet' odour	
						11.0		becoming orange from 8.75m		Very good returns	
						12.0		Loose, brown, very fine sandy, silty CLAY (BOULDER CLAY) becoming lighter in colour		Dry	
						13.0				No odour	
						14.0					
						15.0					
						16.0					
						17.0					
						18.0					
						19.0					
						20.0					
						21.0					
						22.0					
						23.0					
						24.0					
						25.0					
						26.0					
						27.0					
						28.0					
						29.0					
						30.0					
						31.0					
						32.0					
						33.0					
						34.0					
						35.0					
						36.0					
						37.0					
						38.0					
						39.0					
						40.0					
						41.0					
						42.0					
						43.0					
						44.0					
						45.0					
						46.0					
						47.0					
						48.0					
						49.0					
						50.0					
						51.0					

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW069S2/D2		PAGE 3 of 4	
	NUMBER	TYPE					START DATE: 27/4/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 27/4/99	BOREHOLE DIAMETER: 200/150 mm
S2	D2						DESCRIPTION		COMMENTS	
					20		Soft grey fine grained SANDSTONE (BEDROCK)		Damp	
							COAL		Damp	
					21		Soft grey SILTSTONE/SANDSTONE (BEDROCK)		Damp	
					22				Damp on rod connection at 22.0m	
							Hard light grey SANDSTONE (BEDROCK)		Wet from 22.2m	
					23					
					24		COAL		Damp	
					25		Consolidated dark grey fine grained crystalline SANDSTONE		Dry	
					26				Wet after rod connection at 25.2m	
					27				becoming drier from 27.8m	
					28		Consolidated dark grey SANDSTONE interbedded with siltstone			
					29					
					30					

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level (mbgl)		☒	Disturbed Sample	Job Title SOIL & GROUNDWATER INVESTIGATION	
		☐	Undisturbed Sample	Location LLANDARCY REFINERY	
		*	Headspace Analysis	Client BP LLANDARCY LTD	
		†	Down Borehole Analysis	App'd DRAFT	
		▽	Groundwater Table	Ref. CR/MC/BRS	
		▽	Perched Water Table	Date MAY 99	
				Job No. 39991-004-401	
				 DAMES & MOORE GROUP	

BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW069S2/D2		PAGE 2 of 4	
		NUMBER	TYPE					START DATE: 27/4/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 27/4/99	BOREHOLE DIAMETER: 200/150 mm
S2 D2								DESCRIPTION		COMMENTS	
								10	Loose light brown very silty BOULDER CLAY	Dry No odour	10
								11	Loose pale yellow-brown siltstone BOULDER	Dry	11
									Dark very soft mudstone BOULDER	Dry to 17.4m	
								12	Loose light brown very silty BOULDER CLAY		12
									Consolidated light grey sandstone BOULDER		
									Loose orange-brown silty BOULDER CLAY		
									Light grey weathered sandstone BOULDERS with alternating thin orange-brown bands (WEATHERED BEDROCK)		
								13	ROCKHEAD - Crystalline light grey fine to medium grained SANDSTONE (BEDROCK)		13
									Soft light brown SILTSTONE (BEDROCK)		
									Crystalline light grey fine to medium grained SANDSTONE with thin interbedded bands of siltstone (BEDROCK)		
								14			14
								15			15
								16		Soft drilling	16
								17	Soft brown SILTSTONE (BEDROCK)	Dry	17
									Soft grey fine grained crystalline SANDSTONE with interbedded siltstone (BEDROCK)	Damp after rod connection at 17.8m	
								18			18
								19		becoming dry at 19.5m	19
										Damp after rod connected at 19.8m	
								20			20

LOCATION / NOTES:

1. All measurements in m below ground level (mbgl)

LEGEND

- Disturbed Sample
- Undisturbed Sample
- Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

Job Title **SOIL & GROUNDWATER INVESTIGATION**

Location **LLANDARCY REFINERY**

Client **BP LLANDARCY LTD**

Appd **DRAFT**

Ref. **CR/MC/BRS**

Date **MAY 99**

Job No. **39991-004-401**

DAMES & MOORE

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW069S2/D2		PAGE 4 of 4		
	NUMBER	TYPE					START DATE: 27/4/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 27/4/99	BOREHOLE DIAMETER: 200/150 mm	DRILLER: R4
						DESCRIPTION		COMMENTS			
S2 D2 						30 31 32 33 34 35 36 37 38 39 40		Dark grey crystalline SANDSTONE interbedded with siltstone		Wet	30 31 32 33 34 35 36 37 38 39 40
LOCATION / NOTES:						LEGEND		BOREHOLE LOG			
1. All measurements in m below ground level (mbgl)						☒ Disturbed Sample ☐ Undisturbed Sample * Headspace Analysis † Down Borehole Analysis  Groundwater Table  Perched Water Table		Job Title SOIL & GROUNDWATER INVESTIGATION Location LLANDARCY REFINERY Client BP LLANDARCY LTD Appd DRAFT Ref. CR/MC/BRS Date MAY 99 Job No. 39991-004-401			
								 DAMES & MOORE			

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW220A		PAGE 1 of 3		
	NUMBER	TYPE					START DATE: 05/5/99		DRILLING METHOD: ROTARY AIR FLUSH		
							FINISH DATE: 11/5/99		BOREHOLE DIAMETER: 250/200/165 mm		
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene		
				LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm					
							DESCRIPTION	COMMENTS			
							CONCRETE (MADE GROUND)			0	
							Loose angular GRAVEL (MADE GROUND)		Dry		
							Loose light brown sandy GRAVEL (MADE GROUND)		Dry, Slight solvent odour		
							Loose grey sandy GRAVEL with sandstone cobbles (MADE GROUND)		Strong solvent odour		
							Loose grey angular GRAVEL (MADE GROUND)		Sheen on water from 1-2m	1.0	
									Very productive from 2.3m	2.0	
									Water dark in colour		
									Water becomes brown-grey	3.0	
							Loose gravelly CLAY (BOULDER CLAY)		Poor returns		
									Wet		
									No sheen on water	4.0	
									Slight solvent odour		
										5.0	
									Water brown-orange from 5.3m		
							large sandstone cobbles from 5.9-6.2m becoming sandy from 6.2m		Drying out following rod connection at 6.2m	6.0	
							Large boulders from 6.5m with denser silty sand		Slight solvent odour from 7m	7.0	
									Damp		
										8.0	
							increasingly silty from 8.8m with sandstone and mudstone cobbles		Dry following rod connection at 8.0m		
										9.0	
									Damp		
									Very slight	10	

LOCATION / NOTES: 1. All measurements in m below ground level (mbgl)		LEGEND Disturbed Sample Undisturbed Sample Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table	BOREHOLE LOG Job Title SOIL & GROUNDWATER INVESTIGATION Location LLANDARCY REFINERY Client BP LLANDARCY LTD App'd DRAFT Ref. CR/MC/BRS Date MAY 99 Job No. 39991-004-401	DAMES & MOORE
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BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW220A		PAGE 2 of 3	
	NUMBER	TYPE					START DATE: 05/5/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 11/5/99		BOREHOLE DIAMETER: 250/200/165 mm	
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene	
LOGGED BY: PW		APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm						
						DESCRIPTION		COMMENTS		
						Dark brown fine sandy, silty CLAY (BOULDER CLAY)		Dry/Damp Slight solvent odour	10	
								Damp following rod connection at 11.0m	11	
								Drying out from 11.5m		
								Damp from 12.0m	12	
									13	
						Loose orange-brown fine sandy CLAY with minor gravel		Slightly damp Slight solvent odour Dry to damp	14	
						Loose dark grey very sandy CLAY (BOULDER CLAY)		Damp Slight odour	15	
						Grey-brown very silty CLAY (BOULDER CLAY)		Very slight solvent odour	16	
								Damp		
								Wet at 17m following rod connection	17	
						becoming orange-brown at 17.7m				
						Sandstone boulders from 19.0m				
								Wet at 18m	18	
								Wet following rod connection at 19.5m	19	
									20	

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level		Disturbed Sample	Undisturbed Sample	Job Title SOIL & GROUNDWATER INVESTIGATION	
		Headspace Analysis	Down Borehole Analysis	Location LLANDARCY REFINERY	
		Groundwater Table	Perched Water Table	Client BP LLANDARCY LTD	
				App'd DRAFT	
				Ref. CR/MC/BRS	
				Date MAY 99	
				Job No. 39991-004-401	

BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW220A		PAGE 3 of 3	
		NUMBER	TYPE					START DATE: 05/5/99	DRILLING METHOD: ROTARY AIR FLUSH		
								FINISH DATE: 11/5/99	BOREHOLE DIAMETER: 250/200/165 mm		
								DRILLER: R4	SCREEN TYPE & DIAMETER: 50 mm polypropylene		
								LOGGED BY: PW APPR'D BY:	SCREEN SLOT SIZE: 0.5 mm		
S D								DESCRIPTION		COMMENTS	
						20	X	Grey-brown very silty CLAY (BOULDER CLAY)	Productive from 20.5m	20	
						21	X	becoming increasingly silty		21	
						22	X			12	
						23	X	ROCKHEAD: SANDSTONE / SILTSTONE (WEATHERED BEDROCK)	Dry	23	
						24	X	Grey SILTSTONE (BEDROCK)	Dry		
						24	X	Light grey fine grained SANDSTONE (BEDROCK)	Dry	24	
						24	X	Grey-brown SILTSTONE (BEDROCK)	Dry		
						25	X	Light grey crystalline SANDSTONE (BEDROCK) with interbedded siltstone	Damp	25	
						26	X		Dry following rod connection at 26m	26	
						27	X	Dark brown SILTSTONE lighter in colour from 27.2m	becoming drier	27	
				28	X	Grey crystalline SANDSTONE interbedded with thin bands of dark grey siltstone		28			
				28	X	Light grey fine to medium grained crystalline SANDSTONE					
				29	X		becoming damp at 29.7m	29			
				30	X		wet	30			

LOCATION / NOTES:

1. All measurements in m below ground level (mbgl)

LEGEND

- Disturbed Sample
- Undisturbed Sample
- Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

Job Title **SOIL & GROUNDWATER INVESTIGATION**

Location **LLANDARCY REFINERY**

Client **BP LLANDARCY LTD**

App'd **DRAFT**

Ref. **CR/MC/BR5**

Date **MAY 99**

Job No. **39991-004-401**

DAMES & MOORE
GROUP

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW220B		PAGE 1 of 2	
	NUMBER	TYPE					START DATE: 11/5/99	DRILLING METHOD: ROTARY AIR FLUSH		
							FINISH DATE: 12/5/99		BOREHOLE DIAMETER: 200/165 mm	
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene	
							LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm	
S2							DESCRIPTION		COMMENTS	
					0		CONCRETE (MADE GROUND)		Strong hydrocarbon odour	0
							Loose dark grey sandy GRAVEL (MADE GROUND)		Wet	
			*1679		1.0				Productive at 1m following rod connection	1.0
					2.0		Loose dark grey-black sandy CLAY (BOULDER CLAY)		Wet	2.0
									Heavily contaminated	
									Unproductive	
			*1151		3.0		Loose brown sandy CLAY (BOULDER CLAY)		Damp	3.0
									Strong hydrocarbon odour	
									Dry following rod connection at 3.5m	
					4.0					4.0
					5.0					5.0
					6.0		Firm orange-brown fine sandy CLAY with frequent coarse rounded gravel (BOULDER CLAY)		Slightly damp	6.0
			*1052						becoming drier from 6.8m	
			*215		7.0				Slight odour	7.0
			*158		8.0					8.0
			*235		9.0					9.0
							becoming darker brown			
			*312		10		Light brown CLAY with grey sandstone cobbles (BOULDER			10

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level		Disturbed Sample	Undisturbed Sample	Job Title SOIL & GROUNDWATER INVESTIGATION	
		Headspace Analysis	Down Borehole Analysis	Location LLANDARCY REFINERY	
		Groundwater Table	Perched Water Table	Client BP LLANDARCY LTD	
				App'd DRAFT	
				Ref. CR/MC/BRS	
				Date MAY 99	
				Job No. 39991-004-401	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW220B		PAGE 2 of 2	
	NUMBER	TYPE					START DATE: 11/5/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 12/5/99		BOREHOLE DIAMETER: 200/165 mm	
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene	
							LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm	
S2							DESCRIPTION		COMMENTS	
			*319		10		Light brown sandy CLAY with frequent light brown-grey sandstone cobbles (BOULDER CLAY)		Damp following rod connection	
					11		Brown-grey very sandy CLAY (BOULDER CLAY)		becoming dry	
			*343		12				Dry-slightly damp	
					13		Orange-brown SAND with rounded cobbles		Damp Productive at 13m following rod connection	
					14		Brown sandy CLAY with large sandstone boulders (BOULDER CLAY)		Damp	
			*>2000		15		Grey-blue very silty CLAY (BOULDER CLAY)		No odour	
					16		becoming grey-brown		No odour	
					17				Very productive at 17.0m following rod connection	
			*>2000		18		Borehole terminated at 18.0 mbgl		Drying from	
					19					
					20					
LOCATION / NOTES: 1. All measurements in m below ground level (mbgl)				LEGEND ☒ Disturbed Sample ■ Undisturbed Sample * Headspace Analysis † Down Borehole Analysis ▽ Groundwater Table ▽ Perched Water Table				BOREHOLE LOG Job Title SOIL & GROUNDWATER INVESTIGATION Location LLANDARCY REFINERY Client BP LLANDARCY LTD App'd DRAFT Ref. CR/MC/BRS Date MAY 99 Job No. 39991-004-401 DAMES & MOORE GROUP		

BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW221A		PAGE 1 of 2	
		NUMBER	TYPE					START DATE: 04/5/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 05/5/99	BOREHOLE DIAMETER: 200 mm
						0		DESCRIPTION		COMMENTS	
						0		CONCRETE (MADE GROUND)			
						0.5		Loose red-brown sandy GRAVEL with brick fragments (MADE GROUND)			
						1.0		Loose grey-brown sandy CLAY (BOULDER CLAY)		Slightly damp Slight hydrocarbon odour	
						2.0				Dry following rod connection at 2.2m	
						3.0		becoming grey and increasingly silty from 3.2m		Slightly damp Dry following rod connection at 3.7m Slight hydrocarbon odour	
				*51.2		4.0		Orange-brown clayey SAND with minor gravel (BOULDER CLAY)		Dry - slightly damp	
						5.0		becoming increasingly orange		Damp Dry following rod connection at 5.1m	
				*3.2		6.0		Grey-brown very silty CLAY with fine sand (BOULDER CLAY)		Dry	
						7.0		sandstone cobbles from 6.4m		Dry following rod connection at 6.7m	
				*0.3		8.0		Orange-brown to brown silty CLAY with much fine sand (BOULDER CLAY)		Dry No odour	
						8.5		Light grey silty CLAY (BOULDER CLAY)		Dry following rod connection at 8.3m	
						9.0		Orange-brown CLAY with much fine sand and silt (BOULDER CLAY)		Dry - slightly damp	
						10.0					

LOCATION / NOTES:

1. All measurements in m below ground level

LEGEND

- Disturbed Sample
- Undisturbed Sample
- Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

Job Title **SOIL & GROUNDWATER INVESTIGATION**

Location **LLANDARCY REFINERY**

Client **BP LLANDARCY LTD**

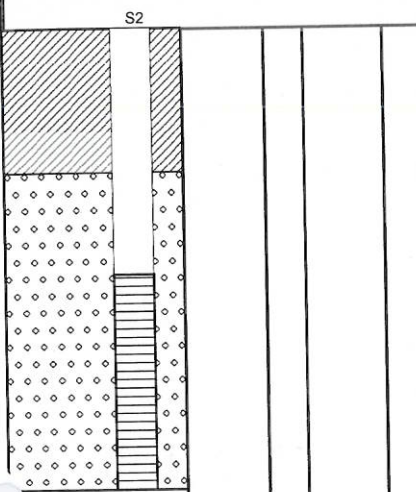
App'd **DRAFT**

Ref. **CR/MC/BRS**

Date **MAY 99**

Job No. **39991-004-401**

DAMES & MOORE
GROUP

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW221A		PAGE 2 of 2		
	NUMBER	TYPE					START DATE: 04/5/99		DRILLING METHOD: ROTARY AIR FLUSH		
							FINISH DATE: 05/5/99		BOREHOLE DIAMETER: 200 mm		
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene		
							LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm		
						DESCRIPTION		COMMENTS			
						10 Orange-brown silty CLAY (BOULDER CLAY)		10 Damp			
						becomes grey at 10.1-10.3m		Slightly damp			
						becomes orange at 10.3 m		Wet following rod connection at			
						11		11			
						12		12			
						13 Borehole terminated at 13.2 mbgl		13			
						14		14			
						15		15			
						16		16			
						17		17			
						18		18			
						19		19			
						20		20			
LOCATION / NOTES:						LEGEND		BOREHOLE LOG			
1. All measurements in m below ground level (mbgl)						 Disturbed Sample		Job Title SOIL & GROUNDWATER INVESTIGATION			
						 Undisturbed Sample		Location LLANDARCY REFINERY			
						 Headspace Analysis		Client BP LLANDARCY LTD			
						 Down Borehole Analysis		App'd DRAFT			
						 Groundwater Table		Ref. CR/MC/BRS			
						 Perched Water Table		Date MAY 99			
								Job No. 39991-004-401			
								 DAMES & MOORE			

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW221B		PAGE 1 of 3	
	NUMBER	TYPE					START DATE: 30/4/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 4/4/99		BOREHOLE DIAMETER: 200/165 mm	
						DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene		
						LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm		
S3	D						DESCRIPTION		COMMENTS	
					0		CONCRETE (MADE GROUND)			0
							Loose red-brown sandy GRAVEL with cobbles (MADE GROUND)			
							Loose brown sandy CLAY (BOULDER CLAY)			
			*232		1.0				Dry	1.0
							Loose grey-brown silty CLAY with fine sand (BOULDER CLAY)		Slight hydrocarbon odour	
			*75.6		2.0				Dry following rod connection	
									Slight hydrocarbon odour	
			*108		3.0		Loose orange-brown fine SAND with minor rounded gravel grading to:		Slight hydrocarbon odour	3.0
									Slightly damp	
							Very sandy orange-brown CLAY (BOULDER CLAY) becoming:		Wet following rod connection at 4m	
			*>2000 (No strong odour)		4.0				Very slight hydrocarbon odour	4.0
									Damp	
					5.0		Grey-brown very silty sandy CLAY (BOULDER CLAY)		Dry from 5.3m	5.0
									Dry following rod connection at 5.5m	
					6.0					6.0
			*11.7		7.0		Brown very sandy and silty CLAY with sandstone boulders (BOULDER CLAY)		Dry	7.0
							Sandstone cobbles at 7.1-7.2m		Dry	
							silt content decreases		No odour	
			*13.7		8.0				Dry - slightly damp	8.0
			*15.7		9.0				No odour	9.0
									Slightly damp	
					10					10

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level (mbgl)			Disturbed Sample	Job Title SOIL & GROUNDWATER INVESTIGATION	
			Undisturbed Sample	Location	
			Headspace Analysis	Client	
			Down Borehole Analysis	App'd DRAFT	
			Groundwater Table	Ref. CR/MC/BRS	
			Perched Water Table	Date MAY 99	
				Job No. 39991-004-401	
				DAMES & MOORE	

BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW221B		PAGE 2 of 3	
		NUMBER	TYPE					START DATE: 30/4/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 4/4/99	BOREHOLE DIAMETER: 200/165 mm
				*>2000		10	<!-- Depth scale markings --> Loose orange, very sandy CLAY (BOULDER CLAY) becomes light grey from 10.1-10.4 orange from 10.4m	Slightly damp Damp Damp Water strike at 11.5m following rod connection Wet Wet No odour Damp Slightly damp No odour Dry following rod connection at 14.4m Wet from 14.7m Damp Wet following rod connection at 15.9m Damp No odour Dry following rod connection at 17.2m Slightly damp No odour Slightly damp	10		
						11			11		
						12			12		
						13			13		
						14			14		
						15			15		
						16			16		
						17			17		
						18			18		
20	20										

LOCATION / NOTES: 1. All measurements in m below ground level	LEGEND Disturbed Sample Undisturbed Sample * Headspace Analysis + Down Borehole Analysis ~ Groundwater Table ^ Perched Water Table	BOREHOLE LOG Job Title SOIL & GROUNDWATER INVESTIGATION Location Client App'd DRAFT Ref. CR/MC/BRS Date MAY 99 Job No. 39991-004-401 DAMES & MOORE
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BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW222A		PAGE 1 of 3	
		NUMBER	TYPE					START DATE: 20/4/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 26/4/99	BOREHOLE DIAMETER: 260/200/165 mm
S1	S2	D1						DESCRIPTION		COMMENTS	
						0		CONCRETE (MADE GROUND)			
						1.0		Loose grey GRAVEL with silty clay		Dry Slight hydrocarbon odour Dry following rod connection	
						2.0		Loose grey gravelly CLAY		Slight hydrocarbon odour	
						2.0		Hard sandstone COBBLES with sand			
						3.0		Loose grey-brown very sandy CLAY (BOULDER CLAY)		Slight hydrocarbon odour Slightly damp	
						4.0		becoming grey at 3.5m		Wet following rod connection at 4m	
						5.0		Hard sandstone BOULDERS with silt		Very slight hydrocarbon odour Damp	
						6.0		Brown, very silty, sandy CLAY with abundant sandstone boulders (BOULDER CLAY)		Dry from 5.3m Dry following rod connection at 5.5m	
						7.0		Brown very sandy CLAY (BOULDER CLAY) becoming grey-brown at 6m			
						8.0		Hard light grey sandstone BOULDERS with minor red sandstone and sand		Dry	
						9.0		Loose grey-brown very silty CLAY (BOULDER CLAY)		No odour	
						10.0		Loose brown sandy CLAY with abundant sandstone and siltstone boulders (BOULDER CLAY)		Dry - slightly damp	
										No odour Slightly damp	
LOCATION / NOTES:						LEGEND			BOREHOLE LOG		
1. All measurements in m below ground level						☒ Disturbed Sample ■ Undisturbed Sample * Headspace Analysis † Down Borehole Analysis ▽ Groundwater Table ▽ Perched Water Table			Job Title SOIL & GROUNDWATER INVESTIGATION		
						Location LLANDARCY REFINERY					
						Client BP LLANDARCY LTD					
						App'd CR/MC/BRS			DRAFT		
						Date MAY 99			 DAMES & MOORE		
						Job No. 39991-004-401					

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW222A		PAGE 2 of 3	
	NUMBER	TYPE					START DATE: 20/4/99	DRILLING METHOD: ROTARY AIR FLUSH		
							FINISH DATE: 26/4/99		BOREHOLE DIAMETER: 260/200/165 mm	
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene	
							LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm	
							DESCRIPTION		COMMENTS	
					10		Brown very silty CLAY (BOULDER CLAY)		Damp	10
							Hard light grey sandstone cobbles			
							Brown very silty CLAY (BOULDER CLAY)		Slight solvent odour	
					11					11
					12					12
					13					13
					14		becomes orange-brown at 14m		Dry	14
					15					15
							Layer of hard grey sandstone cobbles from 15.6-15.7m		Dry	
					16		becomes darker in colour at 6.1m with sandstone cobbles		Dry	16
									Dry	
					17		Hard light grey sandstone BOULDERS			17
							Brown-grey very silty CLAY (BOULDER CLAY)		Dry	
							Layer of hard light grey sandstone cobbles from 17.4-17.5m becoming light brown			
					18		Soft grey mudstone COBBLES			18
							ROCKHEAD: light grey crystalline SANDSTONE (BEDROCK)			
							MUDSTONE (BEDROCK)			
					19					19
					20					20

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level (mbgl)			Disturbed Sample	Job Title SOIL & GROUNDWATER INVESTIGATION	
			Undisturbed Sample	Location LLANDARCY REFINERY	
			Headspace Analysis	Client BP LLANDARCY LTD	
			Down Borehole Analysis	App'd DRAFT	DAMES & MOORE
			Groundwater Table	Ref. CR/MC/BRS	
			Perched Water Table	Date MAY 99	
				Job No. 39991-004-401	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW222A		PAGE 3 of 3	
	NUMBER	TYPE					START DATE: 20/4/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 26/4/99		BOREHOLE DIAMETER: 260/200/165 mm	
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene	
LOGGED BY: PW		APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm						
						DESCRIPTION		COMMENTS		
						20	Light grey crystalline SANDSTONE (BEDROCK)	Dry		20
						21	COAL	Damp		21
						22	Weak light brown-grey MUDSTONE with interbedded coal	Dry		12
						23	Light grey crystalline SANDSTONE	Dry		23
						24				24
						25				25
						26				26
						27				27
						28				28
						29				29
						30				30

LOCATION / NOTES:

1. All measurements in m below ground level

LEGEND

- Disturbed Sample
- Undisturbed Sample
- Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

Job Title: **SOIL & GROUNDWATER INVESTIGATION**

Location: **LLANDARCY REFINERY**

Client: **BP LLANDARCY LTD**

App'd: **DRAFT**

Ref: **CR/MC/BRS**

Date: **MAY 99**

Job No. **39991-004-401**

DAMES & MOORE

BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW222B		PAGE 1 of 4	
		NUMBER	TYPE					START DATE: 19/4/99	DRILLING METHOD: Cable Percussion/Rotary Air Flush		
								FINISH DATE: 23/4/99	BOREHOLE DIAMETER: 250/200/165 mm		
								DRILLER: R4	SCREEN TYPE & DIAMETER: 50 mm polypropylene		
								LOGGED BY: PW APPR'D BY:	SCREEN SLOT SIZE: 0.5 mm		
								DESCRIPTION		COMMENTS	
S2 A						0		TARMAC (MADE GROUND)		Very poor returns	
								CONCRETE (MADE GROUND)			
						1.0		Loose grey GRAVEL with silty clay		Very poor returns	
								Loose grey gravelly CLAY			
						2.0		Hard sandstone COBBLES with sand			
								Loose grey-brown very sandy CLAY (BOULDER CLAY)			
						3.0					
								becoming grey at 3.5m		Oily sheen on water Strong hydrocarbon odour	
						4.0		Hard sandstone BOULDERS with silt			
						5.0		Brown, very silty, sandy CLAY with abundant sandstone boulders (BOULDER CLAY)			
						6.0		Brown very sandy CLAY (BOULDER CLAY) becoming grey-brown at 6m			
								Hard light grey sandstone BOULDERS with minor red sandstone and sand		Drier from 6.7m No odour	
						7.0					
								Loose grey-brown very silty CLAY (BOULDER CLAY)			
						8.0		Loose brown sandy CLAY with abundant sandstone and siltstone boulders (BOULDER CLAY)			
						9.0		Loose brown GRAVEL with silty sand (MADE GROUND)			
						10					
LOCATION / NOTES: 1. All measurements in m below ground level (mbgl) 2. Cable percussion to 6.0m, Rotary to 32m 3. Poor returns from cable percussion tools - Log for rotary boring MSMW-222A used to						LEGEND Disturbed Sample Undisturbed Sample Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table		BOREHOLE LOG			
								Job Title SOIL & GROUNDWATER INVESTIGATION Location LLANDARCY REFINERY Client BP LLANDARCY LTD App'd DRAFT Ref. CR/MC/BRS Date MAY 99 Job No. 39991-004-401			
								DAMES & MOORE GROUP			

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW222B		PAGE 3 of 4	
	NUMBER	TYPE					START DATE: 19/4/99		DRILLING METHOD: Cable Percussion/Rotary Air Flush	
							FINISH DATE: 23/4/99		BOREHOLE DIAMETER: 250/200/165 mm	
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene	
						LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm		
						DESCRIPTION		COMMENTS		
S2 A						20	Grey crystalline SANDSTONE (BEDROCK)	Wet following rod connection at 20.0m		20
						21				21
						22				22
						23				23
						24	Weak grey SILTSTONE (BEDROCK)	Dry		24
						25		Damp becoming wet		25
						26		Wet following rod connection at 25.0m		26
						27				27
						28	becomes harder at 28.0m	Grout seal installed at 28.0m		28
						29		Wet		29
						30				30

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level (mbgl)		☒ Disturbed Sample		Job Title SOIL & GROUNDWATER INVESTIGATION	
2. Cable Percussion to 6m, Rotary to 32m		■ Undisturbed Sample		Location LLANDARCY REFINERY	
3. Bentonite slug inserted from 20.0m-18.3m		* Headspace Analysis		Client BP LLANDARCY LTD	
4. Grout seal installed from 18 to 28m		† Down Borehole Analysis		App'd DRAFT	
		⚡ Groundwater Table		Ref. CR/MC/BRS	
		⚡ Perched Water Table		Date MAY 99	
				Job No. 39991-004-401	
				 DAMES & MOORE	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW222B		PAGE 2 of 4		
	NUMBER	TYPE					START DATE: 19/4/99		DRILLING METHOD: Cable Percussion/Rotary Air Flush		
							FINISH DATE: 23/4/99		BOREHOLE DIAMETER: 250/200/165 mm		
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene		
				LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm					
S2 A								10 11 12 13 14 15 16 17 18 19 20	Grey sandy CLAY becoming gravelly from 11.1m Dark grey CLAY (BOULDER CLAY) Orange-brown gravelly CLAY (BOULDER CLAY) Grey silty plastic CLAY with minor gravel (BOULDER CLAY) Grey silty GRAVEL with fine sand Grey sandstone GRAVEL with minor sandy silt Grey sandstone GRAVEL with silt becoming clayey at 16.3m Sandstone BOULDERS ROCKHEAD: Grey crystalline SANDSTONE (BEDROCK)	Damp Water at 10.5m Drier from 11.5m Dry Dry Dry following pipe connection at 14.0m Dry Dry Damp to wet Damp Wet	10 11 12 13 14 15 16 17 18 19 20

LOCATION / NOTES:

1. All measurements in m below ground level (mbgl)

LEGEND

- Disturbed Sample
- Undisturbed Sample
- Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

Job Title **SOIL & GROUNDWATER INVESTIGATION**

Location **LLANDARCY REFINERY**

Client **BP LLANDARCY LTD**

App'd **DRAFT**

Ref. **CR/MC/BRS**

Date **MAY 99**

Job No. **39991-004-401**

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