

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW225D		PAGE 3 of 3	
	NUMBER	TYPE					START DATE: 19/4/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 20/4/99		BOREHOLE DIAMETER: 165/115 mm	
							DRILLER: R1		SCREEN TYPE & DIAMETER: 50 mm ID UPVC	
							LOGGED BY: DB APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm	
						DESCRIPTION		COMMENTS		
						ard light grey crystalline SANDSTONE with thin interbedded layers of mudstone (BEDROCK)		productive		
						Borehole terminated at 25.0 mbgl				
LOCATION / NOTES: 1. All measurements in m below ground level (mbgl) 2. ODEX with Rotary throughout						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: MSMW224A		PAGE 1 of 4	
		NUMBER	TYPE					START DATE: 12/5/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 13/5/99	BOREHOLE DIAMETER: 250/165 mm
S1	D2					0		CONCRETE (MADE GROUND)			0
						1.0		Loose black coarse angular GRAVEL (MADE GROUND)	Strong hydrocarbon odour Damp		1.0
				* >2000		2.0				Wet following rod connection at 1.8m	2.0
						3.0		Loose black SAND with minor gravel	Wet Strong hydrocarbon odour		3.0
				* >2000		4.0		Loose black sandy GRAVEL	Wet - Sheen on returns		4.0
						5.0					5.0
				* >2000		6.0					6.0
						7.0		Stiff brown sandy CLAY (BOULDER CLAY)	Drying out Damp		7.0
				* >2000		8.0				Dry following rod connection at 7.0m Moderate hydrocarbon odour	8.0
						9.0		Stiff light brown very sandy silty CLAY (BOULDER CLAY)	Dry Slight to moderate hydrocarbon		9.0
				* 298		10.0					10.0
				* 509							

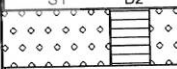
LOCATION / NOTES: 1. All measurements in m below ground level (mbgl)		LEGEND Disturbed Sample Undisturbed Sample * Headspace Analysis † Down Borehole Analysis ▽ Groundwater Table ▽ Perched Water Table	BOREHOLE LOG Job Title SOIL & GROUNDWATER INVESTIGATION Location LLANDARCY REFINERY Client BP LLANDARCY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

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW224B		PAGE 3 of 3		
	NUMBER	TYPE					START DATE: 14/5/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 14/5/99	BOREHOLE DIAMETER: 250/200/165 mm	DRILLER: R4
S2 D1							DESCRIPTION		COMMENTS		
20 21 22 23 24 25 26 27 28 29 30						Grey-brown fine to medium grained crystalline SANDSTONE (BEDROCK) traces of coal from 22m	Wet Wet following rod connection at 20.3m Wet	20 21 22 23 24 25 26 27 28 29 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 DCM GROUP DAMES & MOORE			

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW224B		PAGE 1 of 3	
	NUMBER	TYPE					START DATE: 14/5/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 14/5/99		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				
S2	D1						DESCRIPTION		COMMENTS	
					0		CONCRETE (MADE GROUND)			
					1.0		Loose black coarse angular sandy GRAVEL		Heavy contamination noted Damp	
					2.0				Dry following rod connection at 1m	
					3.0				Wet	
					4.0		sand becoming very fine		Dry following rod connection at 4m	
					5.0				Damp Strong hydrocarbon odour	
					6.0					
					7.0				Damp Slight hydrocarbon odour	
					8.0					
					9.0					
					10				Dry following rod connection at	

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: MSMW224A		PAGE 4 of 4	
	NUMBER	TYPE					START DATE: 12/5/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 13/5/99		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		
S1 D2 						30  Light brown-grey fine to medium grained crystalline SANDSTONE (BEDROCK)		Very productive		30
						Borehole terminated at 30.4 mbgl				31
										32
										33
										34
										35
										36
										37
										38
										39
										40

LOCATION / NOTES:

- All measurements in m below ground level (mbgl)
- ODEX to 20.5m, Rotary to 30.4m

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

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW224B		PAGE 2 of 3	
	NUMBER	TYPE					START DATE: 14/5/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 14/5/99	BOREHOLE DIAMETER: 250/200/165 mm
S2	D1				10	Stiff brown sandy CLAY (BOULDER CLAY)				
					11	becoming grey-brown Stiff grey silty, sandy CLAY (BOULDER CLAY)			Damp No odour	
					12	Stiff grey fine SAND with minor gravel Firm grey silty CALY			Damp to wet No odour	
					13	Loose grey SAND with minor silt and clay Stiff brown very sandy CLAY (BOULDER CLAY)			Damp, no odour	
					14	Loose orange-brown very sandy CLAY (BOULDER CLAY)			Damp	
					15				Damp No odour	
					16					
					17	Stiff light brown very sandy CLAY (BOULDER CLAY) with boulders from 17.2m			Dry to slightly damp No odour Dry following rod connection at 17.2m	
					18	Grey sandy CLAY with sandstone boulders (BOULDER CLAY)				
					19	Weathered sandstone BOULDERS (WEATHERED BEDROCK)			Wet	
					20	ROCKHEAD: Grey-brown fine to medium grained Crystalline SANDSTONE (BEDROCK)				

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 App'd DRAFT Ref. CR/MC/BR5 Date MAY 99 Job No. 39991-004-401	
2. Rotary with ODEX throughout				DAMES & MOORE GROUP	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW223B		PAGE 1 of 2			
	NUMBER	TYPE					START DATE: 28/4/99		DRILLING METHOD: Cable Percussion/Rotary Air Flush			
							FINISH DATE: 29/4/99		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						
D1							DESCRIPTION		COMMENTS			
							CONCRETE (MADE GROUND)		0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10			
							Very dense grey-black angular coarse GRAVEL (MADE GROUND)					
							Coarse angular GRAVEL (Ballast) (MADE GROUND)				Slight hydrocarbon odour	
							Loose brown silty CLAY (BOULDER CLAY)				Damp Wet following rod connection at 3.9m	
							becoming more clayey and firmer from 5.8m					
							Dark brown PEAT		Damp Dry following rod connection at 6.9m			
									No hydrocarbon odour			

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 App'd DRAFT Ref. CR/MC/BRS Date MAY 99 Job No. 39991-004-401	
2. Cable percussion to 3.3m, Rotary to 20m				DAMES & MOORE	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW223B		PAGE 2 of 2	
	NUMBER	TYPE					START DATE: 28/4/99	DRILLING METHOD: Cable Percussion/Rotary Air Flush	FINISH DATE: 29/4/99	BOREHOLE DIAMETER: 250/200/165 mm
D1							DESCRIPTION	COMMENTS		
					10		Loose brown very silty CLAY (BOULDER CLAY)	Dry		10
					11		with sandstone boulders from 11.2m			11
					12		Siltstone BOULDERS (WEATHERED BEDROCK)			12
					13		ROCKHEAD: Grey crystalline SANDSTONE (BEDROCK)	Dry		13
					14		interbedded with siltstone from 14m			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 Undisturbed Sample Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table	Job Title SOIL & GROUNDWATER INVESTIGATION	
2. Cable percussion to 3.3m, Rotary to 20m		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: MSMW223A		PAGE 1 of 3		
	NUMBER	TYPE					START DATE: 14/4/99	DRILLING METHOD: Cable Percussion/Rotary Air Flush			
							FINISH DATE: 28/4/99	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			
S1	D2						DESCRIPTION		COMMENTS		
					0		TARMAC (MADE GROUND)		Very hard drilling		
							CONCRETE (MADE GROUND)		Slight to moderate hydrocarbon odour		
					1.0		Very dense grey-black COBBLES with gravel and minor sand (MADE GROUND)		Sheen on water surface		
					2.0						
					3.0						
					4.0		Dark grey-black coarse angular GRAVEL (MADE GROUND)		Wet, poor returns Slight hydrocarbon odour		
					5.0		Plastic grey-brown CLAY (BOULDER CLAY)		Damp, no odour Wet following rod connection at 4.8m		
					6.0		Firm brown CLAY (BOULDER CLAY) becoming grey		Damp, no odour		
					7.0		Dark brown PEAT		Damp, no odour Water ingress at 6.7m		
					8.0		Grey, very silty CLAY (BOULDER CLAY)		No odour Damp Wet following rod connection at 7.2m		
					9.0		Hard sandstone COBBLES		Slightly damp		
							Loose orange-brown very silty CLAY (BOULDER CLAY)		Damp		
							Orange, silty clay with sandstone BOULDERS (BOULDER				
					10						

LOCATION / NOTES: 1. All measurements in m below ground level (mbgl) 2. Cable percussion to 3.6m, Rotary to 30m		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
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BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW223A		PAGE 2 of 3	
		NUMBER	TYPE					START DATE: 14/4/99	DRILLING METHOD: Cable Percussion/Rotary Air Flush	FINISH DATE: 28/4/99	BOREHOLE DIAMETER: 250/200/165 mm
S1	D2							DESCRIPTION	COMMENTS		
						10	X	Orange-brown very silty CLAY (BOULDER CLAY)	Slightly damp	10	
						11	X	Grey-brown very silty CLAY (BOULDER CLAY)	Damp	11	
						12	X	Orange-brown very silty CLAY with sandstone cobbles (BOULDER CLAY)	Slightly damp	12	
						13	X	ROCKHEAD: Light grey crystalline SANDSTONE (BEDROCK)		13	
						14	X	Weak dark grey-brown SILTSTONE (BEDROCK)	Dry	14	
						15	X	Light grey crystalline SANDSTONE with thin (<100mm) layers of interbedded siltstone (BEDROCK)	Dry	15	
						16	X			16	
						17	X			17	
						18	X			18	
						19	X			19	
20	X			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

BOREHOLE CONSTRUCTION		SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW223A		PAGE 3 of 3	
		NUMBER	TYPE					START DATE: 14/4/99		DRILLING METHOD: Cable Percussion/Rotary Air Flush	
								FINISH DATE: 28/4/99		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			
S1	D2							DESCRIPTION	COMMENTS		
						20		Light grey crystalline SANDSTONE (BEDROCK)	Dry		20
						21					21
						22					22
						23					23
						24		some fine gravel from 24m	Damp		24
						25			Drying out from 24.5m		25
						26					26
						27					27
						28		Dark grey SILTSTONE (BEDROCK)	Wet from 27.5m		28
						29		Light grey SANDSTONE with fine gravel (BEDROCK)	Wet		29
						30			Water strike at		30

LOCATION / NOTES: 1. All measurements in m below ground level (mbgl) 2. Cable percussion to 3.6m, Rotary to 30m		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
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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		0	
										CONCRETE (MADE GROUND)					
								1.0		Loose grey GRAVEL with silty clay		Very poor returns		1.0	
										Loose grey gravelly CLAY					
								2.0		Hard sandstone COBBLES with sand				2.0	
										Loose grey-brown very sandy CLAY (BOULDER CLAY)					
								3.0						3.0	
										becoming grey at 3.5m		Oily sheen on water Strong hydrocarbon odour			
								4.0		Hard sandstone BOULDERS with silt				4.0	
								5.0		Brown, very silty, sandy CLAY with abundant sandstone boulders (BOULDER CLAY)				5.0	
								6.0		Brown very sandy CLAY (BOULDER CLAY) becoming grey-brown at 6m				6.0	
								7.0		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)				8.0	
								9.0		Loose brown GRAVEL with silty sand (MADE GROUND)				9.0	
10						10									

LOCATION / NOTES:

- All measurements in m below ground level (mbgl)
- Cable percussion to 6.0m, Rotary to 32m
- 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

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	
					DESCRIPTION		COMMENTS			
S2 A					10	Grey sandy CLAY	Damp	10		
					11	becoming gravelly from 11.1m	Water at 10.5m	11		
					12		Drier from 11.5m	12		
					13	Dark grey CLAY (BOULDER CLAY)	Dry	13		
					14	Orange-brown gravelly CLAY (BOULDER CLAY)	Dry	14		
					15		Dry following pipe connection at 14.0m	15		
					16	Grey silty plastic CLAY with minor gravel (BOULDER CLAY)		16		
					17	Grey silty GRAVEL with fine sand	Dry	17		
					18	Grey sandstone GRAVEL with minor sandy silt	Dry	18		
					19	Grey sandstone GRAVEL with silt becoming clayey at 16.3m	Damp to wet Damp	19		
					20	Sandstone BOULDERS		20		
						ROCKHEAD: Grey crystalline SANDSTONE (BEDROCK)	Wet			

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: MSMW222B		PAGE 4 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		
SZ	A				30	Light grey crystalline SANDSTONE interbedded with thin coal bands	Wet			
					31					
					32					
					33					
					34					
					35					
					36					
					37					
					38					
					39					
					40					

LOCATION / NOTES:

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

LEGEND

X Disturbed Sample

■ Undisturbed Sample

* Headspace Analysis

+ Down Borehole Analysis

G Groundwater Table

V 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

DCM GROUP

DAMES & MOORE

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 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: 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	
							Hard light grey sandstone BOULDERS			
					17		Brown-grey very silty CLAY (BOULDER CLAY)		Dry	17
							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
			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: 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		
							Light grey crystalline SANDSTONE (BEDROCK)	Dry	20	
							COAL	Damp	21	
							Weak light brown-grey MUDSTONE with interbedded coal	Dry	12	
							Light grey crystalline SANDSTONE	Dry	23	
									24	
									25	
									26	
									27	
									28	
									29	
									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: 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		
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene		
							LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm		
						DESCRIPTION		COMMENTS			
S3 D					10		Loose orange, very sandy CLAY (BOULDER CLAY) becomes light grey from 10.1-10.4 orange from 10.4m		Slightly damp Damp Damp		10
*>2000					11		Orange SAND with minor gravel		Water strike at 11.5m following rod connection Wet		11
					12		Brown sandy CLAY (BOULDER CLAY)		Wet No odour		12
					13		Orange-red SAND with gravel		Damp Slightly damp No odour		13
*0.0					14		Orange-brown very sandy CLAY (BOULDER CLAY)		Dry following rod connection at 14.4m Wet from 14.7m		14
					15		Becomes light grey-brown at 14.9m				15
*0.0					16		Dark brown PEAT		Damp Wet following rod connection at 15.9m		16
					17		Soft grey silty CLAY with gravel and peat PEAT with sandy clay from 17.1m Firm dark grey fibrous silty CLAY with traces of wood		Damp No odour Dry following rod connection at 17.2m Slightly damp No odour		17
					18				Slightly damp		18
					19						19
					20						20

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	
				Client	
				App'd Ref. CR/MC/BR 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	
							DRILLER: R4		SCREEN TYPE & DIAMETER: 50 mm polypropylene	
							LOGGED BY: PW APPR'D BY:		SCREEN SLOT SIZE: 0.5 mm	
S1	S2						DESCRIPTION		COMMENTS	
							0	CONCRETE (MADE GROUND)		
								Loose red-brown sandy GRAVEL with brick fragments (MADE GROUND)		
								Loose grey-brown sandy CLAY (BOULDER CLAY)	Slightly damp Slight hydrocarbon odour	
							1.0			
							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	Orange-brown clayey SAND with minor gravel (BOULDER CLAY)	Dry - slightly damp	
								becoming increasingly orange	Damp	
							*3.2		Dry following rod connection at 5.1m	
								Grey-brown very silty CLAY with fine sand (BOULDER CLAY)	Dry	
							*0.3	sandstone cobbles from 6.4m	Dry following rod connection at 6.7m	
									Dry	
								Orange-brown to brown silty CLAY with much fine sand (BOULDER CLAY)	Dry No odour	
								Light grey silty CLAY (BOULDER CLAY)	Dry following rod connection at 8.3m	
								Orange-brown CLAY with much fine sand and silt (BOULDER CLAY)	Dry - slightly damp	
							9.0			
							10			
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) becomes grey at 10.1-10.3m becomes orange at 10.3 m		Damp Slightly damp Wet following rod connection at		10
						Borehole terminated at 13.2 mbgl				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		DAMES & MOORE	
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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		
*1679 *1151 *1052 *215 *158 *235 *312						0	CONCRETE (MADE GROUND)	Strong hydrocarbon odour Wet	0	
						0.5	Loose dark grey sandy GRAVEL (MADE GROUND)	Productive at 1m following rod connection	0.5	
						1.0			1.0	
						2.0	Loose dark grey-black sandy CLAY (BOULDER CLAY)	Wet Heavily contaminated Unproductive	2.0	
						3.0	Loose brown sandy CLAY (BOULDER CLAY)	Damp Strong hydrocarbon odour Dry following rod connection at 3.5m	3.0	
4.0			4.0							
5.0			5.0							
6.0			6.0							
6.5	Firm orange-brown fine sandy CLAY with frequent coarse rounded gravel (BOULDER CLAY)	Slightly damp becoming drier from 6.8m	6.5							
7.0		Slight odour	7.0							
8.0		Dry from 7.8m	8.0							
9.0			9.0							
10.0	becoming darker brown		10.0							
10.5	Light brown CLAY with grey sandstone cobbles (BOULDER		10.5							

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