

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: WSMW033		PAGE 2 of 2	
	NUMBER	TYPE					DRILLING DATES: 09/12/2003		DRILLING METHODS : Beretta - Various	
							DRILLER : APEX - Rhymal		BOREHOLE DIAMETER : 100-115mm	
							LOGGED BY : SS		SCREEN TYPE & DIAM: 50mm HDPE	
							CHECKED BY : SG		SCREEN SLOT SIZE: 1mm	
								COMMENTS	S.V	
					5.5					
					6.0					
					6.5					
					7.0					
					7.5					
					8.0					
					8.5		Terminated at 8.0m due to refusal			
					9.0					
					9.5					
					10.0					

LOCATION / NOTES: NVO = No visual or olfactory evidence of contamination S,V = Contamination Observations S - Odour score (0-5) V - Visual score (0-5)	LEGEND Disturbed Sample Undisturbed Sample Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table	BOREHOLE LOG Job Title: BP Llandarcy Whole Site Investigation Location: BP Llandarcy Refinery Client: BP/WDA <table> <tr> <td>App'd:</td> <td>Date: December 2003</td> </tr> <tr> <td>Drawn : SS</td> <td>Ref:</td> </tr> <tr> <td>Scale: As scale</td> <td>Job No: 39991-044-785</td> </tr> <tr> <td>Drg. Size: A4</td> <td>BOREHOLE LOG</td> </tr> </table>	App'd:	Date: December 2003	Drawn : SS	Ref:	Scale: As scale	Job No: 39991-044-785	Drg. Size: A4	BOREHOLE LOG
App'd:	Date: December 2003									
Drawn : SS	Ref:									
Scale: As scale	Job No: 39991-044-785									
Drg. Size: A4	BOREHOLE LOG									

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: WSMW036		PAGE 1 of 2	
	NUMBER	TYPE					DRILLING DATES: 6/1/2004		DRILLING METHODS : RAF	
							DRILLER : APEX - Richard		BOREHOLE DIAMETER : 100-115mm	
							LOGGED BY : CM		SCREEN TYPE & DIAM: 50mm HDPE	
							CHECKED BY : SG		SCREEN SLOT SIZE: 1mm	
						DESCRIPTION	COMMENTS	S,V		
						0.0 Soft to firm, dark brown, gravelly silt with rare metal fragments. Gravel is angular to subrounded fine to coarse of sandstone. (MADE GROUND)	Dry	0,0		
						0.5 Soft to firm, orange brown slightly gravelly SILT. Gravel is subangular to rounded fine to coarse of sandstone.				
						1.0 Soft to firm, light brown fine sandy SILT.				
						1.5 Becoming brown in colour from 1.5m	Dry	0,0		
						2.0 Becoming dark brown with frequent cobbles and boulders from 2.0m.				
						2.5 With occasional fragments of purple mudstone from 2.5m.				
						3.0 Becoming black brown in colour from 3.0m	Dry	0,0		
						3.5 Well cemented light grey SANDSTONE.				
						4.0 Well cemented light grey SANDSTONE.				
						4.5 Well cemented light grey SANDSTONE.	Dry	0,0		
5.0 Well cemented light grey SANDSTONE.	Damp. Slight hydrocarbon odour.	1,0								

LOCATION / NOTES:

NVO = No visual or olfactory evidence of contamination

S,V = Contamination Observations

S - Odour score (0-5)

V - Visual score (0-5)

LEGEND

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

BOREHOLE LOG

Job Title: BP Llandarcy Whole Site Investigation

Location: BP Llandarcy Refinery

Client: BP/WDA

App'd:	Date: February 2004
Drawn : CM	Ref:
Scale: As scale	Job No: 39991-044-785
Drg. Size: A4	BOREHOLE LOG

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: WSMW036		PAGE 2 of 2	
	NUMBER	TYPE					DRILLING DATES: 6/1/2004		DRILLING METHODS : RAF	
							DRILLER : APEX - Richard		BOREHOLE DIAMETER : 100-115mm	
							LOGGED BY : CM		SCREEN TYPE & DIAM: 50mm HDPE	
							CHECKED BY : SG		SCREEN SLOT SIZE: 1mm	
							Becoming brown grey in colour from 5.0m		COMMENTS	S,V
							Becomig dark brown grey from 5.5m			
		Damp-wet.	1,0							
Borehole terminated at 7.5m.										

LOCATION / NOTES:

NVO = No visual or olfactory evidence of contamination

S,V = Contamination Observations

S - Odour score (0-5)

V - Visual score (0-5)

LEGEND

Disturbed Sample

Undisturbed Sample

Headspace Analysis

Down Borehole Analysis

Groundwater Table

Perched Water Table

BOREHOLE LOG

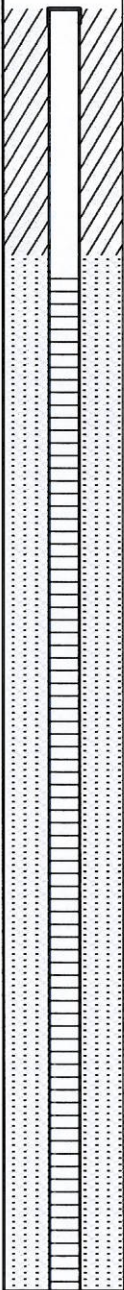
Job Title: BP Llandarcy Whole Site Investigation

Location: BP Llandarcy Refinery

Client: BP/WDA

App'd:	Date: February 2004
Drawn : CM	Ref:
Scale: As scale	Job No: 39991-044-785
Drg. Size: A4	BOREHOLE LOG

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: WSMW088		PAGE 1 of 1	
	NUMBER	TYPE					DRILLING DATES: 6/1/2004		DRILLING METHODS: Beretta	
							DRILLER: APEX - Rhym		BOREHOLE DIAMETER: 100-115mm	
							LOGGED BY: HM		SCREEN TYPE & DIAM: 50mm HDPE	
				CHECKED BY: SG		SCREEN SLOT SIZE: 1mm				
					0.0		DESCRIPTION	COMMENTS	S,V	
			*0.3		0.5	Brown to mottled orange, slightly sandy SILT with some medium to coarse gravel. Medium to firm, brown and orange mottled (20:80) silty CLAY with occasional coarse gravel.	Wet, nvo.	0,0		
					1.0		Dry	0,0		
					1.5	Increase in grey sandstone cobbles.	Slight grey staining	0,1		
			*0.1		2.0		Wet, nvo	0,0		
			*0.6		2.5	Becoming grey brown fine to coarse slightly silty SAND with frequent fine to coarse gravel and grey to red sandstone cobbles to boulders	Poor percussive recovery in last 2 sections.	0,0		
					3.0		NVO	0,0		
					3.5	Borehole terminated at 3.5m due to refusal.				
					4.0					
					4.5					
LOCATION / NOTES: NVO = No visual or olfactory evidence of contamination S,V = Contamination Observations S - Odour score (0-5) V - Visual score (0-5)						LEGEND Disturbed Sample Undisturbed Sample Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table		BOREHOLE LOG Job Title: BP Llandarcy Whole Site Investigation Location: BP Llandarcy Refinery Client: BP/WDA 		
						App'd: _____ Date: February 2004 Drawn: CM Ref: _____ Scale: As scale Job No: 39991-044-785 Drg. Size: A4 BOREHOLE LOG				

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: WSMW135		PAGE 1 of 2	
	NUMBER	TYPE					DRILLING DATES: 15/12/2003		DRILLING METHODS : Beretta - various	
							DRILLER : Apex - Rhymal		BOREHOLE DIAMETER : -	
							LOGGED BY : HM		SCREEN TYPE & DIAM: -	
							CHECKED BY :		SCREEN SLOT SIZE: -	
							DESCRIPTION	COMMENTS	S,V	
			1.5		0.0		Soft, slightly sandy SILT with occasional fine to coarse gravel, sandstone cobbles and rootlets.	Black heavy smell to 0.2m, wet.	2,3	
	SPT - 0.5m		1.5		0.5		Soft to firm, light brown slightly sandy SILT with frequent fine to coarse gravel, occasional sandstone cobbles.	Dry to damp, very slight grey streaky staining, very slight light hydrocarbon odour.	2,3	
			2.4		1.0		With boulders from 1.0m.			
	SPT - 1.5m Refusal				1.5					
	SPT - 2.5m Refusal				2.0					
					2.5					
					3.0		Brown arisings.			
					3.5		With boulder at 3.5-4.0m			
					4.0					
					4.5					
					5.0			Becoming damp.		

LOCATION / NOTES:	LEGEND	BOREHOLE LOG	
NVO = No visual or olfactory evidence of contamination S,V = Contamination Observations S - Odour score (0-5) V - Visual score (0-5)	 Disturbed Sample  Undisturbed Sample  Headspace Analysis  Down Borehole Analysis  Groundwater Table  Perched Water Table	Job Title: BP Llandarcy Whole Site Investigation Location: BP Llandarcy Refinery Client: BP/WDA 	
		App'd:	Date: December 2003
		Drawn: HM	Ref:
		Scale: As scale	Job No: 39991-044-785
		Drg. Size: A4	BOREHOLE LOG

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: WSMW135		PAGE 2 of 2	
	NUMBER	TYPE					DRILLING DATES: 15/12/2003		DRILLING METHODS: Beretta - various	
							DRILLER: Apex - Rhymal		BOREHOLE DIAMETER: -	
							LOGGED BY: HM		SCREEN TYPE & DIAM: -	
							CHECKED BY:		SCREEN SLOT SIZE: -	
								COMMENTS	S,V	
					5.5	Grey SANDSTONE bedrock.				
					6.0					
					6.5					
					7.0					
					7.5					
					8.0					
					8.5					
					9.0					
					9.5					
					10.0					

LOCATION / NOTES:	LEGEND	BOREHOLE LOG	
NVO = No visual or olfactory evidence of contamination S,V = Contamination Observations S - Odour score (0-5) V - Visual score (0-5)	Disturbed Sample Undisturbed Sample Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table	Job Title: BP Llandarcy Whole Site Investigation Location: BP Llandarcy Refinery Client: BP/WDA	
			App'd: _____ Date: December 2003 Drawn: HM Ref: _____ Scale: As scale Job No: 39991-044-785 Drg. Size: A4 BOREHOLE LOG

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: WSMW151		PAGE 1 of 1	
	NUMBER	TYPE					DRILLING DATES: 16/01/2004		DRILLING METHODS : Beretta	
							DRILLER : APEX - Terry		BOREHOLE DIAMETER : 100-115mm	
							LOGGED BY : JG		SCREEN TYPE & DIAM: 50mm HDPE	
							CHECKED BY : SG		SCREEN SLOT SIZE: 1mm	
						DESCRIPTION	COMMENTS	S,V		
					0.0	Medium dense, dark brown, silty, clayey, fine sand with gravel, cobbles and boulders. (MADE GROUND)		0,0		
					0.5	Soft, brown, silty CLAY.		0,0		
	SPT - 1.0m 3,3/50 for 50mm (n>50)	+			1.0	Dark brown silty fine SAND with occasional gravels and cobbles and patches of solid black coarse material.	Wet.	0,2		
					2.0		All black stained.	2,4		
	SPT - 2.5m 50 for 10mm (n>50)	+			2.5		Very wet.			
				3.0		Water blown out of hole.				
				3.5						
				4.0		Black stained coarse SAND with liholelicts of friable sandstone. (Weathered sandstone) Borehole terminated at 4.0m.	Wet.	0,3		
				4.5						
				5.0						

LOCATION / NOTES:	LEGEND	BOREHOLE LOG	
NVO = No visual or olfactory evidence of contamination S,V = Contamination Observations S - Odour score (0-5) V - Visual score (0-5)	Disturbed Sample Undisturbed Sample Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table	Job Title: BP Llandarcy Whole Site Investigation Location: BP Llandarcy Refinery Client: BP/WDA	
			App'd: _____ Date: February 2004 Drawn : SS Ref: _____ Scale: As scale Job No: 39991-044-785 Drg. Size: A4 BOREHOLE LOG

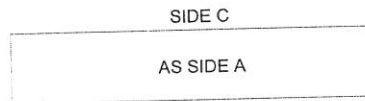
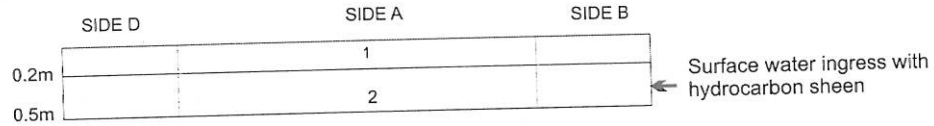
BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: TFTP015		PAGE 1 of 1	
	NUMBER	TYPE					START DATE: 18/08/00		DRILLING METHOD: Hydraulic Percussive	
							FINISH DATE: 18/08/00		BOREHOLE DIAMETER: 133 mm	
							DRILLER: GEOTECHNICAL		SCREEN TYPE & DIAMETER: 19 mm	
		LOGGED BY: ss APPR'D BY:		SCREEN SLOT SIZE: N/A						
						DESCRIPTION	COMMENTS			
						Red-grey, gravelly CLAY with frequent sub-rounded to angular cobbles and brick fragments (MADE GROUND)	Dry. No odour			
						Firm grey-red-brown, silty, gravelly CLAY with occasional sub-rounded cobbles	Strong hydrocarbon odour and dark staining noted			
						Firm green and red mottled, silty CLAY with occasional sub-rounded cobbles				
						Firm grey-brown, clayey, sandy SILT with frequent coarse gravel and angular to sub-rounded cobbles	Moderate hydrocarbon odour			
						Borehole terminated at 2.8 mbgl on refusal				
LOCATION / NOTES: 1. All measurements in m below ground level (mbgl) 2. Borehole backfilled to 1.0m with bentonite 3. Vapour point installed						LEGEND Disturbed Sample Undisturbed Sample * Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table		BOREHOLE LOG Job Title SOIL & GROUNDWATER INVESTIGATION Location BP LLANDARCY REFINERY LTD Client BP LLANDARCY LTD App'd DRAFT Ref. MC/CR/BRS Date SEP 2000 Job No. 39991-017-402		

URS

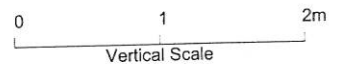
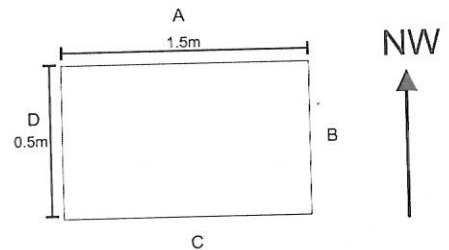
Dames & Moore
O'Brien Kreitzberg
Thorburn Colquhoun

TRIAL PIT NUMBER: TFTP058
GROUND ELEVATION: -
DATE OF EXCAVATION: 22/08/00
WATER LEVEL: -
LOGGED BY: SC
APPROVED BY:

SIDE ELEVATIONS



PLAN



Key:

- * Sample location
- SO Soil Sample
- WA Water Sample
- HS Headspace Analysis (ND = Not Detected)
- Water Ingress

All measurements in m BGL
(metres below ground level)

STRATA DESCRIPTIONS	COMMENTS	SAMPLES
1 Soft, dark brown, sandy SILT with gravel and rootlets. Large angular cobbles and boulders on surface	1 Wet due to surface water. Oily sheen noted on surface water	
2 Loose, black-dark brown, sandy SILT with frequent sub-angular gravel and cobbles with some sub-rounded gravel and cobbles	2 Wet with hydrocarbon odour	HS - 0.5m - 18.2 ppm SO - TFTP052-0.5m
Trial pit terminated at 0.5 mbgl on refusal - bedrock exposure noted adjacent to tank base		

Job Title: SOIL AND GROUNDWATER INVESTIGATION, TANK FARM

Location: BP LLANDARCY LTD

Client: BP LLANDARCY LTD

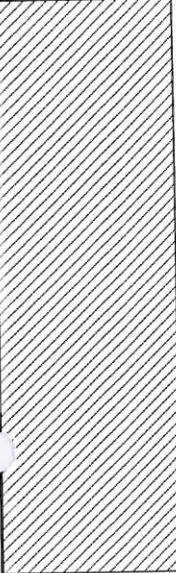
URS

Dames & Moore
O'Brien Kreitzberg
Thorburn Colquhoun

Job No:
39991-017-402

Ref: MC/CR/BRS

DRAFT

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: TFTP060		PAGE 1 of 1						
	NUMBER	TYPE					START DATE: 22/08/00	DRILLING METHOD: Hydraulic Percussive							
							FINISH DATE: 22/08/00	BOREHOLE DIAMETER: 108 mm							
							DRILLER: GEOTECHNICAL	SCREEN TYPE & DIAMETER: N/A							
				LOGGED BY: ss APPR'D BY:		SCREEN SLOT SIZE: N/A									
						DESCRIPTION		COMMENTS							
	TFTP060		*14.0		0		Red-brown, silty CLAY with rare coarse gravel		Dry. No odour		0				
	0.5m								0.5		Loose, brown-orange, clayey, silty SAND with rare sub-rounded to angular cobbles and gravel		No odour or staining		0.5
									1.0			Red-brown, sandy, silty CLAY with rare gravel		Slight hydrocarbon odour	
									1.5	Borehole terminated at 2.0 mbgl					1.5
	TFTP060		*149		2.0						2.0				
	2.0m				2.5						2.5				
					3.0						3.0				
					3.5						3.5				
					4.0						4.0				
					4.5						4.5				
					5.0						5.0				

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level (mbgl)			Disturbed Sample	Job Title SOIL & GROUNDWATER INVESTIGATION	
2. Borehole backfilled with bentonite			Undisturbed Sample	Location BP LLANDARCY REFINERY LTD	
			Headspace Analysis	Client BP LLANDARCY LTD	
			Down Borehole Analysis	App'd DRAFT	
			Groundwater Table	Ref. MC/CR/BRS	
			Perched Water Table	Date SEP 2000	
				Job No. 39991-017-402	
				 Dames & Moore O'Brien Kreitzberg Thorburn Colquhoun	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: TFTP154		PAGE 1 of 1				
	NUMBER	TYPE					START DATE: 22/08/00		DRILLING METHOD: Percussive				
							FINISH DATE: 22/08/00		BOREHOLE DIAMETER: 108 mm				
							DRILLER: GEOTECHNICAL		SCREEN TYPE & DIAMETER: N/A				
				LOGGED BY: ss APPR'D BY:		SCREEN SLOT SIZE: N/A							
						DESCRIPTION		COMMENTS					
TFTP154 0.5m TFTP154 2.5m *4.3 *4.6 *4.9 *1.4 *10.6 *2.8						0 		Red-brown, clayey GRAVEL with frequent angular cobbles (TOPSOIL)		No odour or staining. Dry		0	
						0.5 		Soft brown-red, gravelly CLAY with frequent sub-angular to sub-rounded sandstone cobbles				0.5	
						1.0 						1.0	
						1.5 						1.5	
						2.0 						2.0	
						2.5 		Dense brown-red, clayey, sandy GRAVEL with frequent sub-rounded to angular cobbles		No odour or staining. Dry		2.5	
						3.0 						3.0	
						3.5 						3.5	
						4.0 						4.0	
						4.5 						4.5	
						5.0 		Borehole terminated at 3.45 mbgl on refusal				5.0	

LOCATION / NOTES:

- All measurements in m below ground level (mbgl)
- Borehole backfilled with arisings

LEGEND

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

BOREHOLE LOG

Job Title **SOIL & GROUNDWATER INVESTIGATION**

Location **BP LLANDARCY REFINERY LTD**

Client **BP LLANDARCY LTD**

App'd **DRAFT**

Ref. **MC/CR/BRS**

Date **SEP 2000**

Job No. **39991-017-402**

URS
Dames & Moore
O'Brien Kreitzberg
Thorburn Colquhoun

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: TFTP155		PAGE 1 of 1	
	NUMBER	TYPE					START DATE: 22/08/00		DRILLING METHOD: Percussive	
							FINISH DATE: 22/08/00		BOREHOLE DIAMETER: 108 mm	
						DRILLER: GEOTECHNICAL		SCREEN TYPE & DIAMETER: 19 mm		
						LOGGED BY: ss APPR'D BY:		SCREEN SLOT SIZE: N/A		
							DESCRIPTION	COMMENTS		
							Brown-red CLAY with frequent gravel (TOPSOIL)	Dry	0	
							Firm grey-brown, sandy, silty CLAY with frequent sub-angular to sub-rounded cobbles and medium coarse gravel	Slight hydrocarbon / sulphurous odour	0.5	
							Firm grey-black, silty CLAY with very frequent, sub-rounded cobbles and frequent fine gravel	Strong hydrocarbon odour	1.5	
								Hydrocarbon sheen on gravel	2.0	
							Borehole terminated at 2.5 mbgl on refusal		2.5	
									3.0	
									3.5	
									4.0	
									4.5	
									5.0	

LOCATION / NOTES:		LEGEND		BOREHOLE LOG	
1. All measurements in m below ground level (mbgl)		☒ Disturbed Sample		Job Title SOIL & GROUNDWATER INVESTIGATION	
2. Borehole backfilled with bentonite to 1.0m		■ Undisturbed Sample		Location BP LLANDARCY REFINERY LTD	
3. Vapour point installed		* Headspace Analysis		Client BP LLANDARCY LTD	
		† Down Borehole Analysis		App'd DRAFT	
		▽ Groundwater Table		Ref. MC/CR/BRS	
		▽ Perched Water Table		Date SEP 2000	
				Job No. 39991-017-402	
				 Dames & Moore O'Brien Kreitzberg Thorburn Colquhoun	

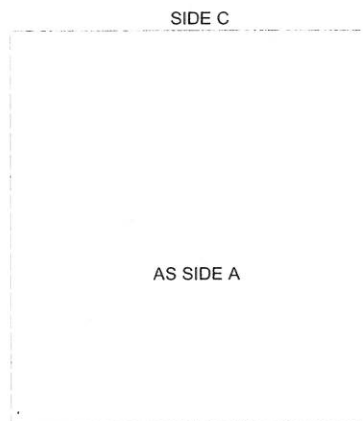
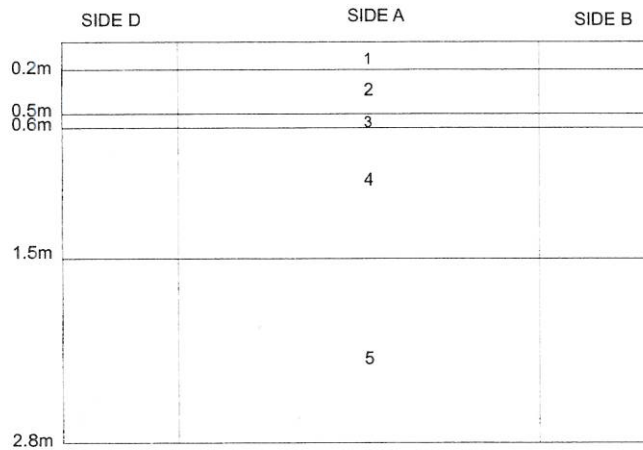
BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: TFMW002		PAGE 1 of 1		
	NUMBER	TYPE					START DATE: 18/08/00		DRILLING METHOD: Percussive		
							FINISH DATE: 18/08/00		BOREHOLE DIAMETER: 108 mm		
							DRILLER: GEOTECHNICAL		SCREEN TYPE & DIAMETER: N/A		
							LOGGED BY: ss APPR'D BY:		SCREEN SLOT SIZE: N/A		
						DESCRIPTION		COMMENTS			
BOREHOLE CONSTRUCTION TFMW002 0.5m TFMW002 4.0m						0		Red-brown, CLAY (TOPSOIL)		Dry. No staining	
								Brown-yellow sandstone COBBLES			
						0.5		Orange-brown, gravelly, silty CLAY with frequent sub-rounded cobbles and occasional red-green mottling		Black staining in places	
						1.0					
						1.5		Firm, grey-brown, silty CLAY with frequent sub-rounded cobbles and occasional red-green mottling		Dry	
						2.0					
						2.5		Yellow-brown sandstone COBBLES		Black staining	
						3.0		Firm, grey-brown, silty CLAY with frequent sub-rounded cobbles and occasional red-green mottling			
						3.5		Brown-grey, clayey, sandy SILT with frequent fine gravel and occasional sub-rounded cobbles		Hydrocarbon odour. Dark staining. Dry	
						4.0		Borehole terminated at 4.0 mbgl			
4.5											
5.0											
LOCATION / NOTES:						LEGEND		BOREHOLE LOG			
1. All measurements in m below ground level (mbgl)						☒ Disturbed Sample		Job Title SOIL & GROUNDWATER INVESTIGATION			
2. Borehole backfilled with bentonite						■ Undisturbed Sample		Location BP LLANDARCY REFINERY LTD			
3. No PID readings taken						* Headspace Analysis		Client BP LLANDARCY LTD			
						† Down Borehole Analysis		App'd DRAFT		URS Dermis & Moore O'Brien Kreitzberg Thornburn Colquhoun	
						☒ Groundwater Table		Ref. MC/CR/BRS			
						☒ Perched Water Table		Date SEP 2000			
								Job No. 39991-017-402			

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: TFMW003b		PAGE 1 of 1	
	NUMBER	TYPE					START DATE: 21/08/00		DRILLING METHOD: Percussive	
							FINISH DATE: 21/08/00		BOREHOLE DIAMETER: 108 mm	
							DRILLER: GEOTECHNICAL		SCREEN TYPE & DIAMETER: N/A	
		LOGGED BY: ss APPR'D BY:		SCREEN SLOT SIZE: N/A						
						DESCRIPTION		COMMENTS		
						Red-grey-brown, gravelly, sandy CLAY with frequent angular cobbles and organic gravel (MADE GROUND)		Dry. No staining		0
						Grey-orange silty CLAY with very occasional sub-rounded to sub-angular cobbles		Slight sulphurous odour		0.5
						Borehole terminated at 1.25 mbgl on refusal				1.0
										1.5
										2.0
										2.5
										3.0
										3.5
										4.0
										4.5
										5.0

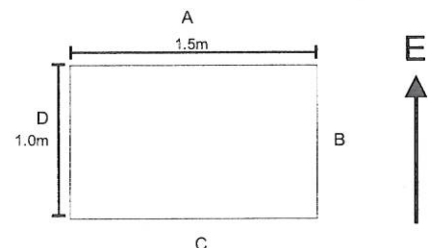
LOCATION / NOTES:	LEGEND	BOREHOLE LOG	
1. All measurements in m below ground level (mbgl)	Disturbed Sample	Job Title	SOIL & GROUNDWATER INVESTIGATION
2. Borehole backfilled with bentonite	Undisturbed Sample	Location	BP LLANDARCY REFINERY LTD
3. No PID readings taken	* Headspace Analysis	Client	BP LLANDARCY LTD
	† Down Borehole Analysis	App'd	DRAFT
	Groundwater Table	Ref.	MC/CR/BRS
	Perched Water Table	Date	SEP 2000
		Job No.	39991-017-402
		 Darres & Moore O'Brien Kreitzberg Thorburn Colquhoun	

TRIAL PIT NUMBER: TFMW004
GROUND ELEVATION: -
DATE OF EXCAVATION: 22/08/00
WATER LEVEL: -
LOGGED BY: SC
APPROVED BY:

SIDE ELEVATIONS



PLAN



0 1 2m
Vertical Scale

Key:

- * Sample location
- SO Soil Sample
- WA Water Sample
- HS Headspace Analysis (ND = Not Detected)
- Water Ingress

All measurements in m BGL
(metres below ground level)

STRATA DESCRIPTIONS	COMMENTS	SAMPLES
1 Loose, brown, sandy SILT with occasional sub-angular gravel and rootlets (TOPSOIL)	1 No odour. Dry	
2 Loose, red-brown, sandy SILT with gravel and small cobbles and rootlets	2 No odour. Dry	HS - 0.5m - 0.0 ppm SO - TFMW004-0.5m
3 Loose, black, sandy SILT with rootlets	3 Slight hydrocarbon odour	HS - 1.0m - 4.3 ppm HS - 1.5m - 8.1 ppm HS - 2.0m - 0.0 ppm SO - TFMW004-0.5m
4 Very loose, brown, sandy SILT with gravel and some large angular boulders		
5 Loose, brown, silty SAND with frequent sub-angular gravel and cobbles, and some boulders (increasing with depth)	5 Damp. No odour	
Trial pit terminated at 2.8 mbgl		

Job Title: SOIL AND GROUNDWATER INVESTIGATION, TANK FARM
Location: BP LLANDARCY LTD
Client: BP LLANDARCY LTD

URS

Dames & Moore
O'Brien Kreitzberg
Thorburn Colquhoun

Job No:
39991-017-402
Ref: MC/CR/BRS
DRAFT

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW17		PAGE 1 of 1	
	NUMBER	TYPE					START DATE: 01/06/98	DRILLING METHOD: Cable Percussion / Rotary		
						FINISH DATE: 01/06/98		BOREHOLE DIAMETER: 200/165/115mm		
						DRILLER: CP2/R2		SCREEN TYPE & DIAMETER: UPVC 50mm		
						LOGGED BY: SG/MC APPR'D BY:		SCREEN SLOT SIZE: 0.5mm		
						DESCRIPTION		COMMENTS		
						0	Soft orange-brown sandy SILT with some clay	No odour	0	
						*0.6				
						*0	Soft brown sandy clayey SILT with frequent blue-grey medium to coarse sandstone gravel and occasional cobbles	No odour	1.0	
						*0	cobble content increases at 1.5m	No odour		
						*17.0		No odour	2.0	
						*13.3	Soft grey-blue gravelly and clayey SILT	Slight hydrocarbon odour		
						*60.8	Soft brown silty CLAY with black hydrocarbon staining	Strong hydrocarbon odour	3.0	
						*12.9	Soft to very soft green-brown silty CLAY with grey mottling and some black hydrocarbon staining			
						*6.3	Soft grey-blue silty CLAY with black hydrocarbon staining		4.0	
							Moderately weak blue-grey medium grained coarse sandstone GRAVEL with cobbles			
							Rotary drilling from 4.5m			
						*0	Medium dark grey silty SAND with angular gravel and some rounded sandstone gravel		5.0	
						*0			6.0	
							ROCKHEAD: Light grey -grey SANDSTONE (BEDROCK)	Casing set into rock and pulled during construction		
						*0		Water strike at 6.9m - productive	7.0	
						*0			8.0	
						*0			9.0	
							Borehole terminated at 9.0 mbgl			
						*0			10	

LOCATION / NOTES:

- All measurements in m below ground level (mbgl)
- Cable Percussion to 4.5 mbgl, Rotary to 9.0 mbgl with odex to 7.5 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**

App'd **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: MSMW186		PAGE 1 of 3	
	NUMBER	TYPE					START DATE: 15/3/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 15/3/99	BOREHOLE DIAMETER: 150/115 mm
							DESCRIPTION	COMMENTS		
			*0.0		0		Loose dark brown very gravelly SILT with some clay (MADE GROUND)	No odour		
					1.0					
					2.0					
					3.0		becoming siltier at 3m	No odour		
					4.0					
			*0.0		5.0		Loose grey GRAVEL with rounded cobbles and some boulders (MADE GROUND)	No odour		
					6.0					
					7.0		ROCKHEAD: Hard light grey crystalline SANDSTONE (BEDROCK)	No odour		
					8.0					
					9.0					
			*0.0		10			Drilling stopped for 15 mins at 10m, but no water ingress - drilling resumed.		

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
		 DAMES & MOORE	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW186		PAGE 2 of 3	
	NUMBER	TYPE					START DATE: 15/3/99		DRILLING METHOD: ROTARY AIR FLUSH	
							FINISH DATE: 15/3/99		BOREHOLE DIAMETER: 150/115 mm	
							DRILLER: R1		SCREEN TYPE & DIAMETER: 50 mm ID UPVC	
		LOGGED BY: DB APPR'D BY:		SCREEN SLOT SIZE: 1 mm						
						DESCRIPTION		COMMENTS		
						Hard light grey crystalline SANDSTONE (BEDROCK)		No odour	10	
									11	
									12	
									13	
									14	
						Hard brown-grey crystalline SANDSTONE (BEDROCK)		No odour	13	
									14	
						Hard grey-light grey SANDSTONE (BEDROCK)		No odour	14	
									15	
									16	
						thin (0.3m thick) band of darker sandstone at 16.5m		No odour	17	
									18	
						sandstone becoming darker in colour		No odour	19	
									20	
								Water strike at 20m, rising to 19.7m after 15	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

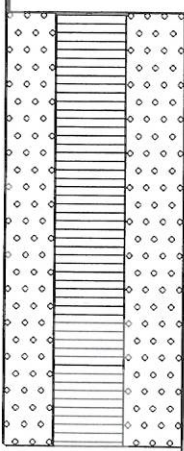
Date

 MAY 99

Job No.

 39991-004-401

DAMES & MOORE

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW186		PAGE 3 of 3	
	NUMBER	TYPE					START DATE: 15/3/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 15/3/99	BOREHOLE DIAMETER: 150/115 mm
						DESCRIPTION		COMMENTS		
						Hard grey crystalline SANDSTONE (BEDROCK)		No odour Damp Water strike at 23m, rising to 21.4m after 15		20
										21
										22
										23
										24
										25
										26
										27
										28
										29
										30

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	
	 DAMES & MOORE GROUP		

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW187		PAGE 1 of 1	
	NUMBER	TYPE					START DATE: 18/3/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 18/3/99	BOREHOLE DIAMETER: 150/115 mm
						DESCRIPTION		COMMENTS		
						0	Loose dark brown silty GRAVEL with brick fragments and angular and rounded cobbles (MADE GROUND)	No odour	0	
						1.0			1.0	
						2.0			2.0	
						3.0			3.0	
						4.0			4.0	
						5.0	ROCKHEAD: Hard light grey crystalline SANDSTONE (BEDROCK)	No odour	5.0	
						6.0			6.0	
						7.0			7.0	
						8.0			8.0	
						9.0			9.0	
						10			10	

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	SOIL & GROUNDWATER INVESTIGATION Job Title 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: MSMW200		PAGE 1 of 1	
	NUMBER	TYPE					START DATE: 15/3/99	DRILLING METHOD: ROTARY AIR FLUSH	FINISH DATE: 15/3/99	BOREHOLE DIAMETER: 165/115 mm
							DESCRIPTION	COMMENTS		
			*0.0		0		Soft brown gravelly CLAY (MADE GROUND)	No odour		
					1.0					
					2.0		Soft brown-grey sandy CLAY with some gravel (MADE GROUND)	No odour		
					3.0					
			*0.0		4.0		Loose brown clayey GRAVEL with some sand (MADE GROUND)	No odour		
			*11.1		5.0			damp at 4m Moderate odour		
					6.0		ROCKHEAD: Hard light grey crystalline SANDSTONE (BEDROCK)	Slight odour Drier		
			*41.1		7.0		sandstone becoming darker grey	No odour		
					8.0		sandstone becoming lighter grey	Damp		
					9.0					
					10					

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
		 DAMES & MOORE	

BOREHOLE CONSTRUCTION	SAMPLE		SOIL VAPOUR (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW56a		PAGE 1 of 1				
	NUMBER	TYPE					START DATE: 12/06/98		DRILLING METHOD: Cable percussion				
							FINISH DATE: 12/06/98		BOREHOLE DIAMETER: 200mm				
							DRILLER: CP3		SCREEN TYPE & DIAMETER: UPVC 50mm				
						LOGGED BY: ED		APPRD BY:		SCREEN SLOT SIZE: 0.5mm			
						DESCRIPTION		COMMENTS					
						0		Sandy brown clayey GRAVEL with ash and rubble (MADE GROUND)		No odour or staining		0	
						1.0						1.0	
						2.0		Borehole terminated at 1.6 mbgl				2.0	
						3.0						3.0	
						4.0						4.0	
						5.0						5.0	
						6.0						6.0	
						7.0						7.0	
						8.0						8.0	
						9.0						9.0	
						10						10	

LOCATION / NOTES: 1. All measurements in m below ground level (mbgl) 2. Borehole backfilled on completion - no well installed		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 GROUP
--	--	---	--	---

BOREHOLE CONSTRUCTION	FRACTURE INDEX	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW56s&d		PAGE 1 of 3	
					START DATE: 15/06/98		DRILLING METHOD: Rotary/Continuous Core	
					FINISH DATE: 15/06/98		BOREHOLE DIAMETER: 120mm	
					DRILLER: R2		SCREEN TYPE & DIAMETER: UPVC 50mm	
					LOGGED BY: MC/SG APPD BY:		SCREEN SLOT SIZE: 0.5mm	
					DESCRIPTION	COMMENTS		
					Sandy brown clayey GRAVEL with ash and rubble (MADE GROUND)		0	
					Light grey-blue sandstone BOULDERS with sandy brown clay		2.0	
					ROCKHEAD: Light grey-blue medium grained SANDSTONE, thinly bedded with a slight pinkish discolouration. Strong with joints / cross bedding planes sub-horizontal very to extremely narrow with iron staining and medium to very rough	9-10m TCR-80% SCR - 80% RQD - 62%	10	
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		
						Appd DRAFT		
						Ref. MC/CR/BRS		
					Date JUL 98		DAMES & MOORE GROUP	
					Job No. 39991-001-401			

BOREHOLE CONSTRUCTION	FRACTURE INDEX	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW56s&d		PAGE 2 of 3	
					START DATE: 15/06/98		DRILLING METHOD: Rotary/Continuous Core	
					FINISH DATE: 15/06/98		BOREHOLE DIAMETER: 120mm	
					DRILLER: R2		SCREEN TYPE & DIAMETER: UPVC 50mm	
					LOGGED BY: MC/SG APP'D BY:		SCREEN SLOT SIZE: 0.5mm	
					DESCRIPTION	COMMENTS		
					vertical fracture from 10.4-10.9m with mottled black staining	10-11.5m TCR - 1-50% SCR - 85% RQD - 37%	10	
					Open clean rough fracture with heavy iron staining at 12.2m cross bedding planes visible between 5 and 50.. from 12.2-13.3mm	11.5 - 12m TCR - 100% SCR - 95% RQD - 74% 12-13m TCR - 100% SCR - 65% RQD - 65%	12	
						13-13.3m TCR - 100% SCR - 100% RQD - 43% 13.3 - 14.8m TCR - 100% SCR - 100% RQD - 90%	13	
						14.8 - 15.5m TCR - 100% SCR - 100% RQD - 100% 15.3 - 16.3m TCR - 100% SCR - 100% RQD - 95%	14	
					Vertical fracture from 15.7 to 16m with pink and orange staining with calcite fill	16.3 - 17.3m TCR - 100% SCR - 70% RQD - 80%	15	
					Heavily iron stained lense with finer grained light brown rounded gravel clasts at 16.4m Occasional grey clasts between 16.5 and 16.9m	17.3 - 17.8m TCR - 100% SCR - 95% RQD - 85%	16	
					Fault at 16.9-17.3m with slickensided breccia of light to dark grey highly weathered (with orange iron staining) mudstone, also with mylonite	17.8 - 19.3m TCR - 100% SCR - 100% RQD - 90%	17	
					Verical fracture from fault zone at 16.9to 17.5m - heavy iron staining and dark grey clasts frequent from 17.5-17.8m		18	
					Fault at 17.8-18.2m with slickensides noted at 17.8m, 18.1m and 18.2m with rock flour and coal at 18m- heavy iron staining Dark grey clasts at 18.3m grading into massive light grey medium grained fresh sandstone with infrequent extremely close rough fractures		19	
						19.3 - 20.3m TCR - 100% SCR - 100% RQD - 100%	20	

LOCATION / NOTES:

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

LEGEND

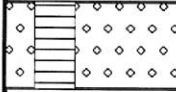
- Disturbed Sample
- Undisturbed Sample
- Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

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

DAMES & MOORE

GROUP

BOREHOLE CONSTRUCTION	FRACTURE INDEX	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MSMW56s&d		PAGE 3 of 3	
					START DATE: 15/06/98		DRILLING METHOD: Rotary/Continuous Core	
					FINISH DATE: 15/06/98		BOREHOLE DIAMETER: 120mm	
					DRILLER: R2		SCREEN TYPE & DIAMETER: UPVC 50mm	
					LOGGED BY: MC/SG APPD BY:		SCREEN SLOT SIZE: 0.5mm	
					DESCRIPTION	COMMENTS		
					Vertical fracture at 20.3-20.5m	20.3 - 20.6m TCR - 100% SCR - 100% RQD - 100%	20	
					Borehole terminated at 20.6mbgl		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 Appd DRAFT Ref. MC/CR/BRS Date JUL 98 Job No. 39991-001-401  DAMES & MOORE GROUP
--	--	---