Paramount et al Fort Liard A-01
- Re-entry Program

January 2000

PARAMOUNT RESOURCES LTD.
4000 - FIRST CANADIAN CENTRE, 350 - 7TH AVENUE S.W.
CALGARY, ALBERTA T2P 3W5
TELEPHONE: (403) 290-3600 FAX: (403) 262-7994

National Energy Board
5th Floor, 444 – 7 Avenue SW
Calgary, Alberta
T2P 0X8

January 28, 2000

Attention: Mr. Terry Baker, Chief Conservation Officer

Dear Sir,

Re: Para et al Fort Liard A-01
WID: 1858
UWI: 300A016010123151
File: 9211-P33-14-1-1

Please be notified that The Application to Alter Condition of a Well on the above referenced well.

The program submitted is to evaluate possible hydrocarbon berring sands in the Mattson formation. The maximum anticipated gas flow rates is estimated to be 170 x 10^3m^3 per day for a period of 15 days. The total estimated sweet gas test volume is 2550 x 10^3m^3.

The operations programmed will be performed in conjunction with the previously approved Emergency Response Plan. The service rig will be Cenalta Rig #R-042. This rig has been previously approved by the NEB for work on Rara et al Liard F-36.

All efforts in expediting the approval for this application will be appreciated in order to activate the service rig in a timely manner for the remainder of this winters operations.

Please contact Wayne Tomm at 290-3626 if you require additional information. Thank you for your assistance.

Yours truly,

PARAMOUNT RESOURCES LTD.

Wayne Tomm, P. Eng.
Sr. Drilling and Completions Engineer

National Energy Board | Office national de l'énergie

APPROVAL TO ALTER CONDITION OF A WELL

This application is to be submitted to the Chief Conservation Officer at least 45 days before commencement of operations.

Well Name: Paramount et al Liard A-01 Area: 60° 10' 123° 15' Cenalta

Operator: Paramount Resources Ltd. Contractor:

Drilling Rig or Unit: Cenalta Rig R-042 Depth: 2046m

Coordinates: Lat: 60° 00' 04.641" Long: 123° 15' 04.862"

Date ADW Issued: January 16, 1999 Date of last Operation: March 24, 1999

Elevation-KB/RT: 522.4 (ASL) GL/Seafloor: 517.4

TYPE OF OPERATION

- Well was drilled to a total depth of 2046m with 222mm hole diameter.
- The hole was subsequently logged ie HDIL-GR, CN-ZOL-GR-XY and XMAC-GR,
- a total of 7 DST's were run, 177.8mmx34.26kg/m. L-80 casing was run to 2046m and cemented to surface.

SUMMARY OF PROPOSED OPERATIONS

- run cement bond log and determine cement top
- perforate 1875m -1882m and evaluate with possible stimulation and test.
- isolate perforations 1875m - 1882m by setting a bridge plug
- perforate 1839.5m - 1843.5m and 1832.5m -1835.5m, and flow test
- set a bridge plug at 1825m
- perforate 1787m - 1792m, evaluate with possible stimulation and flow test
- suspend completed well.

Signed: *Wayne R. Tomm* Title: Sr. Drilling and Completions Engineer

Responsible Officer

Name: Wayne R. Tomm Company: Paramount Resources Ltd.

Date: January 26, 2000 Phone: (403) 290-3600

APPROVAL

An approved copy of this notice is to be posted at each wellsite.

Date: Signed:

Chief Conservation Officer

File:

WID:

Well Status

Suspended ☒

Completed ☐

Abandoned ☐

COMPLETION PROGRAM

PARA ET AL FORT LIARD A-01

AREA 60^0 10' 123^0 15'

AFE NUMBER:	**?**
WID:	**1858**
UWI:	**300A016010123151**
File:	**9211-P33-14-1-1**

Prepared By: Wayne Tomm

January27,2000

PERSONNEL & EMERGENCY CONTACTS

An 0800 hour status morning report and daily cost summary will be faxed in to Paramount Resources Ltd. office at 266-6032, by the company representative

	OFFICE	CELLULAR	RESIDENCE	BUS. FAX
COMPLETION				
Wayne Tomm	**290-3626**	**861-8473**	**251-0456**	**266-6032(office) 251-2723(home)**
Phil Christie	290-3627	861-8476	290-1574	266-6032
GEOLOGIST				
Paul Price	290-3605	651-3426	547-2296	266-6032
COMPLETION SUPERVISOR		(		
	Bert Blakely	780) 910-7105		
Reservoir Engineer				
	Terry Stasiuk		242-2341	266-6032
LAND OCCUPANT				
CROWN				

NEB	**Chris Knoechel**, Calgary (403) 299-3866 – Residence (403) 241-0047	
	Rick Fisher	Calgary (403) 299-2798
	Terry Baker	Calgary (403) 299-2792 - Residence (403) 239-5032

EMERGENCY PHONE NUMBERS

RCMP:	**770-4221**	**Ft. Liard**
HOSPITAL:	**(250) 774-6916**	**Ft. Nelson, B.C.**
AMBULANCE:	**1-800-461-9911**	
AIR AMBULANCE:	**(250) 774-2072**	**Ft. Nelson, B.C.**

GENERAL

Full co-operation by field personnel is to be maintained with the NEB and other government agencies.

Under no circumstances will the possession and use of alcoholic beverages or illegal drugs be permitted on the wellsite or campsite.

Any accidents involving personnel are to be reported immediately to the Calgary Drilling Department. Access to the lease is to be restricted to authorized personnel only.

Safety meetings to discuss program are to be held prior to commencing well completion, perforating, stimulation and testing.

Material Transfers MUST be filled out on all tangible materials such as tubing. Note on the daily report when movement occurs. Tallies should be with "threads on" for inventory purposes.

Purchase order numbers are not used by Paramount.

Field tickets are to be completed in detail with the **Well Name** and **Number**, **A.F.E. No.**, and **AFE Sub Item Number (i.e.: 22737-324 for Stimulation)** and details of the service work. Tickets are to be signed by the company representative and entered on daily cost log. (Note: Do not include GST on cost log)

All field tickets and copies of rental sheets must be submitted to the Calgary office weekly

Invoices are to be mailed to:

PARAMOUNT RESOURCES LIMITED
#4000, 350-7th Avenue S.W.
Calgary, Alberta
T2P 3W5

ATTENTION: ACCOUNTS PAYABLE

SUPPLIES AND SERVICES

SERVICE	COMPANY / CONTACT/LOCATION	PHONE
SERVICE RIG	Cenalta Rig # R-042; Calvin Berg	(250) 785-5096
CAMP	Beaver Enterprises Ltd.	(867)770-3508
WELL SITE TRAILER	Dene' Rentals; Hat River, NWT Doug Cardinal	(867)874-6701
SATELLITE		
KILL FLUID		
PRODUCED WATER		
WELLHEAD	AJ Industries(ABB Vetco Gray)	(403) 262-8900
BOND & TEMP. LOG	Baker Atlas – Slickline Division	(403) 571-1070
	Grande Prairie	(780) 532-5177
SLICKLINE	Baker Atlas – Slickline Division	(403) 571-1070
	Grande Prairie	(780) 532-5177
STIMULATION	Nowsco- Fracmaster; Grande Prairie	(780) 539-5210
COIL TUBING	Nowsco- Fracmaster; Grande Prairie	(780) 539-5210
ABANDONMENT CMT		
TUBING		
PACKERS, BP,	Baker Oil Tools; Ken Soderberg	(403) 296-9600
SAFETY		
First Aid	Safety Boss, Randy Cusson, Calgary	(403) 261-5075
SNUBBING	Live Well Services; Larry MacPherson	1-800-232-7219
LINER SEAL	Import Tools	(780) 434-6406
TANK RENTAL	DC Energy Services Inc.-Brian Grant	(780) 532-5515
WELL TESTING	Baker Atlas – Norward Energy Ser.	(403) 236-2100
	Grande Prairie	(780) 539-5710
RECORDERS	Baker Atlas – Slickline Division	(403) 571-1070
	Grande Prairie	(780) 532-5177

NOTE: Services that are "Field Bid" must have a minimum of two (2) bids and company selected shown on Daily Cost Log.

PROJECT OVERVIEW:

To obtain data and evaluate three individual sands of the Mattson formation

SAFETY REFER TO THE SITE SPECIFIC "EMERGENCY RESPONSE PLAN"

All operations are to be carried out in accordance with government regulations and recognized safety procedures. Operations are to be conducted in a manner that results in the greatest degree of protection possible for the public, on-site personnel and the environment.

Service Rig Manager and Wellsite Supervisor are to have valid PITS "Well Service Blowout Prevention" and "H2S alert" certificate on site.

THIS WELL IS NOT EXPECTED TO ENCOUNTER H_2S.

Continually monitor annulus pressures and bleed off if necessary.

BOP EQUIPMENT

Use a 179 mm 35 mPa BOP complete with blind rams, tubing rams, and annular to meet NEB requirements. Function test and pressure test BOPs to 35 mPa.

Ensure rams will close on both 73 mm tubing.

COMPLETION PROCEDURE

ZONE #1

1. Move in and RUSR c/w pump and clean tank. Rig up safety equipment. Extra "slop" tank required. Spot tubing trailer with approximately 2000 m of 73mm mm, 9.6 kg/m, L-80, EUE tubing.

2. Stump test BOP. Remove tubing bonnet and install BOPs. Function test.

3. Pressure test casing to 21 mPa.

4. Pick up a 156 mm bit, 177.8mm casing scraper and 4 - 89mm DC's for 177 mm casing. Run in hole on 73 mm L-80 tubing and tag BP at approximately 2031 m KB. Measure and drift on way in the hole.

5. Circulate well to clean 3% KCl brine and pull out with 73mm L-80 tubing string.

6. Rig in logging unit and run bond log from PBTD to 1200m and cement top. Make a 7mPa pressure pass.

7. Pick up the following TCP and packer assembly to perforate the interval 1875.0m -1882.0mKB:

- tubing conveyed perforating guns(interval: 1875.0m – 1882.0mKB)
- 73mm Mechanical firing head
1 – 73mm x 3.0m pup joint
1 – Gun Release Sub
1 – Ported Underbalance Sub
1 - 73mm x 3.0m pup joint
1 – 73mm Kobe Sub
1 - 73mm x 3.0m pup joint
1 – 73mm Baker "R" nipple
1 - 73mm x 3.0m pup joint
1 – Baker "A-3" Lok-Set Retrievable Packer
1 – Baker "L-10" On-Off Connector c/w "F" Profile
- 73mm x 9.67kg/m L-80 EUE tubing to surface

Note: Allow for a 300m water cushion inside tubing only.

8. Log guns on depth and set packer with 10,000 daN compression landing tubing with dognut.

8. Pressure test packer annulus to14mPa.

9. Nipple down BOP's and install wellhead.

10. Drop bar and perforate the Mattson interval.

11. Shut well in and allow well to stabilize before flowing.

12. Run static gradient before flowing to establish virgin reservoir pressure. Hang bombs before testing..

13. Open well and evaluate productivity.

14. If well will not flow, swab well and evaluate influx

Note: Perforated section may require stimulation

ZONE #2A

1 MISR c/w pump and clean tank. Extra "slop" tank required. Tubing remaining on location from previous completion(73.0 mm, 9.67 kg/m, L-80, EUE, ERW tubing) should be sufficient for the recompletion.

2 Kill well by pumping 3% KCl brine down tubing.

3 Stump test BOP's. Remove tubing bonnet and install BOP's. Function test . and pressure test.

4 Pick up on tubing releasing packer, circulate well clean and POH with packer and TCP assembly. Stand tubing in derrick and lay down bottom hole assembly..

5 Pick up Permanent Bridge Plug on wireline and RIH.

6 Set Bridge Plug at 1865mKB and dump bail 3m cement on top of plug.

7 Pick up packer and perforating gun assembly(interval: 1839.5m – 1843.5mKB)

- tubing conveyed perforating guns(interval: 1839.5m – 1843.5mKB)
- 73mm Mechanical firing head

1 – 73mm x 3.0m pup joint
1 – Gun Release Sub
1 – Ported Underbalance Sub
1 - 73mm x 3.0m pup joint
1 – 73mm Kobe Sub
1 - 73mm x 3.0m pup joint
1 – 73mm Baker "R" nipple
1 - 73mm x 3.0m pup joint
1 – Baker "A-3" Lok-Set Retrievable Packer
1 – Baker "L-10" On-Off Connector c/w "F" Profile
- 73mm x 9.67kg/m L-80 EUE tubing to surface

Note: Allow for a 300m water cushion inside tubing only.

8 Log guns on depth and set packer with 10,000 daN compression landing tubing with dognut.

9.. Pressure test packer annulus to14mPa.

10. Nipple down BOP's and install wellhead.

11. Drop bar and perforate the Mattson interval.

12. Shut well in and allow well to stabilize before flowing.

13. Run static gradient before flowing to establish virgin reservoir pressure. Hang bombs before testing..

14. Open well and evaluate productivity.

15. If well will not flow, swab well and evaluate influx

Note: Perforated section may require stimulation
If perforations are wet, set cement retainer at 1838mKB and squeeze off lower perforations

ZONE: #2B

1. MISR c/w pump and clean tank. Extra "slop" tank required. Tubing remaining on location from previous completion(73.0 mm, 9.67 kg/m, L-80, EUE, ERW tubing) should be sufficient for the recompletion.

2. Kill well by pumping 3% KCl brine down tubing.

3. Stump test BOP's. Remove tubing bonnet and install BOP's. Function test . and pressure test.

4. Pick up on tubing releasing packer, circulate well clean and POH with packer and TCP assembly. Stand tubing in derrick and lay down bottom hole assembly..

5. Pick up packer and perforating gun assembly(interval: 1839.5m – 1843.5mKB)

   - tubing conveyed perforating guns(interval: 1839.5m – 1843.5mKB)
   - 73mm Mechanical firing head

   1 – 73mm x 3.0m pup joint
   1 – Gun Release Sub
   1 – Ported Underbalance Sub
   1 - 73mm x 3.0m pup joint
   1 – 73mm Kobe Sub

1 - 73mm x 3.0m pup joint
1 – 73mm Baker "R" nipple
1 - 73mm x 3.0m pup joint
1 – Baker "A-3" Lok-Set Retrievable Packer
1 – Baker "L-10" On-Off Connector c/w "F" Profile
- 73mm x 9.67kg/m L-80 EUE tubing to surface

Note: Allow for a 300m water cushion inside tubing only.

6. Log guns on depth and set packer with 10,000 daN compression landing tubing with dognut.

7. Pressure test packer annulus to14mPa.

8. Nipple down BOP's and install wellhead.

9. Drop bar and perforate the Mattson interval.

10. Shut well in and allow well to stabilize before flowing.

11. Run static gradient before flowing to establish virgin reservoir pressure. Hang bombs before testing..

12. Open well and evaluate productivity.

13. If well will not flow, swab well and evaluate influx

ZONE #3

1. MISR c/w pump and clean tank. Extra "slop" tank required. Tubing remaining on location from previous completion(73.0 mm, 9.67 kg/m, L-80, EUE, ERW tubing) should be sufficient for the recompletion.

2. Kill well by pumping 3% KCl brine down tubing.

3. Stump test BOP's. Remove tubing bonnet and install BOP's. Function test . and pressure test.

4. Pick up on tubing releasing packer, circulate well clean and POH with packer and TCP assembly. Stand tubing in derrick and lay down bottom hole assembly..

5. Pick up Permanent Bridge Plug on wireline and RIH.

6. Set Bridge Plug at 1825mKB and dump bail 3m cement on top of plug.

7. Pick up packer and perforating gun assembly(interval: 1787.0m – 1792.0mKB)

   - tubing conveyed perforating guns(interval:1787.0m – 1792.0mKB)
   - 73mm Mechanical firing head

   1 – 73mm x 3.0m pup joint
   1 – Gun Release Sub
   1 – Ported Underbalance Sub
   1 - 73mm x 3.0m pup joint
   1 – 73mm Kobe Sub
   1 - 73mm x 3.0m pup joint
   1 – 73mm Baker "R" nipple
   1 - 73mm x 3.0m pup joint
   1 – Baker "A-3" Lok-Set Retrievable Packer
   1 – Baker "L-10" On-Off Connector c/w "F" Profile
   - 73mm x 9.67kg/m L-80 EUE tubing to surface

   Note: Allow for a 300m water cushion inside tubing only.

8. Log guns on depth and set packer with 10,000 daN compression landing tubing with dognut.

9. Pressure test packer annulus to14mPa

10. Nipple down BOP's and install wellhead.

11. Drop bar and perforate the Mattson interval.

12. Shut well in and allow well to stabilize before flowing.

13. Run static gradient before flowing to establish virgin reservoir pressure. Hang bombs before testing..

14. Open well and evaluate productivity.

15. If well will not flow, swab well and evaluate influx

Note: Perforated section may require stimulation

PRODUCTION TEST

NOTE: Install real time surface pressure read out prior to beginning test.

1. Immediately after perforating, shut well in, run static gradient and then hang bombs in "R" nipple below packer.

2. If zone is producing at high water rates, conduct single rate test at the highest possible rate.

3. Flow at rate of maximum 30% drawdown or at rates instructed by Calgary office.

4. Shut well in for build-up.

5. Return to main program where you previously left off.

Baker Atlas

1300 401 9th Avenue SW
Calgary, Alberta
Tel: 403-537-3400
Fax: 403-537-3801

PROPOSAL

DATE:	January 26, 2000	REFERENCE WELL
COMPANY:	**PARAMOUNT RESOURCES.** **4000 First Canadian Centre** **350 – 7th Avenue S.W.** **Calgary, Alberta; T2P 3W5**	**Para et al Ft. Liard** **A-01**
PHONE:	290-3626	
FAX:	266-6032	**Quotation No. CCS**
ATTENTION:	**WAYNE TOMM, P.Eng.**	**NO. OF PAGES: 1**

Wayne, as per your request, we are pleased to provide you with the following cost estimate.

Zone A
For a price of **$23,896.00** we will provide the following services:

- Mobilization/Demobilization from Fort Nelson
- Segmented bond Log with 500 meters Logging
- Perforate TCP **interval (1875.0 – 1882.0) 7.0m** using a **60° phased 127mm Expendable Retrievable Hollow Steel Carrier (ERHSC)**, armed at **17 shots per meter** with **38.5 gram "Predator" Deep Penetrating (DP) charges.** System includes **Flow Sub with Debris Barrier, Gun Release and Drop bar firing head.**
- GR/CCL Correlation and Confirmation log for positioning guns.
- Pressure equipment (lubricator and pack-off)

Zone B
For a price of **$17,639.00** we will provide the following services:

- Mobilization/Demobilization from Fort Nelson
- Run Gauge Ring, Set Bridge Plug and dump Cement
- Perforate TCP **interval (1839.5 - 1843.5) 4.0m** using a **60° phased 127mm Expendable Retrievable Hollow Steel Carrier (ERHSC)**, armed at **17 shots per meter** with **38.5 gram "Predator" Deep Penetrating (DP) charges.** System includes **Flow Sub with Debris Barrier, Gun Release and Drop bar firing head.**
- GR/CCL Correlation and Confirmation log for positioning guns.
- Pressure equipment (lubricator and pack-off)

Zone B Optional
For a price of **$14,823.00** we will provide the following services:

- Mobilization/Demobilization from Fort Nelson
- Run Gauge Ring, Set Cement Retainer
- Perforate TCP **interval (1832.5 - 1835.5) 3.0m** using a **60° phased 127mm Expendable Retrievable Hollow Steel Carrier (ERHSC)**, armed at **17 shots per meter** with **38.5 gram "Predator" Deep Penetrating (DP) charges.** System includes **Flow Sub with Debris Barrier, Gun Release and Drop bar firing head.**
- GR/CCL Correlation and Confirmation log for positioning guns.
- Pressure equipment (lubricator and pack-off)

Zone C
For a price of **$14,308.00** we will provide the following services:

- Mobilization/Demobilization from Fort Nelson
- Perforate TCP **interval (1787 – 1792.0) 1.0m** using a **60° phased 127mm Expendable Retrievable Hollow Steel Carrier (ERHSC)**, armed at **17 shots per meter** with **38.5 gram "Predator" Deep Penetrating (DP) charges.** System includes **Flow Sub with Debris Barrier, Gun Release and Drop bar firing head.**
- GR/CCL Correlation and Confirmation log for positioning guns.
- Pressure equipment (lubricator and pack-off)

Pricing is based on the discount agreement October 12, 1999.

The above prices are estimates and Baker Atlas reserves the right to adjust pricing to reflect actual intervals logged and services performed. All other terms and conditions of the current Western Atlas Company Price Schedule (dated June 1, 1998) will apply. This service will be dispatched out of our Grande Prairie station phone 1-403-539 3505.

In closing, thank you very much for considering **BAKER ATLAS** for your electric wireline requirements. If you have any questions or concerns regarding this quotation, please do not hesitate to contact the undersigned at 537-3402.

Respectfully submitted,

BAKER ATLAS
A DIVISION BAKER HUGHES CANDA COMPANY

WJ Lisoway.

WJ (Bill) Lisoway
Cased Hole Sales Manager

BAKER HUGHES

PROPOSED WELL COMPLETION

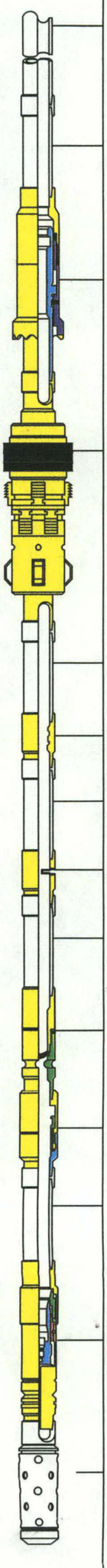
CUSTOMER: PARAMOUNT

PROVINCE: NWT
FIELD: PARA etal FT LIARD
WELL NO. A-01
QUOTATION NO. C00-01-93

DRAWING NO. A-01FtLiardPerf
APPROVED BY: WAYNE TOMM
DRAWN BY: SODERBERG
DATE: 00-01-25

BAKER HUGHES

Baker Oil Tools

MAX. O.D.	MIN. I.D.	WELL SCHEMATIC	DESCRIPTION	MATERIAL	PRODUCT NUMBER
			CASING:177.8 mm 38.69 kG/M TUBING: 73 mm EUE NOTE: THIS IS RUN NUMBER ONE PERFS FROM 1875 M - 1882 M		
73mm	62		TUBING SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	J-55	
73mm	62		TUBING JOINT SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	L-80	
139.7 mm	58.72 mm		(2) BAKER MODEL "L-10" ON-OFF SEALING CONNECTOR SIZE: 139.7 mm X 73 mm X 58.72 mm BAKER 'F' PROFILE THREADS: 73mm EUE	4140-18-22RC	684-20
151.97 mm	62 mm		(3) BAKER MODEL "A-3" LOK-SET RETRIEVABLE PACKER SIZE: 4782 THREADS: 73 mm EUE	4140 18-22 Rc	646-30
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0 M THREADS: 73 mm EUE	J-55	
78.97 mm	55.68 mm		(4) BAKER MODEL "R" BOTTOM NO-GO SEATING NIPPLE SIZE: 73 mm x 57.15 mm "R" THREADS: 73 mm EUE	4140-18-22RC	801-55
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(5) KOBE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(6) PORTED UNDER BALANCE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
93 mm	58.75 mm		(7) GUN RELEASE SUB (SHIFT UP TYPE) SIZE: 73 mm X 58.75 mm THREADS: 73 mm EUE SHIFT W/ OTIS 'B' SHIFTING TOOL TO RELEASE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
93 mm	N/A		(8) MECHANICAL FIRING HEAD SIZE: 73 mm X93 mm THREADS: 73 mm EUE	4140 18-22 Rc	
			TUBING CONVEYED PERFORATING GUNS GUN O.D.:101.6 mm O.D. SPM: 20 PHASING: 60° CHARGES:38.5 gm PREDATOR DP INTERVAL: 1875 m - 1882 m (7.0m) LOADED		

PROPOSED WELL COMPLETION

CUSTOMER: PARAMOUNT

PROVINCE: NWT
FIELD: PARA etal FT LIARD
WELL NO. A-01
QUOTATION NO. C00-01-93

DRAWING NO. A-01FtLiardPerf2
APPROVED BY: WAYNE TOMM
DRAWN BY: SODERBERG
DATE: 00-01-25

Baker Oil Tools

MAX. O.D.	MIN. I.D.	WELL SCHEMATIC	DESCRIPTION	MATERIAL	PRODUCT NUMBER
			CASING:177.8 mm 38.69 kG/M TUBING: 73 mm EUE NOTE: THIS IS RUN NUMBER TWO NEW PERF INTERVAL 1839.5 - 1843.5		
73mm	62		TUBING SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	J-55	
73mm	62		TUBING JOINT SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	L-80	
139.7 mm	58.72 mm		(2) BAKER MODEL "L-10" ON-OFF SEALING CONNECTOR SIZE: 139.7 mm X 73 mm X 58.72 mm BAKER "F" PROFILE THREADS: 73mm EUE	4140-18-22RC	684-20
151.97 mm	62 mm		(3) BAKER MODEL "A-3" LOK-SET RETRIEVABLE PACKER SIZE: 4782 THREADS: 73 mm EUE	4140 18-22 Rc	646-30
	62 mm		PUP JOINT SIZE: 73 mm X 3.0 M THREADS: 73 mm EUE	J-55	
78.97 mm	55.68 mm		(4) BAKER MODEL "R" BOTTOM NO-GO SEATING NIPPLE SIZE: 73 mm x 57.15 mm "R" THREADS: 73 mm EUE	4140-18-22RC	801-55
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(5) KOBE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(6) PORTED UNDER BALANCE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
93 mm	58.75 mm		(7) GUN RELEASE SUB (SHIFT UP TYPE) SIZE: 73 mm X 58.75 mm THREADS: 73 mm EUE SHIFT W/ OTIS 'B' SHIFTING TOOL TO RELEASE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
	N/A		(8) MECHANICAL FIRING HEAD SIZE: 73 mm X93 mm THREADS: 73 mm EUE	4140 18-22 Rc	
			TUBING CONVEYED PERFORATING GUNS GUN O.D.:101.6 mm O.D. SPM: 20 PHASING: 60° CHARGES:38.5 gm PREDATOR DP INTERVAL: 1839.5 m - 1843.5 m (4.0m) LOADED		
			CEMENT CAP		
144.4 mm	-		(9) MODEL S WIRELINE SET BRIDGE PLUG SIZE: 3BB THREADS: -	GCI	401-19
			PERFORATIONS 1875 M TO 1882		

PROPOSED WELL COMPLETION

CUSTOMER: PARAMOUNT

PROVINCE: NWT
FIELD: PARA etal FT LIARD
WELL NO. A-01
QUOTATION NO. COO-01-93

DRAWING NO. A-01FtLiardPert2A
APPROVED BY: WAYNE TOMM
DRAWN BY: SODERBERG
DATE: 00-01-25

Baker Oil Tools

MAX. O.D.	MIN. I.D.	WELL SCHEMATIC	DESCRIPTION	MATERIAL	PRODUCT NUMBER
			CASING:177.8 mm 38.69 kG/M TUBING: 73 mm EUE NOTE: THIS IS RUN NUMBER 2A NEW PERF INTERVAL 1832.5 - 1835.5		
	62		TUBING SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	J-55	
73mm	62		TUBING JOINT SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	L-80	
139.7 mm	58.72 mm		(2) BAKER MODEL "L-10" ON-OFF SEALING CONNECTOR SIZE: 139.7 mm X 73 mm X 58.72 mm BAKER 'F' PROFILE THREADS: 73mm EUE	4140-18-22RC	684-20
151.97 mm	62 mm		(3) BAKER MODEL "A-3" LOK-SET RETRIEVABLE PACKER SIZE: 4782 THREADS: 73 mm EUE	4140 18-22 Rc	646-30
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0 M THREADS: 73 mm EUE	J-55	
78.97 mm	55.68 mm		(4) BAKER MODEL "R" BOTTOM NO-GO SEATING NIPPLE SIZE: 73 mm x 57.15 mm "R" THREADS: 73 mm EUE	4140-18-22RC	801-55
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
	62 mm		(5) KOBE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(6) PORTED UNDER BALANCE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
93 mm	58.75 mm		(7) GUN RELEASE SUB (SHIFT UP TYPE) SIZE: 73 mm X 58.75 mm THREADS: 73 mm EUE SHIFT W/ OTIS 'B' SHIFTING TOOL TO RELEASE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
93 mm	N/A		(8) MECHANICAL FIRING HEAD SIZE: 73 mm X93 mm THREADS: 73 mm EUE	4140 18-22 Rc	
			TUBING CONVEYED PERFORATING GUNS GUN O.D.:101.6 mm O.D. SPM: 20 PHASING: 60° CHARGES:38.5 gm PREDATOR DP INTERVAL: 1832.5 m - 1835.5 m (3.0m) LOADED		
144.44 MM	-		(9) MODEL K-1 WIRELINE SET CR SIZE: 388 THREADS: -	GCI	400-23
			PERFORATIONS FROM 1839.5 M TO 1843.5 M SQUEEZED OFF		
			CEMENT CAP		
144.4 mm	-		(10) MODEL S WIRELINE SET BRIDGE PLUG SIZE: 388 THREADS: -	GCI	401-19
			PERFORATIONS FROM 1875.0 M - 1882.0 M		

PROPOSED WELL COMPLETION

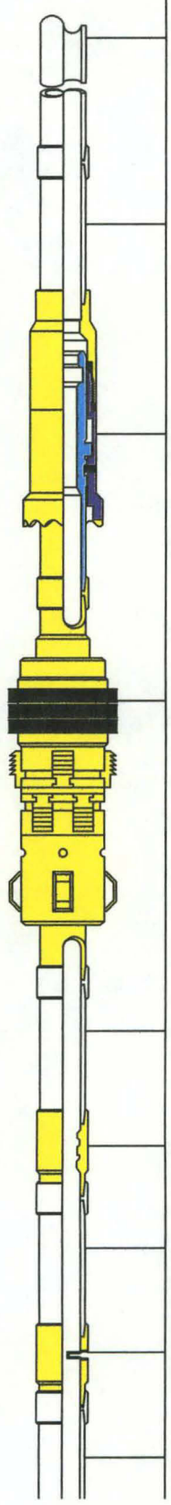
CUSTOMER: PARAMOUNT

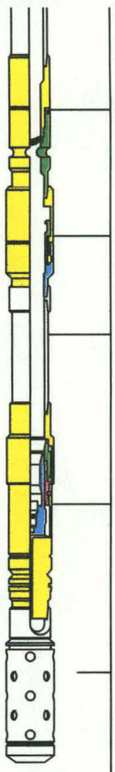
PROVINCE: NWT
FIELD: PARA etal FT LIARD
WELL NO. A-01
QUOTATION NO. C00-01-93

DRAWING NO. A-01FtLiardPerf2A
APPROVED BY: WAYNE TOMM
DRAWN BY: SODERBERG
DATE: 00-01-25

BAKER HUGHES

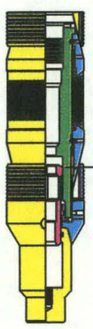
Baker Oil Tools

MAX. O.D.	MIN. I.D.	WELL SCHEMATIC	DESCRIPTION	MATERIAL	PRODUCT NUMBER
			CASING: 177.8 mm 38.69 kG/M TUBING: 73 mm EUE NOTE: THIS IS RUN NUMBER 2A NEW PERF INTERVAL 1832.5 - 1835.5		
73mm	62		TUBING SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	J-55	
73mm	62		TUBING JOINT SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	L-80	
139.7 mm	58.72 mm		(2) BAKER MODEL "L-10" ON-OFF SEALING CONNECTOR SIZE: 139.7 mm X 73 mm X 58.72 mm BAKER 'F' PROFILE THREADS: 73mm EUE	4140-18-22RC	684-20
151.97 mm	62 mm		(3) BAKER MODEL "A-3" LOK-SET RETRIEVABLE PACKER SIZE: 4782 THREADS: 73 mm EUE	4140 18-22 Rc	646-30
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0 M THREADS: 73 mm EUE	J-55	
78.97 mm	55.68 mm		(4) BAKER MODEL "R" BOTTOM NO-GO SEATING NIPPLE SIZE: 73 mm x 57.15 mm "R" THREADS: 73 mm EUE	4140-18-22RC	801-55
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(5) KOBE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73mm X 3.0m LONG THREADS: 73 mm EUE	J-55	



THREADS: 73 mm EUE

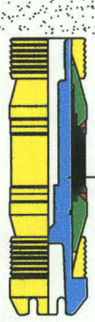
78mm	62 mm	6	PORTED UNDER BALANCE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140–18–22RC	
93 mm	58.75 mm	7	GUN RELEASE SUB (SHIFT UP TYPE) SIZE: 73 mm X 58.75 mm THREADS: 73 mm EUE SHIFT W/ OTIS 'B' SHIFTING TOOL TO RELEASE	4140–18–22RC	
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J–55	
93 mm	N/A	8	MECHANICAL FIRING HEAD SIZE: 73 mm X93 mm THREADS: 73 mm EUE	4140 18–22 Rc	
			TUBING CONVEYED PERFORATING GUNS GUN O.D.:101.6 mm O.D. SPM: 20 PHASING: 60° CHARGES: 38.5 gm PREDATOR DP INTERVAL: 1832.5 m – 1835.5 m (3.0m) LOADED		



144.44 MM	–	9	MODEL K–1 WIRELINE SET CR SIZE: 3BB THREADS: –	GCI	400–23

PERFORATIONS FROM:
1839.5 M TO 1843.5 M
SQUEEZED OFF

CEMENT CAP



144.4 mm	–	10	MODEL S WIRELINE SET BRIDGE PLUG SIZE: 3BB THREADS: –	GCI	401–19

PERFORATIONS FROM:
1875.0 M – 1882.0 M

PROPOSED WELL COMPLETION

CUSTOMER: PARAMOUNT

PROVINCE: NWT
FIELD: PARA etal FT LIARD
WELL NO. A-01
QUOTATION NO. CDD-01-03

DRAWING NO. A-01FtLiardPart3
APPROVED BY: WAYNE TOMM
DRAWN BY: SODERBERG
DATE: 00-01-25

Baker Oil Tools

MAX. O.D.	MIN. I.D.	WELL SCHEMATIC	DESCRIPTION	MATERIAL	PRODUCT NUMBER
			CASING:177.8 mm 38.69 kG/M TUBING: 73 mm EUE NOTE: THIS IS RUN NUMBER 3 NEW PERF INTERVAL 1787M - 1792 M		
	62		TUBING SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	J-55	
73mm	62		TUBING JOINT SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	L-80	
139.7 mm	58.72 mm		(2) BAKER MODEL "L-10" ON-OFF SEALING CONNECTOR SIZE: 139.7 mm X 73 mm X 58.72 mm BAKER "F" PROFILE THREADS: 73mm EUE	4140-18-22RC	684-20
81.97 mm	62 mm		(3) BAKER MODEL "A-3" LOK-SET RETRIEVABLE PACKER SIZE: 4782 THREADS: 73 mm EUE	4140 18-22 Rc	646-30
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0 M THREADS: 73 mm EUE	J-55	
78.97 mm	55.68 mm		(4) BAKER MODEL "R" BOTTOM NO-GO SEATING NIPPLE SIZE: 73 mm x 57.15 mm "R" THREADS: 73 mm EUE	4140-18-22RC	801-55
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(5) KOSE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(6) PORTED UNDER BALANCE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
93 mm	58.75 mm		(7) GUN RELEASE SUB (SHIFT UP TYPE) SIZE: 73 mm X 58.75 mm THREADS: 73 mm EUE SHIFT W/ OTIS "B" SHIFTING TOOL TO RELEASE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
93 mm	N/A		(8) MECHANICAL FIRING HEAD SIZE: 73 mm X93 mm THREADS: 73 mm EUE	4140 18-22 Rc	
			TUBING CONVEYED PERFORATING GUNS GUN O.D.:101.6 mm O.D. SPM: 20 PHASING: 60° CHARGES:38.5 gm PREDATOR DP INTERVAL: 1787 m - 1792 m (5.0m) LOADED		
			CEMENT CAP		
144.4 mm	-		(10) MODEL S WIRELINE SET BRIDGE PLUG SIZE: 3BB THREADS: -	QCI	401-19
			PERFORATIONS FROM 1832.5 M - 1835.5 M		
144.44 MM	-		(9) MODEL K-1 WIRELINE SET CR SIZE: 3BB THREADS: -	QCI	400-23
			PERFORATIONS FROM: 1839.5 M TO 1843.5 M SQUEEZED OFF		
			CEMENT CAP		
144.4 mm	-		(10) MODEL S WIRELINE SET BRIDGE PLUG SIZE: 3BB THREADS: -	QCI	401-19
			PERFORATIONS FROM: 1875.0 M - 1882.0 M		

PROPOSED WELL COMPLETION

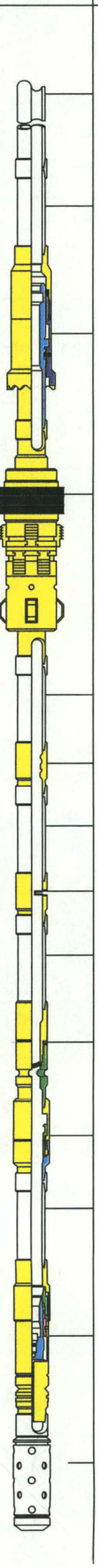
CUSTOMER: PARAMOUNT

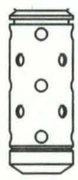
PROVINCE: NWT
FIELD: PARA etal FT LIARD
WELL NO. A-01
QUOTATION NO. C00-01-93

DRAWING NO. A-01FtLiardPerf3
APPROVED BY: WAYNE TOMM
DRAWN BY: SODERBERG
DATE: 00-01-25

BAKER HUGHES

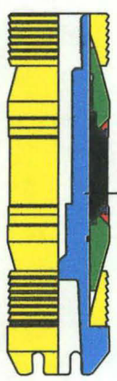
Baker Oil Tools

MAX. O.D.	MIN. I.D.	WELL SCHEMATIC	DESCRIPTION	MATERIAL	PRODUCT NUMBER
			CASING: 177.8 mm 38.69 kG/M TUBING: 73 mm EUE NOTE: THIS IS RUN NUMBER 3 NEW PERF INTERVAL 1787M - 1792 M		
73mm	62		TUBING SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	J-55	
73mm	62		TUBING JOINT SIZE: 73mm, 9.67kg/m THREADS: 73mm EUE	L-80	
139.7 mm	58.72 mm		(2) BAKER MODEL "L-10" ON-OFF SEALING CONNECTOR SIZE: 139.7 mm X 73 mm X 58.72 mm BAKER 'F' PROFILE THREADS: 73mm EUE	4140-18-22RC	684-20
151.97 mm	62 mm		(3) BAKER MODEL "A-3" LOK-SET RETRIEVABLE PACKER SIZE: 4782 THREADS: 73 mm EUE	4140 18-22 Rc	646-30
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0 M THREADS: 73 mm EUE	J-55	
78.97 mm	55.68 mm		(4) BAKER MODEL "R" BOTTOM NO-GO SEATING NIPPLE SIZE: 73 mm x 57.15 mm "R" THREADS: 73 mm EUE	4140-18-22RC	801-55
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(5) KOBE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
78mm	62 mm		(6) PORTED UNDER BALANCE SUB SIZE: 73 mm THREADS: 73 mm EUE	4140-18-22RC	
93 mm	58.75 mm		(7) GUN RELEASE SUB (SHIFT UP TYPE) SIZE: 73 mm X 58.75 mm THREADS: 73 mm EUE SHIFT W/ OTIS 'B' SHIFTING TOOL TO RELEASE	4140-18-22RC	
73 mm	62 mm		PUP JOINT SIZE: 73 mm X 3.0m LONG THREADS: 73 mm EUE	J-55	
93 mm	N/A		(8) MECHANICAL FIRING HEAD SIZE: 73 mm X93 mm THREADS: 73 mm EUE	4140 18-22 Rc	
			TUBING CONVEYED PERFORATING GUNS GUN O.D.:101.6 mm O.D. SPM: 20 PHASING: 60° CHARGES: 38.5 gm PREDATOR DP INTERVAL: 1787 m - 1792 m (5.0m) LOADED		



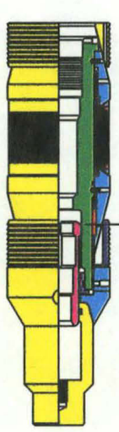
TUBING CONVEYED PERFORATING GUNS
GUN O.D.:101.6 mm O.D.
SPM: 20
PHASING: 60°
CHARGES: 38.5 gm PREDATOR DP
INTERVAL: 1787 m – 1792 m (5.0m) LOADED

CEMENT CAP



144.4 mm – (10) MODEL S WIRELINE SET BRIDGE PLUG — GCI — 401–19
SIZE: 3BB
THREADS: –

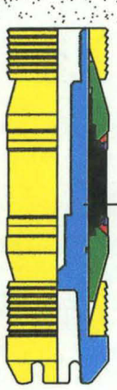
PERFORATIONS FROM
1832.5 M – 1835.5 M



144.44 MM – (9) MODEL K–1 WIRELINE SET CR — GCI — 400–23
SIZE: 3BB
THREADS: –

PERFORATIONS FROM:
1839.5 M TO 1843.5 M
SQUEEZED OFF

CEMENT CAP



144.4 mm – (10) MODEL S WIRELINE SET BRIDGE PLUG — GCI — 401–19
SIZE: 3BB
THREADS: –

PERFORATIONS FROM:
1875.0 M – 1882.0 M

AFE

COMPLETION AUTHORITY FOR EXPENDITURE

PARAMOUNT RESOURCES LTD.

4000, 350 - 7th Avenue S.W.
Calgary, AB T2P 3W5

AFE #: _____

Date Prepared: January 26,2000

FOR ADDITIONAL INFORMATION CONTACT: 290-3600

DEPARTMENT: DRILLING

AREA: Fort Liard, NWT

BUDGET CLASSIFICATION:

FUNDS REQUESTED FOR:
Para et al Fort Liard A-01
A-01 60deg 10' 123deg 15'

REMARKS:
to individually complete 3 separate zones, flow test on each zone, possibly stimulate 2 zones with post stimulation tests for evaluation of the Mattson formation.

ACCT. NO.	ITEM NO.	DETAIL OF EXPENDITURE	COST ESTIMATE	FIELD ESTIMATE	ACTUAL COST
8010	100	LOGISTICS COSTS - Intangible	23500		
8010	200	COMPLETION COSTS - Intangible	592000		
8010	300	EVALUATION COSTS - Intangible	145000		
20005	800	WELL EQUIPMENT - Tangible	72000		
20005	900	WELL EQUIPMENT - OIL - Tangible			
		PST			
8010	99	ADMINISTRATIVE - Overhead - 3, 2, 1%	8300		
		TOTAL COST	840800		

PARTICIPATION:

(OP)	Paramount Resources Ltd.	%			
		%			
		%			
		%			
		%			
		%			
		%			

PARMOUNT RESOURCE LTD.

	SIGNATURE	DATE
OPERATIONS		
D		
ADMINISTRATION		
ACCOUNTING		

NON-OPERATOR

COMPANY	
APPROVED BY	
TITLE	
DATE	

PARAMOUNT RESOURCES LTD.

COMPLETION COST ESTIMATE

AFE #

Date Prepared: January 26,2000

WELL NAME: Para et al Fort Liard A-01 **LOCATION:** A-01 60deg 10' 123deg 15'

AREA: Fort Liard, NWT **PROVINCE:** NWT

BUDGET CLASSIFICATION: **PBTD:** 2046 m

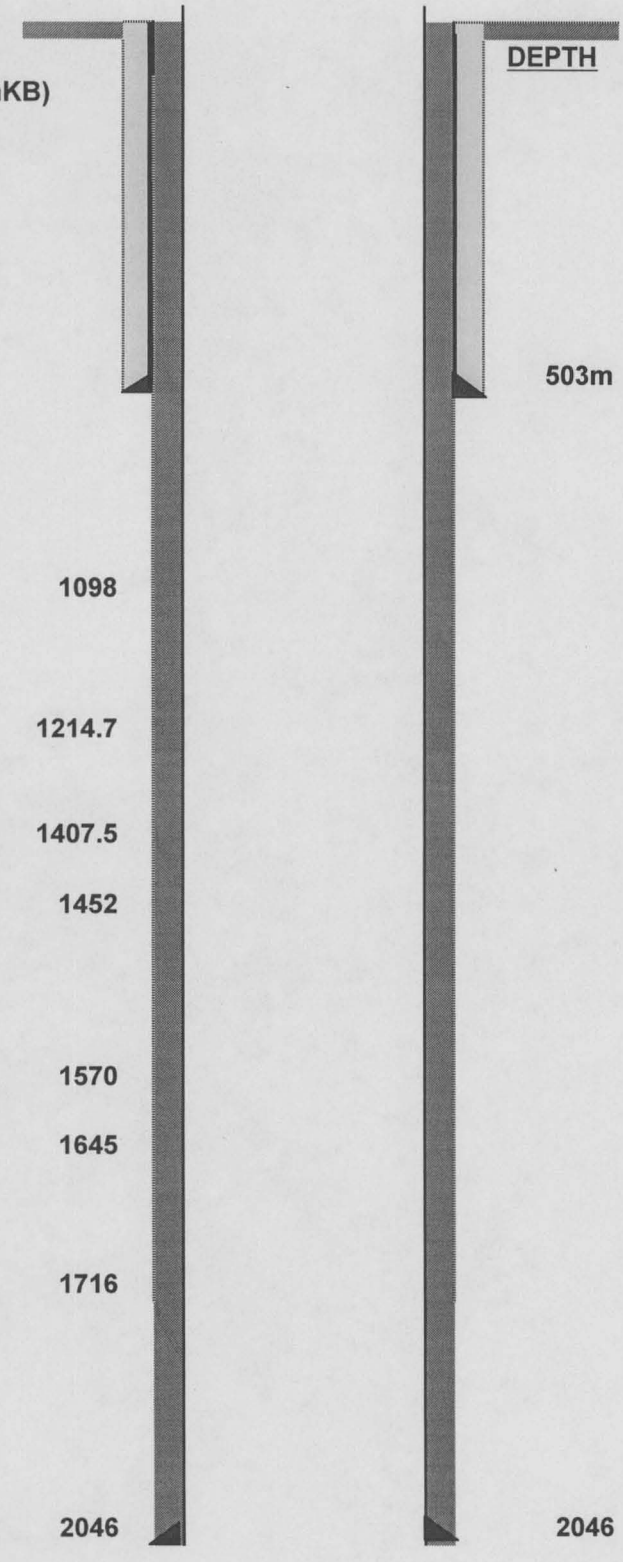
ITEM NO.	DESCRIPTION	COST ESTIMATE	FIELD ESTIMATE	ACTUAL
100	**LOGISTICS COSTS - Intangible**			
101	Surveying & Scouting	1000		
103	Access Preparation	10000		
104	Wellsite Preparation	10000		
108	Wellsite Restoration			
109	Access Restoration			
112	Airstrip Construction			
116	Maintanance - Access, Airstrip, etc.			
117	Towing			
119	Logistics Supervision	2500		
	ITEM 100 COSTS	23500		
200	**COMPLETION COSTS - Intangible**			
.01	MISR & RUSR	60000		
203	Service Rig	104000		
204	Service Rig - Standby			
205	Boiler	16000		
206	TOSR & MOSR	30000		
208	Coiled Tubing Unit			
210	Camp & Catering	71000		
212	Aviation Support	15000		
214	Fuel - Diesel, Propane, Gas	21000		
216	Communications & Equipment	8000		
218	Water	8000		
219	Vacuum Truck	10000		
221	Completion Fluids and Hauling			
222	Fluid Cleaning, Disposal & Hauling			
225	Completion Supervision			
228	Directional Surveys			
230	Medical & Safety Services			
232	Fishing - Wireline, Tools			
234	Other Contract Services			
236	Transportation - Trucking	45000		
238	Workover Tools and Service			
240	Equipment Rentals			
242	Drilling Bits & Mills			

ITEM NO.	DESCRIPTION	COST ESTIMATE	FIELD ESTIMATE	ACTUAL
246	Lost or Damaged Equipment			
250	Miscellaneous Materials			
260	Logging, Conductor Wireline, Perforating	60000		
262	Wireline - Slickline	24000		
264	Cementing			
266	Stimulation	120000		
	ITEM 200 COSTS	592000		
300	**EVALUATION COSTS - Intangible**			
310	Production Testing / AOF Testing	130000		
312	Sample Analyses	15000		
	ITEM 300 COSTS	145000		
800	**WELL EQUIPMENT - Tangible**			
802	Completion Wellhead Parts			
803	Tubing	42000		
805	Tubing Accessories	30000		
	ITEM 800 COSTS	72000		
900	**WELL EQUIPMENT - OIL - Tangible**			
901	Wellhead Parts			
903	Sucker Rod String and Accessories			
907	Subsurface Pump			
910	Pumpjack and Accessories			
912	Prime Mover & Accessories			
916	Electrification			
	ITEM 900 COSTS			
	SUBTOTAL COSTS	832500		
	PST - % of Subtotal			
99	**ADMINISTRATIVE COSTS**			
	Overhead @ 1%	8300		
	TOTAL AFE COSTS	840800		

Actual Wellbore and Wellhead Data

PARAMOUNT ET AL LIARD A-01

(Actual as of March 24, 1999)



ACTUAL TOPS (confirmed log tops mKB)		DEPTH	HOLE SIZES	CASING
		503m	444.5mm	349.7 mm, 81.8 kg/m K-55 ST&C - cemented to surface
SCATTER	1098			
GARBUTT	1214.7			
CHINKEH SAND *	1407.5			
TRIASSIC	1452			
BELLOY	1570			
FANTASQUE **	1645			
MATTSON **	1716			
TOTAL DEPTH	2046	2046	222	177.8 mm, 34.26 kg/m L-80 LT&C - cemented to surface

AJ INDUSTRIES

March 09, 1999

WELL FILE

PARAMOUNT RESOURCES LTD.

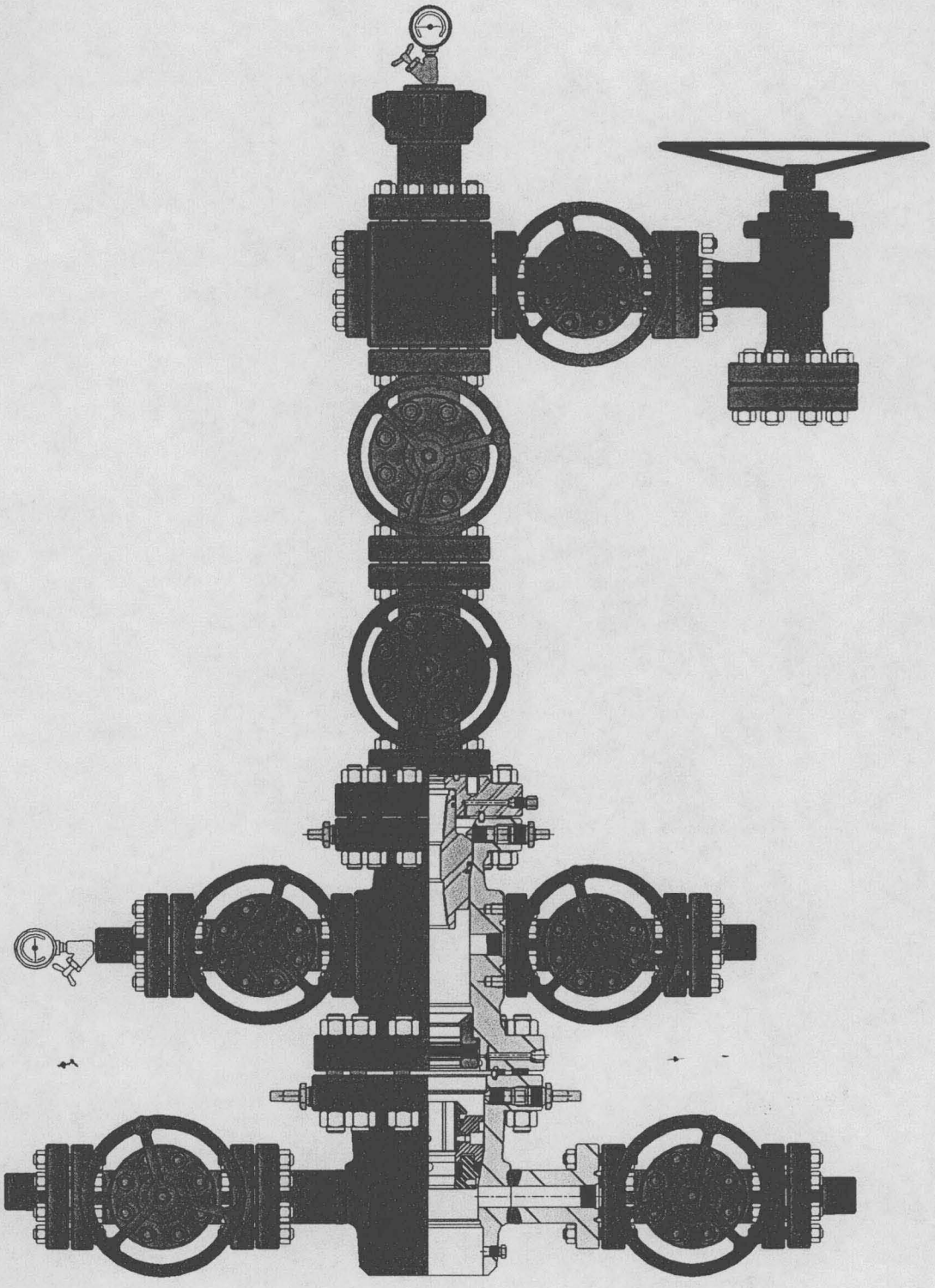
LOCATION: **A-01**

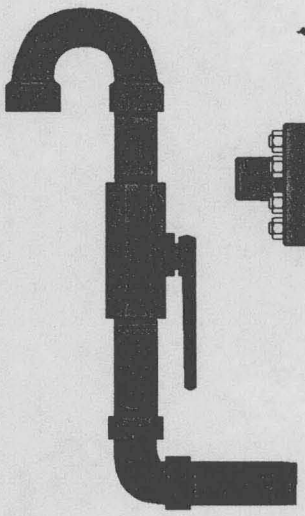
ITEM	SERIAL #
1.) Casing Bowl 13 5/8" 3M x 11 3/4" ODSO c/w 2-2" LPSO VG-100	#23388-01
2.) (2) Gate Valves 2 1/16" 3/5M FLGD c/w T-36 Trim VGC	#23420-23
	#23420-11
3.) Tubing Head 13 5/8" 3M x 7 1/16" 3M c/w 2-2" SSO ABB VG-OF	#24043-01
4.) Tubing Hanger 7 1/16" x 3 1/2" EUE c/w BVPT PSL-1 ABB XP-1	#24051-03
5.) (2) Gate Valves 3 1/8" 3M FLGD c/w L, DD, PSL-1 Newco	#53516
	#53514
6.) (3) Gate Valves 2 1/16" 5M FLGD L, DD, PSL-1 VGC	#23420-90
	#23420-48
	#23420-86
7.) Adapter Flange 7 1/16" 3M x 3 1/8" 3M SSU ABB XP-1	#24045-01
8.) Studded Tee 3 1/8" 3M x 3 1/8" 3M x 2 1/16" 5M CRC	#22034
9.) BHTA 3 1/8" 3M FLGD x 3 1/2" EUE c/w Top Cap	#23556-06
10.) Choke Valve 2 1/16" 5M FXF L, DD, PSL-1 HF Intervals MasterFlow P-1	#P1-8678

MISC.

1.) Needle Valves
2.) Pressure Gauges
3.) Bull Plugs
4.) Studs & Nuts
5.) Ring Gaskets
6.) Casing Vent Assembly
7.) Etc...

AJ INDUSTRIES





PARAMOUNT RESOURCES LTD.

A J INDUSTRIES.

LOCATION : **A-01**

RE: 13 5/8" 3000# X 11 3/4" X 7 1/16" 3000# X 7" X 3 1/2"

FLOWING

PARAMOUNT RESOURCES LTD.

CASING SUMMARY

WELL NAME PARA ET AL LIARD LOCATION A-01 DATE 99 02 15

SURFACE (X) INTERMEDIATE ( ) PRODUCTION ( ) LINER ( )

Size: 349.7mm

KB: 522.65 m

KB - CF: 5.5 m

NO.	DESCRIPTION	MEASURED LENGTH	KB Depth
1	349.7mm FLOAT SHOE	0.45	503.00
1	349.7mm, 81.1kg/m K-55 JOINT	12.64	502.55
1	349.77 FLOAT	0.32	489.91
37	349.7mm, 81.8kg/m K-55 JOINTS.	490.25	489.59
	Scratchers		
12	Centralizers		
	Total String	503.86	
	minus KB to Cag Top (STICK UP)	0.86	Cut-off
	Landed Depth KB	503.00	Jt. Length
	Hole Depth KB	503.00	
	Distance Cag Landed Off Bottom	0.00	

Cementing Company NOWSCO

Wash-Type H20 + 2m3 Scavanger Volume: 6m3

Cement Type Lead Slurry 0:1:0 "G" Volume: 42.4m3

Additives 1% CaCl2

Cement Type Tail Slurry Volume:

Additives

Cement Type Above Stage Collar Volume:

Additives

Displacement Rate: Max 0.7 m3/min Average 0.7 m3/min

Calculated Cement Top(s): (fill) 0 mKB (tail) mKB

Returns: Mud 37.4m3 Cement 5 m3

String Wt. in Mud Wt of: 1170 kg/m3 = 41,000 daN

Wt. set on slips: daN

Remarks: STAGE CEMENT AFTER RETURNS.

PLUG DOWN @ 21:59 Hrs 99 02 15.

Supervisor D.McCULLOCH

PARA-C-1.XLS

PARAMOUNT RESOURCES LTD.

PIPE TALLY SHEET

DATE 99 02 15

PAGE 1 of 1

WELL NAME PARA ET AL LIARD LOCATION A-01 60 00' 4.641"-123 15' 4.862"

Size 339.7mm Wt. 81.1kg/m Grade K-55 Cplg ST&C Thread 8rd

Joint	Length	Joint	Length	Joint	Length	Joint	Length	Joint	Length
1	12.84	11	14.21	21	13.91	31	12.64	41	
2	12.35	12	13.24	22	12.79	32	12.78	42	
3	12.34	13	13.98	23	12.90	33	14.04	43	
4	12.66	14	12.78	24	13.15	34	14.69	44	
5	12.64	15	13.06	25	12.80	35	12.32	45	
6	14.28	16	13.05	26	12.92	36	12.85	46	
7	13.96	17	12.60	27	12.79	37	13.75	47	
8	12.98	18	12.78	28	13.62	38	14.18	48	
9	13.82	19	14.21	29	12.94	39		49	
10	13.65	20	14.03	30	12.56	40		50	
A	131.52	B	133.94	C	130.38	D	107.25	E	

Joint	Length	Joint	Length	Joint	Length	Joint	Length	Joint	Length
51		61		71		81		91	
52		62		72		82		92	
53		63		73		83		93	
54		64		74		84		94	
55		65		75		85		95	
56		66		76		86		96	
57		67		77		87		97	
58		68		78		88		98	
59		69		79		89		99	
60		70		80		90		100	
F		G		H		I		J	

A	131.52	Column Subtotal	
B	133.94		265.46
C	130.38		395.84
D	107.25		503.09
E			
F			
G			
H			
I			
J			
Total	503.09		

Shoe	0.45
Collar	0.32
Other	

	JOINTS	LENGTH
Page Total		503.86
Brought FWD		
Grand Total		503.86

Joints on Location

Remarks: FLOAT @ 490.25m

Supervisor D.McCULLOCH

NOTE: Use a new page for each casing type. Number joints in order of running. Indicate joints not run by * and do not include in total length.

PARA-P-1.XLS

PARAMOUNT RESOURCES LTD.

CASING SUMMARY

WELL NAME PARA ET AL LIARD LOCATION _A-01_____ DATE ___ 99 03 23

SURFACE ( ) INTERMEDIATE (X) PRODUCTION ( ) LINER ( )

Size: _177.8mm

KB: __522.65__ m

KB - CF: _5.5 m

NO.	DESCRIPTION	MEASURED LENGTH	KB Depth
1	177.8mm FLOAT SHOE	0.65	46.00
1	177.8mm, 34.26kg/m L-80 JOINT	7.75	45.35
1	177.8mm FLOAT	0.45	37.60
154	177.8mm, 34.26kg/m L-80 JOINTS.	2039.38	37.15
	Scratchers		
30	Centralizers		

Total String	2048.23	
minus KB to Cag Top (STICK UP)	2.23	Cut-off
Landed Depth KB	2046.00	Jt. Length
Hole Depth KB	2046.00	
Distance Cag Landed Off Bottom	0.00	

Cementing Company NOWSCO

Wash-Type 3m3 Diesel +3m3Nowflush Volume: 6m3

Cement Type Lead Slurry 10t-1:1:2 Scavanger + 17t- 1:1:2 Fill Volume: 27.91m3

Additives 0.5% T-10

Cement Type Tail Slurry 15t- 0:1:0 Volume: 11.35

Additives 0.8% NFL-2 + 1% A-11

Cement Type Above Stage Collar Volume:

Additives

Displacement Rate: Max 1.04 m3/min Average 1.04 m3/min

Calculated Cement Top(s): (fill) 0 mKB (tail) 1333 mKB

Returns: Mud 75m3 Cement Scavanger 3 m3

String Wt. in Mud Wt of: 970 kg/m3 = 56,000 daN

Wt. set on slips: 40,000 daN

Remarks:

PLUG DOWN @ 20:12 Hrs 99 03 23.

Supervisor D.McCULLOCH

PARA-C~1.XLS

PARAMOUNT RESOURCES LTD.

PIPE TALLY SHEET

DATE 99 03 23

PAGE 1 of 2

WELL NAME PARA ET AL LIARD LOCATION A-01 60 00' 4.641"-123 15' 4.862"

Size 177.8 Wt. 34.26kg/m Grade 1-80 Cplg LT&C Thread 8rd

Joint	Length	Joint	Length	Joint	Length	Joint	Length	Joint	Length
1	7.75	11	9.56	21	13.56	31	13.59	41	13.58
2	13.60	12	13.58	22	13.56	32	13.59	42	13.60
3	13.56	13	13.56	23	13.67	33	13.56	43	13.58
4	9.41	14	13.58	24	9.08	34	13.55	44	13.56
5	9.33	15	13.54	25	10.40	35	12.93	45	13.58
6	9.30	16	13.57	26	13.54	36	13.57	46	13.56
7	9.33	17	13.58	27	13.57	37	13.54	47	13.59
8	8.25	18	12.96	28	13.58	38	13.58	48	13.59
9	9.23	19	13.56	29	13.57	39	13.57	49	13.57
10	9.52	20	13.57	30	13.57	40	13.68	50	13.42
A	99.28	B	131.06	C	128.10	D	135.16	E	135.63

Joint	Length	Joint	Length	Joint	Length	Joint	Length	Joint	Length
51	13.56	61	13.51	71	13.60	81	13.48	91	13.57
52	13.61	62	13.56	72	13.56	82	13.58	92	13.56
53	13.53	63	13.56	73	13.60	83	13.57	93	13.54
54	13.53	64	11.90	74	13.58	84	13.57	94	13.56
55	13.67	65	13.59	75	13.59	85	13.57	95	13.58
56	13.56	66	13.56	76	13.58	86	13.58	96	13.60
57	12.49	67	13.57	77	13.58	87	13.57	97	13.58
58	13.58	68	13.53	78	13.56	88	13.58	98	13.58
59	10.65	69	13.53	79	13.59	89	13.58	99	13.60
60	13.59	70	13.58	80	13.59	90	13.56	100	13.56
F	131.77	G	133.87	H	135.83	I	135.64	J	135.74

		Column Subtotal
A	99.28	
B	131.06	230.34
C	128.10	358.44
D	135.16	493.60
E	135.63	629.23
F	131.77	761.00
G	133.87	894.87
H	135.83	1,030.70
I	135.64	1,166.34
J	135.74	1,302.08
Total	1,302.08	

Shoe	0.65
Collar	0.45
Other	

	JOINTS	LENGTH
Page Total		
Brought FWD		
Grand Total		

Joints on Location _____

Remarks: _____

Supervisor D.McCULLOCH

NOTE: Use a new page for each casing type. Number joints in order of running.
Indicate joints not run by * and do not include in total length.

PARA-P~1.XLS

PARAMOUNT RESOURCES LTD.

PIPE TALLY SHEET

DATE 99 03 23

PAGE 2 of 2

WELL NAME PARA ET AL LIARD LOCATION A-01 60 00' 4.641"-123 15' 4.862"

Size 177.8 Wt. 34.26kg/m Grade I-80 Cplg LT&C Thread 8rd

Joint	Length	Joint	Length	Joint	Length	Joint	Length	Joint	Length
1	13.59	11	13.54	21	13.57	31	13.57	41	13.57
2	13.55	12	13.57	22	13.60	32	13.58	42	13.52
3	13.57	13	13.54	23	13.58	33	13.48	43	13.59
4	13.56	14	13.56	24	13.57	34	13.66	44	13.59
5	13.57	15	13.54	25	13.57	35	13.54	45	13.42
6	13.57	16	13.55	26	13.60	36	13.58	46	13.55
7	13.68	17	13.56	27	13.57	37	13.58	47	13.60
8	13.60	18	13.58	28	13.56	38	13.57	48	13.57
9	13.64	19	13.49	29	13.60	39	13.09	49	13.58
10	13.57	20	13.59	30	13.22	40	13.60	50	13.06
A	135.90	B	135.52	C	135.44	D	135.25	E	135.05

Joint	Length	Joint	Length	Joint	Length	Joint	Length	Joint	Length
51	13.58	61		71		81		91	
52	13.56	62		72		82		92	
53	13.57	63		73		83		93	
54	13.59	64		74		84		94	
55	13.59	65		75		85		95	
56		66		76		86		96	
57		67		77		87		97	
58		68		78		88		98	
59		69		79		89		99	
60		70		80		90		100	
F	67.89	G		H		I		J	

		Column Subtotal	
A	135.90		
B	135.52		271.42
C	135.44		406.86
D	135.25		542.11
E	135.05		677.16
F	67.89		745.05
G			
H			
I			
J			
Total	745.05		

Shoe	0.65
Collar	0.45
Other	

	JOINTS	LENGTH
Page Total	55	745.05
Brought FWD	100	1,302.08
Grand Total	155	2,047.13
Joints on Location	158	

Remarks:

Supervisor D.McCULLOCH

NOTE: Use a new page for each casing type. Number joints in order of running.
Indicate joints not run by * and do not include in total length.

PARA-P~1.XLS

CANADA

Exploratory ☒ Delineation ☐
Development ☐ Service ☐

AUTHORITY TO DRILL A WELL

APPLICATION

This application is submitted with Section 82 of the Canada Oil and Gas Drilling Regulations. When approved under Section 83 of the Regulations, it is the requisite authority for the commencement of drilling operations.

Well Name in Full: Paramount et al Liard A-01

Operator: Paramount Resources Ltd. Drilling Program No.: -

Contractor: Precision Drilling Ltd. Permit or Lease No.: EL 381

Drilling Rig or Unit: 373 Estimated Well Cost: 2,500,000

Location-Unit: A Section: 01 Grid Area: 60° 10' 123° 15'

Coordinates: Lat.: 60° 00' 04.641" Long.: 123° 15' 04.862"

Area: Ft. Liard Field/Pool: -

Elevation: KB: 522.4 (ASL) GL: 517.4 m

Approx. Spud Date: January 11, 1999 Estimated Days on Location: 30

Anticipated Total Depth: 2350 m Target Horizon(s) MATTSON

EVALUATION PROGRAM

Ten-metre sample intervals N/A

Five-metre sample intervals N/A

Canned sample intervals As specified from under surface casing shoe to TD.

Conventional cores at N/A

Logs and Tests Resitivity and Porosity logs, DST may be called while drilling.

CASING AND CEMENTING PROGRAM

O.D	Weight:	Grade:	Setting Depth KB	Cementing Program (Volumes):
244.5	48.07	H-40	500	G + 2% $CaCl_2$ 48T
139.7	25.3	K-55	2350	G + additives 69T

B.O.P. Equipment: 21 mPa stack and manifold - R/U - spool, pipe ram, blind ram, pipe ram, double choke and kill, annular and rotating head. Elastometers compatible with OBM. Diverter used for surface.

Other Information:

Signed: [signature] Title: Drilling and Completions Consultant

Date: November 27, 1998 Company: Paramount Resources Ltd.

APPROVAL

An approved copy of this notice is to be posted at each wellsite.

Signed: [signature] Chief Conservation Officer

Date: Jan 16/99

File: 9211-P33-14-1-1, WID 1858

UWI 300A016010123150

Canada

CENALTA
Well Services Inc.

R-042

- Inspections
- Registration
- Equipment Certifications

Province of British Columbia
Motor Vehicle Branch

BRITISH COLUMBIA Vehicle Inspection Report

FACILITY S 3 1 4 1 8 1 9

Department Use Only

CIRCLE INSPECTION RESULT: (1. PASSED) 2. REJECTED 3. CONDEMNED

DATE 1 6 APR 1 9 9 9

DECAL EXPIRY DATE 3 0 APR 2 0 0 0

ODOMETER (MI) KM 8518

CIRCLE INSPECTION TYPE: (1. Complete) 2. Re-inspection

Inspector's Signature

Inspector's Certificate of Qualification # M07251

OWNER: CENAIA WELL SERVICES INC.
MILE 51 ALASKA HWY.
BOX 6582
CITY FORT ST JOHN
PROV. B.C. POSTAL CODE V1J 4J1

LESSEE:
CITY
PROV. POSTAL CODE

MOTOR VEHICLE LICENCE X001676
MOTOR VEHICLE REGISTRATION 5598578
UNIT RIG 42
FUEL CODE (GAS) DSL P

YEAR 1980 MAKE KREMCO MODEL K-600 BODY STYLE DRILL

VIN 80622 SB CAPACITY

THE FACILITY AND INSPECTOR MUST BE AUTHORIZED FOR CLASSES OF VEHICLES INSPECTED

CIRCLE CLASS OF VEHICLE INSPECTED

1. LIGHT COMMERCIAL VEHICLE
2. TRUCK & TRUCK TRACTOR
3. TRAILER & SEMI-TRAILER
4. BUS
5. SCHOOL BUS

MARK

"✓" PASSED "C" PASSED WITH WARNING
"X" FAILED "✓" UNDER "R" IF REPAIRED SAME DAY
"O" OUT OF SERVICE

	F	R	P
SECTION 1 - POWER TRAIN			✓
U-JOINT CHANGED ON TRANSMISSION			
SECTION 2 - SUSPENSION		✓	
TORSION BARS and bushings changed			
SECTION 3 - HYDRAULIC BRAKES			
SECTION 3A - AIR BRAKES		✓	
RELAY VALVE CHANGED			
SECTION 4 - STEERING		✓	
D pwr steering abc line changed			
SECTION 5 - INSTRUMENTS, AUX EQUIP			✓
SECTION 6 - LAMPS			✓
SECTION 7 - ELECTRICAL SYSTEM			✓
ADDITIONAL COMMENTS:			

	F	R	P
SECTION 8 - BODY & FRAME			✓
SECTION 9 - TIRES & WHEELS			✓
SECTION 10 - COUPLERS & HITCHES			✓
SECTION 10 - (SPECIAL USE VEHICLE COMPONENTS)			

PRESSURE FUEL	O/S	P
LIQUID PROPANE GAS		
COMPRESSED NATURAL GAS		

PRESSURE FUEL INSPECTORS SIGNATURE & NUMBER

SLACK ADJUSTER/ PUSH ROD TRAVEL AXLE	L	R
1	WEDGE	
2	WEDGE	
3	1¼	1¼
4	1¼	1¼
5		
6		
7		
8		

The information on this form is collected under the authority of the Motor Vehicle Act, Section 215. The information provided will be used to process your vehicle inspection. If you have any questions please call (250) 387-6634.

MV 3104(10:96)

OWNER COPY - RETAIN IN VEHICLE

Conway Electric Inc.

R. R. 1, 244A Road
Fort St. John, BC V1J 4M6
CANADA

Phone: (250) 785-6829
Fax: (250) 785-3032
Email: conway@fsj.net

Cenalta Well Services Inc.
Bag 5764
Red Deer, Alberta
T4N 6W5

RE: Inspection on Rig #42

This is to confirm our inspection and repairs made at Cenalta Well Service Rig #42 on December 4th and December 8th, 1998. We have made all necessary repairs to meet BC Electrical Rig Regulations set out in the Province of BC Ministry of Energy, Mines and Petroleum Resources Drilling and Production Procedural Handbook.

Inspection was performed by Ashley Henry for Conway Electric Inc.

Yours truly,

Donna Dejonghe
for
Mike Conway
General Manager
Conway Electric Inc.

Owner's Certificate of Insurance and Vehicle Licence

ICBC

Insurance Corporation of British Columbia

Insurance (Motor Vehicle) Act
Motor Vehicle Act
Commercial Transport Act

DCID 183144131

Owner's BC driver's licence no.

Owner
CENALTA WELL SERVICES INC
MILE 51 ALASKA HWY
PO BOX 6582
FORT ST JOHN BC
V1J4J1

Effective date 21JUL1999
Expiry date 20JUL2000
Registration no. 5598578
Decal no. 56538590
Plate no. X00676
Permit no.
VIN 801022
Fleet no.
Unit no. R42
Veh. inspect. decal S
Veh. inspect. expiry 30APR2000
NSC no. 200086829
M.C. ref. no.
Driver's licence address change request NO

This card to be signed and carried in the insured vehicle as proof of insurance.

Proof of Insurance

The owner and/or the operator of the vehicle described herein is insured against liability for bodily injury and property damage by reason of the operation of such vehicle. The coverage provided by this certificate also satisfies the minimum limits set out by the respective legislation governing vehicle insurance in any area of Canada and the USA.

Vehicle use: VEHICLE USED IN DRILLING, EXPLORING OR SEISMOGRAPHIC ACTIVITIES FOR THE EXPLORATION OR RECOVERY OF OIL OR GAS.

Declaration of entitlement:

Conditional factor: LICENCE VALID ONLY ON A VEHICLE USED IN PERFORMING ANY WORK IN OR UPON ANY MINE OR INDUSTRIAL UNDERTAKING AND TRAVELLING TO AND FROM SUCH WORK WITHOUT LOAD.

By signing here, you:
- apply for a Vehicle Licence and Registration under the Motor Vehicle Act or Commercial Transport Act;
- apply for an Owner's Certificate of Insurance under the Insurance (Motor Vehicle) Act and Regulation;
- apply for special coverages for which a premium is shown, in accordance with the terms and conditions for those coverages contained in Schedule 5 or 6 of the Regulation under the Insurance (Motor Vehicle) Act;
- certify that all information on all pages of this form is true and agree that you are responsible for any inaccuracies on any page or pages of this form;
- certify that coverage and use of the vehicle is correct;
- certify that you are a resident of British Columbia, and/or the vehicle is not currently required to be registered and licenced in another jurisdiction;
- certify that you, if under 18 years of age, have the consent of a parent or (legal) guardian to licence and register this vehicle.

Owner's signature(s) Kristen Bowers
Admin Asst

86720

Thom Thompson
PRESIDENT AND CHIEF EXECUTIVE OFFICER
INSURANCE CORPORATION OF BRITISH COLUMBIA

NOT VALID UNLESS STAMPED BY AUTHORIZED ISSUING OFFICE

Vehicle Registration

ICBC

Insurance Corporation of British Columbia

Registered Owner
CENALTA WELL SERVICES INC
MILE 51 ALASKA HWY
PO BOX 6582
FORT ST JOHN BC
V1J4J1

Registration no. 5598578
Plate no. X00676
Year 1980
Make KREMCO
Model
Body style DRILL
VIC DDDED6
Colour YELLOW
VIN 801022
Fuel type DIESEL
Net weight (kg) 42420
GVW(kg)/Disp.(cc) 042420
Seating capacity N/A
Vehicle type COMMERCIAL
Anti-theft device
Vehicle status
Import code
AirCare expiry

This certificate must be carried in the vehicle. This certificate must be produced by the owner as seller if the vehicle is sold.

Number of owners: 1

Owner's signature(s) Kristen Bowers
Admin Asst

When you sell the vehicle, the buyer must take the Registration and submit it with an application for transfer within 10 days of the purchase. Contact your Autoplan agent for details.

720D65A8

APV250L (111998)

CUSTOMER

R-042

EQUIPMENT LOG

ITEM	MAKE	MODEL	SIZE RATING	ID NUMBER	CEN NUMBER	CERT. DATE	CERT. COMPANY	EXPIRY DATE
BLOCKS	McKissick		100 Ton	4985		02/02/99	RD Inspection	02/02/05
BAILS #1	BJ		77" 150 Ton	C-2553		05/31/99	Kova Engineering	05/31/05
BAILS #2	BJ		77" 150 Ton	C-2552		05/31/99	Kova Engineering	05/31/05
2 7/8 TBG ELEVATOR	BJ	TA	100 Ton	5443	6679	05/30/94	T&T Inspection	05/30/00
2 3/8 TBG ELEVATOR	Web Wilson	C-100		1793		10/16/96	RD Inspection	10/16/02
3 1/2 TBG ELEVATOR	BJ	TA	65 Ton	5359		06/30/99	Hydra Group	06/30/05
DERRICK	Kremco		103' 217,000 lbs	CDN 1095		07/21/95	Altec Inspection	8541 hrs to Aug 99
BOP DOUBLE GATE	Hyrdil	Type X	7 1/16 5000psi	#063		05/17/99	Toran	05/17/02
BOP ANNULAR	Hyrdil	GK	7 1/16 5000psi	80186		02/01/98	Toran	02/01/01
WORK SPOOL			7 1/16 5000psi	19071				Certs N/A
WORK/ GATE VALVE	WKM	Sour	2 1/16 5000psi	A-1461	222	03/29/99	D-Valves	03/29/05
SAFETY VALVE	D-Valve		2 7/8 EUE 5000psi	D2875-446		02/12/99	D-Valves	02/12/05
AIR SLIPS	Cavins	TC-101		14266	20846	12/19/97	T&T Inspection	12/19/02
CLIMBING DEVICE	DBI/Sala	Z3600		#001613		12/08/98	Nisku Safety	12/08/99
WEIGHT INDICATOR	Clipper			3992		10/08/97	Control Drilling	10/08/03

(No Rod Equipment)

R.D. INSPECTION SERVICES LTD.

Non-Destructive Testing and Engineering Services

BOX 27013, RED DEER, AB T4N 6X8 • Tel: (403) 340-1073 • Fax: (403) 346-8448

February 2, 1999

Ref.: RDI-M-4985

CENALTA WELL SERVICES INC.
Bag 5764
Red Deer, AB
T4N 6W5

Attention: Phil

EQUIPMENT CERTIFICATION

Equipment:	**Tubing Hook & Block**
Manufacturer:	**McKissick**
Capacity:	**100 Tons**

The above hook and block was examined in detail on January 7, 1999 at CenAlta's shop. The unit was in a sandblasted condition. Magnetic particle and visual inspections were completed on 100% of all surface areas as detailed on the attached report.

Repairs were recommended to and completed by CenAlta's staff. Based on the inspections and a review of the repairs, it is our opinion that the block is safe to operate within its rated capacity when used in accordance with the manufacturers specifications and/or industry standards.

In accordance with C.A.O.D.C. Recommended Practice 4.0, this certification is valid for a period of 6 years, provided an annual Level III inspection is completed. This certification is void if unit is damaged structurally by either operation or handling.

PERMIT TO PRACTICE
R. D. Inspection Services Ltd.
Signature _____
Date FEB 2/99
PERMIT NUMBER: P 6165
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
GERETT MERVYN BASSEK

Kova Engineering Ltd. THE CRANE CERTIFICATION BUREAU™

more Centre, #201, 7007 - 5 Street S.E.
gary, Alberta T2H 2G2

Tel: (403) 258-0484 • Fax: (403) 258-2854
Cell: (403) 650--0119

May 31, 1999

Crown Industries Inc.
3111 Shepard Place S.E.
Calgary, AB
T2C 4P1

Attention: Mr. Albert Makaruk

Gentlemen:

Re: Inspection of BJ Weldless Links, Length 77"
Capacity: 150-Ton
Job: 44810
Your Purchase Order: F34383
Our File: C-2552

Visual examinations and magnetic particle inspections were performed on the above-described link. Our inspections revealed no defects.

Based on our examination findings, the inspected link is recommended for service.

Yours very truly,

KOVA ENGINEERING LTD.
the Crane Certification Bureau™

PROFESSIONAL ENGINEER ALBERTA CHRIS GREEN

PERMIT TO PRACTICE
KOVA ENGINEERING LTD.
Signature
Date
PERMIT NUMBER: P 5138
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Chris Green, P. Eng.
CG:mm

REPORTC-2552\1

Kova Engineering Ltd. THE CRANE CERTIFICATION BUREAU™

...ore Centre, #201, 7007 - 5 Street S.E.
Calgary, Alberta T2H 2G2

Tel: (403) 258-0484 • Fax: (403) 258-2854
Cell: (403) 650-0119

May 31, 1999

Crown Industries Inc.
3111 Shepard Place S.E.
Calgary, AB
T2C 4P1

Attention: Mr. Albert Makaruk

Gentlemen:

Re: Inspection of BJ Weldless Links, Length 77"
Capacity: 150-Ton
Job: 44830
Your Purchase Order: P34383
Our File: C-2553

Visual examinations and magnetic particle inspections were performed on the above-described link. Our inspections revealed no defects.

Based on our examination findings, the inspected link is recommended for service.

Yours very truly,

KOVA ENGINEERING LTD.
the Crane Certification Bureau™

PERMIT TO PRACTICE
KOVA ENGINEERING LTD.
Signature
Date
PERMIT NUMBER: P 5138
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA CHRIS GREEN

Chris Green, P. Eng.
CG:mm

ALLAN R. NELSON ENGINEERING LTD.
17510 - 102 Avenue, Edmonton, Alberta T5S 1K2
Bus. (403) 483-3436, (403) 489-9688
Fax (403) 489-9557
NON-DESTRUCTIVE TESTING
CONSULTING ENGINEERS
24-Hour Service

DATE 04/28/94
W.O. 6679
P.O. 5339
INVOICE 94-19956 RIG
CO. Cenalta Oilwell Servicing

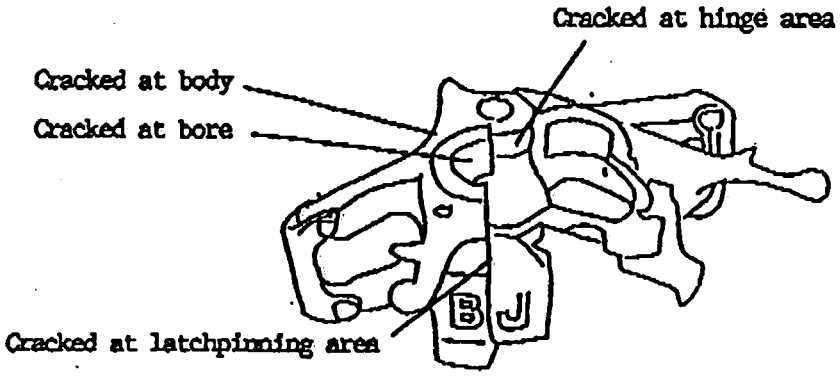
-N.D.T. METHODS APPLICATION

:MAGNETIC PARTICLE
DRY X WET Fluorescent
RESIDUAL D.C. 110VCoil
CONTINUOUS A.C. 110VYoke/Coil
:ULTRASONIC
SHEAR WAVE
ST BEAM
:LIQUID PENETRANT

CUSTOMER Alco Machine Works
ADDRESS 6925 - 104 Street
Edmonton, Alberta T6H 2L5

TYPE OF INSPECTION

Magnetic Particle Inspection on (1) set of Elevators as per T-150, Section V, Article 7 M.P.S.
NOTE: Surface preparation/sandblasted.
Left & Right Ear Size 3"
All defects marked for identification and repairs.



SUMMARY 05/28/94 No discontinuities at inspection after completion of repairs.
05/30/94 Black Lite Inspection after load test - OK.
Previously stamped 597.

MODEL 2 7/8" 90 degree TA-100
SERIALNO PW #19, ALCO LT#94056679
Stamped 5443

MANUFACTURE B.J. Elevator
INSPECTED BY TP & C CGSB#5703
ASNT II/CGSB II

ORDEREDBY Adolf

APPROVEDBY Adolf

RD INSPECTION SERVICES LTD.

P.O. Box 27013
Downtown Postal Outlet
Red Deer, Alberta
Canada T4N 6X8
Phone: (403) 340-1073
Fax: (403) 346-8448
24 HOUR SERVICE

MAGNETIC PARTICLE INSPECTION

REPORT# M 1793

INVOICE # 5976

CUSTOMER: CENALTA WELL SERVICES INC. DATE: Oct. 16, 1996

LOCATION: Inspected @ R.D. Inspection's Shop PAGE: 1 OF 1

ITEM INSPECTED: (1) Web Wilson C-100 2 3/8" Tubing Elevator P.O. # 11061

W.O. #

Previous Markings: HOU 93300 LT / P.W. 5093 DJLB REF:

MAGNETIZING EQUIPMENT: Contour Probe

BLACK LIGHT: Spectroline

METHOD: AC X DC ____ CONTINUOUS X RESIDUAL ____ YOKE X COIL ____

PARTICLES (TYPE): Magnaglow "14A" in H2O

SURFACE CONDITION: Sandblasted

TEST RESULTS:

A Wet Fluorescent Magnetic Particle Inspection was conducted on above Elevator as requested.

Inspection was performed in accordance with ASME Sec V, Article 25, SE 709.

DETAILS:

Elevator completely disassembled as required.

RESULTS:

Hinge pin grease nipple broken - Replace.

Sharp casting line @ car on body detected - Blended.

Door car had rough areas of metal - Blended.

There were no relevant or rejectable indications at time of inspection.

Elevator stamped RDI-1793 and dated.

TECHNICIAN: Roger Carlton ASSISTANT: Everett Gusek, P. Eng.

C.G.S.B.: 6522 Level II A.S.N.T.: Level II C.G.S.B.: ____ A.S.N.T.: ____

APPROVED BY: Les

LOAD TEST CERTIFICATE

DATE: June 30, 1999

CUSTOMER: Cenalta Well Services Inc
ADDRESS: Bag 5764
Red Deer, Alberta
T4N 6W5

RIG # : Rig #42

THE FOLLOWING EQUIPMENT HAS RECEIVED A LOAD TEST TO 1.5 TIMES ITS RATED CAPACITY AND A SAFETY INSPECTION.

PART NUMBER: BJ TA Tubing Elevator

DESCRIPTION: 3 1/2" - 90 Degree - 65 Ton

SERIAL NUMBER: EDM 0699 3356 514 LT

W.O. NUMBER: OT-514

LOAD TESTED TO: 97.5 Tons

MPI NUMBER: H-5359

AUTHORIZED BY: 

Quality Assurance Department
Hydra Group Ltd. - Edmonton, AB

Authorized VARCO BJ Repair Center

BOX 283
CHARLIE LAKE, B.C.
V0C 1H0

ALTEC INSPECTION LTD.

ENGINEERING & INSPECTION

TELEPHONE: (604) 785-6295
FAX: (604) 785-4395

INSPECTION CERTIFICATE

CLIENT: Cenalta Oilwell Servicing

MAKE & MODEL: Kremco Model: 103' 217,000#

SERIAL NUMBER: cdn - 1095

LOCATION: Cenalta's Yard, Fort St. John, B.C.

DATE: July 21, 1995

DESCRIPTION: Service Rig #42

INSPECTION NOTES:

The subject rig was inspected on July 21, 1995. A number problems were identified at the time of the inspection. Several cracked weldments were noted in section three of the crown and there was a bent sheave guard on the block. For a detailed description of all deficiencies noted see the inspection results section of the accompanying report. At the same time as the derrick inspection, a number of rig attachments were also inspected for possible defects. A table indicating all attachments inspected and the results of the inspections is also included in the accompanying report. All repairs completed to Rig #42 were found to be effective and of good quality.

N.D.T. TECHNIQUES : High Resolution Wet Magnetic Particle, Visual Inspection

This equipment was inspected by the above N.D.T. techniques; such flaws as were found were repaired in a satisfactory manner.

INSPECTOR:

for Sean Mallay

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA RONALD J. BAKER

R.J. Baker, P.Eng.

ALTEC INSPECTION LTD.
ALTEC INSPECTION LTD.
ALTEC INSPECTION LTD.

PHONE: (604) 785-6295
FAX# : (604) 785-4395
Box 283 Charlie Lake, B.C.
V0C 1H0
INSPECTION & ENGINEERING

TO: Cenalta Oilwell Servicing Ltd., Dennis Ogren

DATE: July 27, 1995

SUBJECT: Magnetic Particle Inspection and Certification of the mast, A-leg assembly, and various pieces of equipment concerning Cenalta Rig# 42.

RIG DETAILS: Rig #42

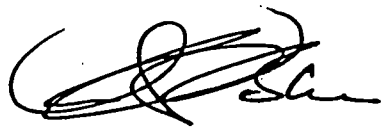
MAKE:	Kremco.
MODEL:	103' 217,000#
SERIAL #:	CDN - 1095
MAX. STATIC LOAD:	6 lines 217,000 lbs.

INTRODUCTION:

On July 21, 1995, Rig #42 was inspected in Cenalta Oilwell Servicing's yard, utilizing visual and magnetic particle inspection techniques. All main structural weldments of the mast and A-legs were visually inspected. Any weldment indicating possible flaws/cracks was re-examined utilizing magnetic particle testing. All damaged areas noted during the inspection were flagged for repair. Repairs were completed by July 26, 1995, and were re-inspected. All repairs completed to Rig #42 appeared to be effective and of excellent quality. Details of all noted damages are included in the inspection results section of this report.

In addition to the mast and A-leg inspection, a number of rig attachments were inspected with magnetic particle to detect possible surface flaws. Details of the attachment inspections are also included in the inspection results.

Sincerely,



R.J. Baker, P. Eng.

CENALTA OILWELL SERVICING
FORT ST. JOHN

INSPECTION RESULTS

Cenalta Oilwell Servicing - Rig# 42

A-LEG SECTION:

2 SECTIONS:
OK condition; no weldment flaws/structural damage indicated.

LOWER MAST SECTION:

12 SECTIONS:
OK condition; no weldment flaws/structural damage indiacted.

CROWN SECTION:

SECTIONS 1 & 2:
OK condition; no weldment flaws/structural damage indicated.

SECTION 3;

a) Eight monkey board fingers cracked. Cracks were ground out, fingers re-welded.
b) Several minor cracks in structural welds of monkey board flooring. Cracks were ground out, re-welded.
c) Block swivel cradle pinning assembly cracked at 3" x 6" box tubing cross grit RF. Cracks were ground out and re-welded.

GENERAL RIG NOTES:

1) Front and rear outriggers appeared to be in good condition; no weldment/structural flaws evident.

2) Driller walkway appeared to be in good condition; no weldment/structural flaws evident.

3) Sheave guard on block assembly bent in. Recommended bending back out and re-welding.

4) The following indicates results for other components which were inspected at the same time as the rig mast and A-legs.

ATTACHMENT	DESCRIPTOR	TEST METHOD	RESULTS
Tubing Elevator		Visual	No obvious flaws were identified
Bale	72"	Visual and Mag. Particle	No obvious flaws were identified
Bale	72"	Visual and Mag. Particle	No obvious flaws were identified

* NOTE * FL = Front Leg, RL = Rear Leg, DS = Drillers' Side, ODS = Off Drillers' Side, RF = Rear Face, FF = Front Face

Rig #42

TORAN POWER & EQUIPMENT INC.

E.R.C.B. REQUIREMENT

3 Year Recertification Certificate

WORK ORDER NO: D -11700
DATE: April 16, 1999 **CERTIFICATE START DATE:** ~~January 99~~
MAKE: HYDRIL
TYPE: Type X Double Gate
S/N: 063
WORKING PRESSURE RATING: 5000
RING GASKET: R46 **STUD SIZE:** 1-3/8

MAGNA FLUX INSPECTION: J&E 0391
STANDARD TRIM ☐ NACE TRIM ☒

15 MINUTE PRESSURE TEST

ANNULAR B.O.P. ☐
PACKING ELEMENT: ☐ NEW ☐ GOOD-USED

WATER PRESSURE:		**HYDRAULIC PRESSURE:**	
LOW	200 PSI	***OPEN*** CHAMBER	1500 PSI
HIGH	☐3000 PSI ☒5000 PSI	***CLOSE*** CHAMBER	1500 PSI

DOUBLE GATE ☒ **SINGLE GATE** ☐

HYDRAULIC PRESSURE:
☒ **PIPE RAM *OPEN*** CHAMBER 1500 PSI
☒ **PIPE RAM *CLOSE*** CHAMBER 1500 PSI
☒ **BLIND RAM *OPEN*** CHAMBER 1500 PSI
☒ **BLIND RAM *CLOSE*** CHAMBER 1500 PSI

WATER PRESSURE:
LOW 200 PSI ***HIGH*** ☐ 3000 PSI ☒ 5000 PSI

703 - 19th Avenue, Nisku, AB, T9E 7V9, Phone: (403) 955-7324 Fax: (403) 955-7320 Toll Free: 1-888-22TORAN

Service Company Representative
Jerry Balka

Attn: Al

TORAN POWER & EQUIPMENT

703-19th Ave. T9E-7V9

WORK ORDER **D-10847** **NISKU ALBERTA**

Phone (403) 955-7324
Fax (403) 955-7320

3 YR RECERTIFICATION CERTIFICATE

E.R.C.B. REQUIREMENT TEST REPORT

DATE SERVICED **DEC 18/97** STARTING DATE *feb - 1998*

TYPE OF EQUIPMENT; **71/16"x5000 HYDRIL GK ANNULAR**

SERIAL 80186

NOMINAL SIZE	71/16"	PRESSURE RATING	5000
FLANGE DESCRIPTION	R-46	STUD SIZE	13/8"
VISUAL CONDITION	GOOD	PACKING ELEMENT	NEW
BODY	GOOD	PISTON	GOOD
RING GROOVES	RECUT	GUIDES	GOOD

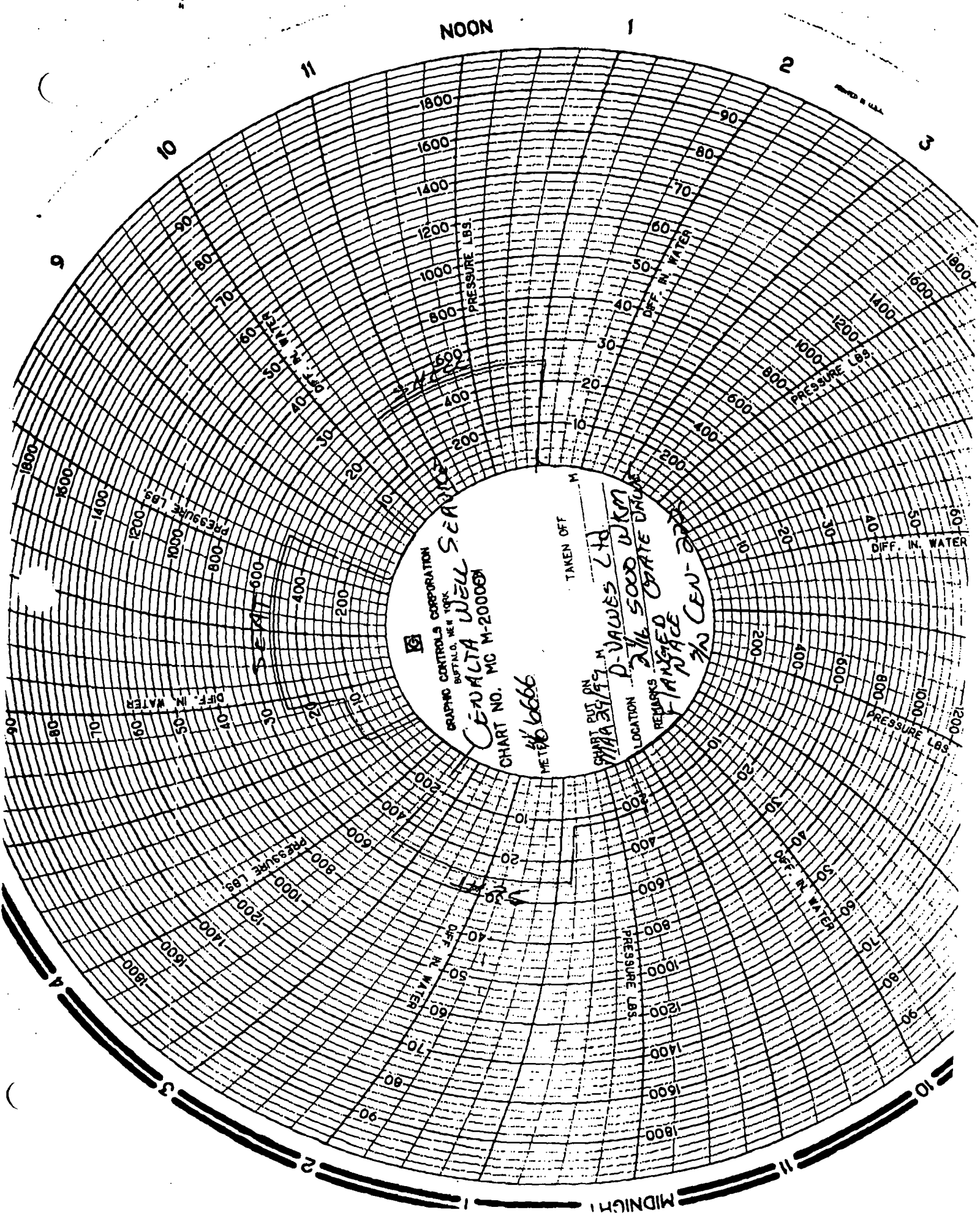
PARTS USED; NEW SEAL KIT DM93462
NEW ELEMENT 25454
OUTSIDE WORK PREFORMED; TRI SERVICE REBUILD
NACE TRIM OR MAGNAFLUX TSM E-49663

PRESSURE TESTED TO; OPENING CHAMBER 5000

CLOSING CHAMBER 5000

Service Company representative

JERRY PALKA


NOON
MIDNIGHT
DIFF. IN WATER
PRESSURE LBS.
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
CHART NO. MC M-2000
METER
TAKEN OFF
CHART PUT ON
LOCATION
REMARKS

T & T # 14266

INSPECTION SERVICES

8022 Coronet Road Edmonton, Alberta T6E 4N9
Phone: 403-469-9688 · Fax: 403-463-9389
NON-DESTRUCTIVE EXAMINATION & ENGINEERING
24 Hour Service

DATE 11/24/97
W.O. 20846
P.O. 25146
INVOICE 4273 RIG
CO. CenAlta Well Services Inc.

-N.D.T. METHODS APPLICATION

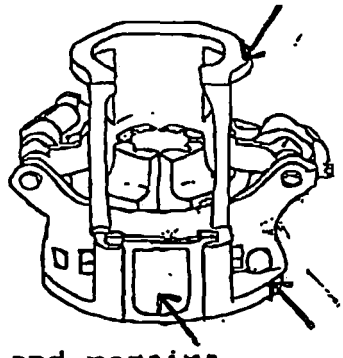
:MAGNETIC PARTICLE
DRY X WET
RESIDUAL
CONTINUOUS A.C.110VYoke
:ULTRASONIC
SHEAR WAVE
ST BEAM
:LIQUID PENETRANT

CUSTOMER Alco Machine Works Inc.
ADDRESS 6925 - 104 Street
Edmonton, Alberta T6H 2L5

TYPE OF INSPECTION

Magnetic particle inspection on (1) Cavins Tubing Spider as per ASTM-E-709.

NOTE: Surface preparation/sandblasted.
- C/W 4 segments - o.k.
- Upper supports cracked.
- Door cracked.
- Bottom base welds cracked.



All defects marked for identification and repairs.

SUMMARY 12/19/97 No discontinuities at final inspection after completion of repairs.

MODEL TC-101
SERIALNO Stamped 14266

MANUFACTURE Cavins Air Slips
INSPECTED BY SS CGSB#6570
CGSB/ASNT II Unit 22

ORDEREDBY Bruce Allen

APPROVEDBY Bruce Allen

DBI/SALA®

Certification

Repair Date: Dec 8/98

Can Alta
Rig #239
Repair

DBI/SALA
2 Thorncliffe Park Drive
Unit 14
Toronto, Ontario M4H 1H2
1-800-205-6866

We hereby certify the following items to meet or exceed the CSA requirements

Model Number	SERIAL NUMBER
23600	001613

All certifications apply to new (or serviced products). Certification void if manufacturer's instructions for use, care, and maintenance are not followed. Alterations or misuse of this product will also void all certification.

NOTES: *ANNUAL INSPECTION IS RECOMMENDED TO BE SERVICED BY AN AUTHORIZED SERVICE CENTER. EXTREME WORKING CONDITIONS MAY INDICATE THE NECESSITY TO INCREASE ANNUAL SERVICE.*

Signature: _____ Title: SERVICE TECHNICIAN Date: Dec 8/98

CONTROL DRILLING SERVICE (1987) LTD.

C E R T I F I C A T I O N

DATE: October 8, 1997

This is to certify that this Clipper Weight Indicator has been calibrated to specifications.

CO. CENALTA WELL SERVICES INC. - FT. ST. JOHN

S/N 3992

W/O 33589

RIG 42

Gilles Riopel

GILLES RIOPEL
INSTRUMENT TECHNICIAN

jvb

5921 - 87A STREET, EDMONTON, ALBERTA T6E 5W6
TELEPHONE (403) 465-6006 FAX (403) 469-8872

PARAMOUNT RESOURCES LTD.

WORKER PROTECTION POLICY

Hazard Analysis and Work Planning
for
Hydrocarbon Based Drilling and Workover Fluids

PARAMOUNT RESOURCES LTD. - WORKER PROTECTION POLICY

Hazard Analysis and Work Planning for Hydrocarbon Based Drilling and Workover Fluids

CONTENTS:

FORWARD

Members of the CAODC Drilling Health Safety and Environmental Committee and the Servicing Safety and Technical Committee had raised concerns about the health and safety of their workers while using Hydrocarbon based drilling and workover fluids.

To date there have been recorded instances of fires and explosions on explosions on equipment using these products as well as instances of crews requiring medical attention due to Hygiene problems resulting from exposure to the fluids during normal drilling and servicing operations. Members have also expressed grave concerns over the potential long-term toxicity of some of these products to their workers. Site and fluid testing done by members showed that a number of these fluids were more than "just invert" and their concerns were valid.

The CAPP Hygiene Committee responded to these issues and an Ad-Hoc Drilling Fluids Committee was formed with representation from the CAODC safety committees, CAPP safety/hygiene/drilling committees and PSAC drilling fluids committee.

After several meetings the group felt that the majority of the issues had been identified and the largest hurdle seemed to be communicating all the hazards and precautions from the drilling fluid supplier through the operating down to the rig worker level. The group felt that the proper committee to deal with this issue was DACC.

This recommended practice sets out in a general manner all the issues raised at the ad-hoc committee meetings. It is worth noting that the toughest issue to get a clear analysis on is the toxicity of the products. Often this information requires the assistance of a hygienist following strict analytic methods.

The increase of under-balanced drilling has increased the concerns with the use of these fluids. Preliminary testing has shown that often the well bore fluids are mixing in with the base fluid increasing the aromatic content. Since the drilling fluids are constantly changing during the drilling or circulating process through the producing zones this process makes it difficult to come up with an analysis that has any value.

SCOPE

A great diversity of drilling and workover fluids are being used in Western Canada. The increased use of Hydrocarbon based fluids introduces the potential for a number of hazards that are not readily recognized nor fully evaluated and understood by the operators and drilling and servicing rig crews.

A risk assessment process must be conducted when using hydrocarbon based fluids. Information on the proposed drilling/workover fluids, expected well bore conditions, production zones and rig and surface equipment requirements must be considered. The potential hazards must be identified and controls evaluated. The work plan/well program must indicate the assessment results and the course of preventative action the crews need to implement.

A risk assessment/hazard analysis conducted following the guidelines set out in this recommended practice will enhance the safety of drilling and servicing workover crews by minimizing the hazards to human health or exposure to fire and explosion due to mechanical or human systems breakdown.

This recommended practice is meant to supplement existing regulations and standards rather than replace them.

PRE-JOB PLAN

The well operator in conjunction with the fluid/mud supplier and the drilling/servicing contractor must ensure that the proper materials, equipment, and procedures are in place to do the job. This information must be communicated to the rig crews in the field.

A risk assessment must be conducted where the following hazards are reviewed and evaluated:

- The hydrocarbon base fluid. MSDS for flash point, toxicity, and preventative measures.
- Expectations and effects of well reservoir inflow/contamination of base fluid.
- Classification of flammability/combustibility.
- Determination of potential ignition sources and controls.
- Identification of health hazards and controls.
- Determination of worker Personal Protective Equipment program.
- Determination of potential deterioration, swelling and breakdown, of well control rubber seal elements, pumping and circulating hoses and equipment.

OPERATORS WORK PROGRAM

Operators are responsible for all activities on a lease. Operators shall maintain general health and safety at the well site by coordinating all information and activities at the lease and by providing for proper materials and equipment that may be needed to accomplish the well program and satisfy all regulatory requirements.

The program should include relevant well data, identify all potential hazards, equipment requirements, and controls to be used to eliminate or reduce the hazards to an acceptable level.

The program information, hazards and controls must be communicated through the rig crews down to the Floor crew level.

CLASSIFYING FLAMMABLE AND COMBUSTIBLE FLUIDS

Flammable and combustible liquids are classified or grouped by their flashpoints. The flashpoint of a liquid is the lowest temperature at which the liquid gives off enough vapour to be ignited. Since testing methods and purity of the liquid tested may vary, flashpoints are intended to be used as guides only, not as fine lines between safe and unsafe.

Generally Speaking flammable liquids will ignite and burn easily usually at normal working temperatures. Flammable liquids have a flashpoint below 37.8°C (100°F). Combustible liquids have a flashpoint at or above 37.8°C (100°F) and below 93.3°C (200°F). Hot combustible liquids can be as serious a fire hazard as flammable liquids.

The "Recommended Practices for Pumping High Flash Hazard Hydrocarbons" gives a risk classification based on flash point.

1. Low Risk - Exists during circulating/drilling operation when a fluid temperature on surface does not exceed its closed cup flash point less ten degrees Celsius. If CCFP is unavailable use Read Vapour Pressure $\leq$ 1.0 PSI.

2. High Risk - Exists during circulating/drilling operation when a fluid temperature on surface exceeds its closed cup flash point less ten degrees Celsius. If CCFP is unavailable use Read Vapour Pressure $>$ 1.0 and $\leq$ 2.0 PSI.

The base fluid MSDS should give values to be used as a starting point. If the fluid has been used on prior wells, production zone fluids or mud additives may alter the flashpoint.

Ongoing temperature monitoring of the fluid returns must take place at the shaker or return flowline as conditions may change.

Normally invert oil systems do not present a fire hazard due to the entrained water. However variations where the base/water ratio is high should be regarded as combustible.

Makeup fluids must be tested for flash point prior to delivery to the rig. Oils with API gravity over 42 degrees or unweathered crude's, which may contain light fractions, must not be used.

High-risk fluids must not be used in the typical open rig tank layout. High-risk fluids require engineering considerations, design, and fire protection systems to ensure a safe operation.

FLAMMABLE & COMBUSTIBLE SAFE WORK PRACTICES

For a flammable or combustible liquid fire to start, a mixture of vapour and air must be ignited. There are many possible ignition sources:

- Sparks from electrical equipment or tools.
- Sparks arcs, and hot metal from welding, cutting, or grinding.
- Smoking.
- Open flames from propane torches, engine pre-heaters, and boilers.
- Hot surfaces such as engine exhausts, boilers, electric coils, and hot bearings.
- Embers and sparks from incinerators and engine exhausts.
- Sparks caused by static electricity from improper transfer of liquids.
- Spontaneous combustion from improperly stored hydrocarbon soaked coveralls & clothing.

Electrical equipment on the rig, mud tanks, and rental equipment near the mud system or used for fluid transfer must be inspected to ensure compliance with the Alberta Labour - Oil and Gas Facilities Electrical Code.

Welding/cutting or other Hot Work classed operations must only take place after a pre-job meeting has been held with all personnel on site and all hazards and precautionary measures have been explained and safe work practices implemented.

Mud tanks, subs and other areas where vapours can accumulate need to be well ventilated in order to reduce concentrations. If weather does not permit ventilation explosive gas monitoring equipment should be put in place.

Practice good housekeeping and environmental practices. Keep all spilled hydrocarbon fluids picked up.

Pressure washing and cleaning with the hydrocarbon base fluid will create mists that increase both the fire and health hazards.

Each lease must have a designated smoking area away from the rig and hydrocarbon base fluids.

Check and test diesel engine kills on a daily basis. Vacuum trucks and other diesel engine powered equipment working near the fluids must have engine kills installed and tested regularly.

Ensure coveralls and soiled clothing are stored away from the rig and laundered on a regular schedule.

Mud loggers should place a gas detector at the bell nipple instead of the shaker to ensure a complete reading of any gas that may be encountered. Since oil muds readily allow gas to escape, it is quite possible to record a lower reading at the shale shaker and an extra high reading at the shaker tank.

Additional fire-fighting equipment should be made available near the mud tanks, especially if an all oil or distillate fluid is in use.

WORKER HAZARD EXPOSURE & TOXICITY

Toxicity is a measure of the poisoning strength and is an unchanged characteristic of the chemical. Hazard is not the same. It is a variable feature of the chemical. Hazard is the likelihood that a chemical will cause poisoning, given its strength and the amounts and manner in which it was used, stored, and handled. The toxicity of the chemical cannot be changed but the hazard it presents can be controlled and minimized. It is possible then that a chemical with a low toxicity may present a high health hazard if it is used carelessly or inappropriately.

Significant concentrations of aromatic hydrocarbon vapour can be produced from base fluids with a high aromatic content. Inhalation and skin absorption are the primary routes of solvents uptake into the blood stream. Solvent uptake through the skin can cause blood levels equivalent to inhalation of vapours for the same time period. Solvent uptake through the skin also varies due to: 1) duration of contact, 2) thickness of skin a degree of hydration, 3) the presence of cuts, abrasions, or skin diseases. This reinforces the need for proper work procedures, back up PPE, and the use of barrier creams and after work skin creams.

Highly refined base fluids will have a lower concentration of total aromatics. Many aromatic compounds are known or are suspected of being carcinogenic although much of the research is not conclusive. Diesel fuel can have up to 30% aromatics.

Airborne mist and vapour concentrations will be the highest above the mud tanks within the immediate area of the shale shaker(s). Ventilating the mud tank area and using local exhaust ventilation by the shakers can reduce worker exposure.

If the mud tanks are tarped to keep water out of the fluids the side panels should be raised to increase the cross ventilation.

Consideration should be given to sheeting over the top of the tanks to reduce the vapour concentrations.

PPE is the least preferred method of exposure control and is only used when other methods have been put in place.

PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM

While contact with hydrocarbon fluids, mists, and vapours can be controlled, it cannot be totally eliminated. Point of contact PPE controls must then be used. Elements to be considered are protection of the workers, compliance with laws/regulations and industry standards, and technical feasibility.

The type of PPE selected is based upon the degree of protection required and the appropriateness of the equipment to the situation, especially the practical consideration of it's being kept in good repair. Note that MSDS phrases may be of limited value as statements such as "Wear chemical resistant gloves" have limited value. No material is resistant to all chemicals and no material will remain impervious to a specific chemical forever. All PPE must meet the appropriate CSA standard.

Rig personnel may experience contact with the fluids in several areas on the rig: The drill floor, the mud tank/pit areas, near the shale shaker/flow line, and in the mud mix room or hopper. Other operations including equipment maintenance and repair, rig cleaning with wash guns using the base product. Many of the solvents in hydrocarbon based mud's readily transmit through the skin or carry other chemicals through the skin.

- FR coveralls must be worn at all times. Soaked coveralls or clothing must be changed immediately. Soiled coveralls/clothing should be laundered thoroughly before reuse. Provisions for clothes washing or Dry cleaning/laundry service will be required.

- Rig floor workers will require slicker/wet suits when tripping, making connections, or stabbing pipe. Materials such as PVC, Nitrile, and neoprene are possible choices. Some FR suits are available.

- Footwear resistant to the solvent content of the hydrocarbon base must be selected. Materials such as PVC and Nitrile are typical for both summer and winter boots.

- Safety glasses should be mandatory. Additional protection such as goggles and face shields will be required for handling/mixing the base fluid, inverts or additives. Ensure eye wash units are in the vicinity of work areas.

- Gloves of PVC or Nitrile of a length that will protect the wrists must be worn. Wash areas of skin contact with soap & water or a hand cleaning cream, as soon as possible.

- Barrier creams must be applied before wearing gloves, to minimize potential skin contact. If there is prolonged or repeated contact a moisturizer should be applied after washing.

- Respiratory protection is required for dusts, mists, or vapours. NIOSH approved masks are available for dusts and light mists. Half-mast respirators with chemical cartridges and prefilters for organic solvents must be issued to each worker exposed to these fumes/vapours.

- Half-mast respirators require fit testing. Refer to appropriate OH&S regulations for details on fit testing procedures and recording requirement.

PPE Program - continued

- Training is a basic requirement of all PPE programs. All crewmembers must receive instruction in the hazards of the fluids and how to use, care for, and maintain the PPE correctly to protect themselves. Training sessions should be recorded in the rig tour book.

- The solvent content of the base fluid will have an impact on the usable life of all PPE. In general as the aromatic solvent concentration increases, the life of the PPE decreases rapidly. Footwear and body suits may break down in as short a time as a few days.

WORKER EXPOSURE EFFECTS

Acute exposures to organic solvents result in depression of the central nervous system. This condition is often referred to as "organic solvent syndrome". Symptoms include headaches, dizziness, nausea, and vomiting. At higher concentrations workers symptoms are similar to drunkenness with giddiness and numbness. Extremely high concentrations can cause irritation to the nose and throat.

There is some evidence that chronic exposure to these solvents over years can make some of these symptoms permanent.

The nervous system effect of exposure to organic solvents can lead to significant morbidity and increased risk of accidental injury, both on the job and away from work. NIOSH recommends the use of engineering controls, personal protective equipment and clothing, and worker education programs to reduce worker exposure to organic solvents, at least to the acceptable OEL levels defined in the OH&S regulations.

Excessive skin exposure leads to irritant contact dermatitis. The skin becomes inflamed with redness, swelling, and pain. Symptoms can include redness blisters, scales, or crusts. Washing of contamination, the use of barrier and moisturizing creams, proper gloves and good personal hygiene can control this problem.

Long term exposures can result in sensitization in some individuals. Exposure to low levels of the product leads to an allergic reaction and medical treatment may be required.

Sensitization is the development, over time, of an allergic reaction to a chemical. The chemical may cause a mild response on the first few exposures but, as the allergy develops, the response becomes worse with subsequent exposures. Eventually, even short exposures to low concentrations can cause a very severe reaction.

There are two different types of occupational sensitization: skin and respiratory. Typical symptoms of skin sensitivity are swelling, redness, itching, pain, and blistering. Sensitization of the respiratory system may result in symptoms similar to a severe asthmatic attack. These symptoms include wheezing, difficulty in breathing, chest tightness, coughing and shortness of breath.

EXPOSURE MONITORING

The potential compounds that could be found in hydrocarbon based drilling and workover fluids are complex. Monitoring devices are available for specific components. Qualified industrial hygiene personnel would be required to make any surveys of worker exposure for these compounds.

The constantly changing conditions on a rig site make this type of survey difficult with ample opportunity for error.

BOP SEAL and EQUIPMENT DEGRADATION

Aromatic solvents attack the rubber compounds used in drilling and servicing hoses, BOP elements, BOP seals and pump packing and seals. The rubber swells, softens, and the components can blister and break down.

Usually made of nitrile, the rubber products are designed to resist the aromatic content of the invert diesel muds. Higher aromatic content, such as found in condensates or frac fluids, and circulating pressure increase the degradation.

Some compounds in hydrocarbon based fluids act as a solvent for other hydrocarbon compounds. As fluid is circulated through the production zone the aromatic content could then increase through this solvent action.

Nitrile is also used in PPE, so rapid breakdown of boots, gloves, and slicker suits is an indicator of high aromatic content. Breakdown of mud motor or production screw pump stators also indicates high aromatic content.

Testing of the hydrocarbon base fluids would include checks of aromatic content and/or aniline point.

WELL CONTROL

Hydrocarbon and acid gases (H_2S and SO_2) are soluble in hydrocarbon based muds and therefore make gas kick detection very difficult especially when drilling at deep depths.

Hydrocarbon and acid gases (H_2S and SO_2) do not break out of oil based muds until they reach their bubble point at around 6000 kPa. When they do not break out they expand and displace mud rapidly out of the well bore.

When circulating bottoms up, when gas is suspecte, when drilling with hydrocarbon based muds, the mud should be run through the BOP manifold choke and degasser prior to the bottom's up mud reaching it's bubbling point.

This information must be included in the well plan/program and review during the regular crew BOP drills.

ENVIRONMENTAL

The toxicity and mobility in the environment of hydrocarbon based fluid mean they must be handled with great care and their ultimate disposal is difficult and costly.

These factors should be a part of the risk analysis process to fully reflect all the hazards and costs of using a hydrocarbon based mud drilling or workover fluid.

CREW TRAINING

The lack of communication of all these issues, down to the rig floor level, has contributed to many incidents where hydrocarbon based drilling and workover fluids have been used.

The well program, mud program, risk assessment and hazard control measures must be communicated to the rig crews on an ongoing basis. Regular safety and training meetings need to be held to ensure all workers on site are aware of the hazards, protective equipment, and safe work procedures to be followed to protect themselves, the equipment and the environment.

REGULATIONS

A variety of regulations deal the hazards and protective measures required when using hazardous fluids:

Alberta

Occupations Health & Safety Act
- Obligations of employers, workers, etc. (2)
- Prime contractor (2.1)

Chemical Hazard Regulations
- Exposure to substance by inhalation (2)
- Procedures, training, and instruction re-exposure to harmful substances (10)
- Skin and eye protection (13)
- Part 2, controlled products

General Safety Regulations
- Part 5, personal protective equipment
- Part 11, fire and explosion hazards
- Part 12, confined spaces
- Part 14, oil and gas servicing and drilling

Saskatchewan

The Occupational Health and Safety Act, 1993
- Part II, duties
- Part IV, workplace hazardous materials information system

The Occupational Health and Safety Regulations, 1996
- Part III, General Duties
- Part VI, General Heath Requirements
- Part VVII, Personal Protective Equipment
- Part XVIII, Confined Space Entry
- Part XXI, Chemical and Biological Substances
- Part XXII, Controlled Products - WHMIS
- Part XXV, Fire and Explosion Hazards
- Part XXIX, Oil and Gas

British Columbia

Occupational Heath and Safety Regulation
- Part 2, Application
- Part 4, Emergency Preparedness and Response
- Part 5, Chemical and Biological Substances
- Part 8, Personal Protective Clothing and Equipment
- Part 9, Confined Spaces
- Part 23, Oil and Gas

References

Alberta Labour - Oil and Gas Facilities Electrical Code
Canadian Centre for Occupational Heath and Safety - OSH Answers
NOISH - Pocket Guide to Chemical Hazards
Canadian Dictionary of Safety Terms
Baroid - Health & Safety Guidelines for Rig Personnel (use of invert emulsion based drilling mud & drilling mud chemicals)
PSAC - Recommended practice for pumping of high flash point hazard hydrocarbons
Alberta Occupational Heath and Safety Magazine - May 1998 - Clear as mud
CAODC Information Bulletins - L-97-3 - and T-96-11
Oilweek - March 4, 1996 - Rubber Blowout Seals Fail
Alberta Labour, Occupational Health and Safety Bulletin - September 1994 - Use of hazardous fluids in well drilling and servicing operations

DEFINITIONS

Acute

Acute means sudden or brief. Acute can be used to describe either an exposure or health effect. An acute exposure is a short-term exposure. Short-term means lasting for minutes, hours or days. An acute health effect is an effect that develops either immediately or a short time after an exposure. Acute health effects may appear minutes, hours or even days after an exposure. (See also Chronic)

Aerosol

An aerosol is a collection of very small particles suspended in air. The particles can be liquid (mist) or solid (dust or fume). The term aerosol is also commonly used for a pressurized container (aerosol can) which is designed to release a fine spray of material such as paint.

Inhalation of aerosols is a common route of exposure to many chemicals. Also, aerosols may be fire hazards.

Alkali, Alkaline

See pH.

Auto-ignition Temperature

The auto-ignition temperature is the lowest temperature at which a material begins to burn in air in the absence of a spark or flame. Many chemicals will decompose (break down) when heated. The auto-ignition temperature is the temperature at which the chemicals formed by decomposition begin to burn. Auto-ignition temperatures for a specific material can vary by one hundred degrees Celsius or more, depending on the test method used. Therefore values listed in documents such as Material Safety Data Sheet may be rough estimates. To avoid the risk of fire or explosion, materials must be stored and handled at temperatures well below the auto-ignition temperature.

Boiling Point

The boiling point is the temperature at which the material changes from a liquid to a gas. Below the boiling point, the liquid can evaporate to form a vapour. As the material approaches the boiling point, the change from liquid to vapour is rapid and vapour concentrations in the air can be extremely high. Airborne gases and vapours may pose fire, explosion and health hazards.

Sometimes, the boiling point of a mixture is given as a range of temperatures. This is because the different ingredients in a mixture can boil at different temperatures.

If the material decomposes (breaks down) without boiling, the temperature at which it decomposes may be given with the abbreviation "dec." Some of the decomposition chemicals may be hazardous.

Carcinogen, Carcinogenic, Carcinogenicity

A carcinogen is a substance, which can cause cancer. Carcinogenic means able to cause cancer. Carcinogenicity is the ability of a substance to cause cancer.

When classifying materials for the workplace, under the Canadian Controlled Products Regulations, materials are identified as carcinogens if they are recognised as carcinogens by the American Conference of Governmental Industrial Hygienists (ACGIH), or the International Agency for Research on Cancer (IARC).

Under the US OSHA Hazard Communication (Hazcom) Standard, materials are identified as carcinogens on MSDS's if they are listed as either carcinogens or potential carcinogens by IARC or the US National Toxicology Program (NTP), if they are regulated as carcinogens by OSHA, or if there is valid scientific evidence in man or animals demonstrating a cancer causing potential.

The lists of carcinogens published by the IARC, ACGIH and NTP include known human carcinogens and some materials which cause cancer in animal experiments. Certain chemicals may be listed as suspect or possible carcinogens if the evidence is limited or so variable that a definite conclusion cannot be made.

CCOHS - Canadian Centre for Occupational Health and Safety

CCOHS provides an occupational health and safety information service through answers to inquiries, publications and computerised information service.

Chronic

Chronic means long-term or prolonged. It can describe either an exposure or a health effect. A chronic exposure is a long-term exposure. Long-term means lasting for months or years. A chronic health effect is an adverse health effect resulting from long-term exposure or persistent adverse health effect resulting from a short-term exposure. The Canadian Controlled Products Regulations describe technical criteria for identifying materials, which cause chronic health effects. These regulations are part of the Workplace Hazardous Materials Information System (WHMIS). See also Acute.

Combustible

Combustible means able to burn. Broadly speaking, a material is combustible if it can catch fire and burn. However, in many jurisdictions, the term combustible is given a specific regulatory meaning. See Combustible Liquid.

Combustible Liquid

Under the Canadian Controlled Products Regulations (CPR), a combustible liquid has a flash point from 37.8 to 93.3 degrees C (100 to 200 degrees F) using a closed cup test. The CPR is part of the national Workplace Hazardous Materials Information System (WHMIS). The US OSHA Hazcom Standard uses a similar definition.

This range of flash points is well above normal room temperature. Combustible liquids are therefore, less of a fire hazard than flammable liquids. If there is a possibility that a combustible liquid will be heated to a temperature near its flash point, appropriate precautions must be taken to prevent a fire or explosion.

Controlled Products

Under the Canadian Products Regulations [part of the Workplace Hazardous Materials Information System (WHMIS)], a controlled product is defined as a material, product or substance which is imported or sold in Canada and meets the criteria for one or more of the following classes:

Class A - Compressed Gas
Class B - Flammable and Combustible Material:
- Division 1 - Flammable Gas
- Division 2 - Flammable Liquid
- Division 3 - Combustible Liquid
- Division 4 - Flammable Solid
- Division 5 - Flammable Aerosol
- Division 6 - Reactive Flammable Material

Class C - Oxidizing Material
Class D - Poisonous and Infectious Material:
- Division 1 - Material causing immediate and serious toxic effects:
  - Subdivision A - Very toxic material
  - Subdivision B - Toxic material
- Division 2 - Material causing other toxic effects:
  - Subdivision A - Very toxic material
  - Subdivision B - Toxic material

Class E - Corrosive material
Class F - Dangerously reactive material

Corrosive Material

A corrosive material can attack (corrode) metals or human tissues such as skin or eyes. Corrosive materials may cause metal containers or structural materials to become weak and eventually leak or collapse. Corrosive materials can burn or destroy human tissue on contact and can cause effects such as permanent scarring or blindness.

The Canadian Controlled Products regulations (part of the Workplace Hazardous Materials Information System (WHMIS)) and the US OSHA Hazcom Standard, specify technical criteria for identifying materials which are classified as corrosive materials for the purposes of each regulation. (See also pH.)

Density

The density of a material is its weight for a given volume. Density is usually given in units of gram per millilitre (g/ml) of grams per cubic centimetre (g/cc). Density is closely related to specific gravity (relative density). The volume of a material in a container can be calculated from its density and weight.

Engineering Controls

Engineering Controls help reduce exposure to potential hazards either by isolating the hazard or by removing it from the work environment. Engineering controls include mechanical ventilation and process enclosure. They are important because they are built into the work process.

Engineering controls are usually preferred to other control measures such as the use of personal protective equipment. Substitution of a less hazardous material or industrial process is the best way to reduce a hazard and is often considered to be a type of engineering control.

Explosive Limits

Explosive limits specify the concentration range of material in air that will burn or explode in the presence of an ignition source (spark or flame). Explosive limits may also be called flammable limits or explosion limits.

The lower explosive limit (LEL), or lower flammable limit (LFL), is the lowest concentration of a gas or vapour that will burn or explode if ignited. The upper explosive limit (UEL), or upper flammable limit (UFL), is the highest concentration of gas or vapour that will burn or explode if ignited. From the LEL to the UEL, the mixture is explosive. Below the LEL, the mixture is too lean to burn. Above the UEL, the mixture is too rich to burn. However, concentrations above the UEL are still very dangerous because, if the concentration is lowered (for example, by introducing fresh air), it will enter the explosive range.

In reality, explosive limits for a material vary since they depend on many factors such as air temperature. Therefore, the values given on a Material Safety Data Sheet are approximate.

The explosive limits are usually given as the percent by volume of the material in the air. One percent by volume is 10, 000 ppm. For example, gasoline has a LEL of 1.4% and a UEL of 7.6%. This means that gasoline vapours at concentrations of 1.4% to 7.6% (14, 000 to 76, 000) are flammable or explosive.

Exposure Limits (or Occupational Exposure Limits (OELs))

An exposure limit is the concentration of a chemical in the workplace air to which most people can be exposed without experiencing harmful effects. Exposure limits should not be taken as sharp dividing lines between safe and unsafe exposures. It is possible for a chemical to cause health effects, in some people, at concentrations lower than the exposure limit.

Exposure limits have different names and different meanings depending on who developed them and whether or not they are legal limits. For example, Threshold Limit Values (TLVs) are exposure guidelines developed by the American Conference of Governmental Industrial Hygienists (ACGIH). These guidelines have been adopted by many Canadian governments as their legal limits. Permissible Exposure Limits (PELs) are legal exposure limits in the United States. Sometimes, a manufacturer will recommend an exposure limit for a material.

Exposure limits have not been set for many chemicals for many different reasons. For example, there may not be enough information available to set an exposure limit. Therefore, the absence of an exposure limit does not necessarily mean the material is not harmful.

There are three different types of exposure limits in common use:

1. Time weighted average (TWA) exposure limit is the time-weighted average concentration of a chemical in air for a normal 8-hour workday and 40-hour workweek to which nearly all workers may be exposed day after day without harmful effects. Time-weighted average means that the average concentration has been calculated using the duration of exposure to different concentrations of the chemical during a specific time period. In this way, higher and lower exposures are averaged over the day or week.

2. Short-term exposure limit (STEL) is the average concentration to which workers can be exposed for a short period (usually 15 minutes) without experiencing irritation, long-term or irreversible tissue damage, or reduced alertness. The number of times the concentration reaches the STEL and the amount of time between these occurrences can also be restricted.

3. Ceiling (C) exposure limit is the concentration which should not be exceeded at any time.

> "SKIN" notation (SKIN) means that contact with the skin, eyes and moist tissues (for example, the mouth) can contribute to the overall exposure. The purpose of this notation is to suggest the measures be used to prevent absorption by these routes: for example, the use of protective gloves. If absorption occurs through the skin, then the airborne exposure limits are not relevant.

Flammable, Flammability

Flammable means able to ignite and burn readily. Flammability is the ability of a material to ignite and burn readily. (See also Combustible) Under the Canadian Controlled Products Regulations [part of the Workplace Hazardous Materials Information System (WHMIS)] and the U.S. HAZCOM Standard, there are specific technical criteria for identifying flammable materials. (See Flammable Aerosol, Flammable Gas, Flammable Liquid, Flammable Solid and Reactive Flammable Material).

There are closely related criteria for the classification of certain flammable materials under the Canadian Transportation of Dangerous Goods (TDG) Regulations and the U.S. Department of Transportation regulations. (See also Combustible).

Flammable Liquid

A flammable liquid gives off a vapour that can be readily ignited at normal working temperatures. Under the Canadian Controlled Products Regulations, a flammable liquid is a liquid with a flash point (in a closed cup test) below 37.8 degrees C (100 degrees F).

Neurotoxins

Neurotoxins are agents that can cause toxic effects on the nervous system.

NOISH - National Institute for Occupational Health and Safety

NOISH is a branch of the United States government, which undertakes research and develops occupational health and safety standards.

OSHA - Occupational Safety and Health Administration

OSHA is the branch of the United States government that sets and enforces occupational health and safety regulations. For example, OSHA sets the legal exposure limits in the United States, which are called Permissible Exposure Limits (PELs). OSHA also specifies what information must be given on labels and Material Safety Data Sheets for materials that have been classified as hazardous using their criteria.

Pensky-Martens Closed Cup

Pensky-Martens Closed Cup (PMCC) is a specific method for determining flash points.

Personal Protective Equipment

Personal protective equipment is clothing or devices worn to help isolate a person from direct exposure to a hazardous material or situation. Recommended personal protective equipment is often listed on an MSDS. This can include protective clothing, respiratory protection and eye protection.

The use of personal protective equipment is the least preferred method of protection from hazardous exposures. It can be unreliable and, if it fails, the person can be left completely unprotected. This is why engineering controls are preferred. Sometimes, personal protective equipment may be needed along with engineering controls. For example, a ventilation system (an engineering control) reduces the inhalation hazard of a chemical, while gloves and an apron (personal protective equipment) reduce skin contact. In addition, personal protective equipment can be an important means of protection when engineering controls are not practical: for example, during an emergency or other temporary conditions such as maintenance operations.

pH

The pH is a measure of the acidity or basicity (alkalinity) of a material when dissolved in water. It is expressed on a scale from 0 to 14. Roughly, pH can be divided into the following ranges:

- pH 0-2 Strongly Acidic
- pH 3-5 Weakly Acidic
- pH 6-8 Neutral
- pH 9-11 Weakly Basic
- pH 12-14 Strongly Basic

Under the Canadian Controlled Products Regulations, materials with pH values of 0-2 or 11.5-14 may be classified as corrosive. Corrosive materials must be stored and handled with great care.

Risk

A probability, during a period of activity, that a hazard will result in a injury or occupational disease.

Sensitization

Sensitization is the development, over time, of an allergic reaction to a chemical. The chemical may cause a mild response on the first few exposures but, as the allergy develops, the response becomes worse with subsequent exposures. Eventually, even short exposures to low concentrations can cause a very severe reaction.

There are two different types of occupational sensitization: skin and respiratory. Typical symptoms of skin sensitivity are swelling, redness, itching, pain, and blistering. Sensitization of the respiratory system may result in symptoms similar to a severe asthmatic attack. These symptoms include wheezing, difficulty in breathing, chest tightness, coughing and shortness of breath.

The Canadian Controlled Products Regulations [part of the Workplace Hazardous Materials Information System (WHMIS)] and the U.S. OSHA HAZCOM Standard describe technical criteria for identifying materials which are respiratory tract sensitizers or skin sensitizers.

Solubility

Solubility is the ability of a material to dissolve in water or another liquid. Solubility may be expressed as a ratio or may be described using word such as insoluble, very soluble or miscible.

Often, on a Material Safety Data Sheet, the "Solubility" section describes solubility in water since water is the single most important industrial solvent. Solubility information is useful for planning spill clean-up and fire fighting procedures.

Solvent

A solvent is a material, usually a liquid, which is capable of dissolving another chemical. Chemicals commonly called solvents can dissolve many different chemicals. Examples of common solvents are water, ethanol, acetone, hexane and toluene.

Specific Gravity

Specific gravity is the ratio of the density of a material to the density of water. The density of water is about 1 gram per cubic centimetre (g/cc). Materials that are lighter than water (specific gravity less than 1.0) will float. Most materials have specific gravity exceeding 1.0, which means they are heavier than water and so will sink. Knowing the specific gravity is important for planning spill clean up and fire-fighting procedures. For example, a light flammable liquid such as gasoline may spread and, if ignited, burn on top of a water surface.

Toxic, Toxicity

Toxic means able to cause harmful health effects. Toxicity is the ability of a substance to cause harmful health effects. Descriptions of toxicity (such as low, moderate, severe, etc.) depend on the amount needed to cause an effect or the severity of the effect.

Under the Canadian Controlled Products Regulations and the U.S. OSHA HAZCOM Standard, there are specific technical criteria for identifying a material as toxic for the purpose of each regulation.

Vapour

A vapour is the gaseous form of a material that is normally solid or liquid at room temperature and pressure. Evaporation is the process by which a liquid is changed into vapour. Sublimation is the process by which a solid is changed directly into the vapour-state.

Flammable liquids can be extremely hazardous in the workplace. For example, if there is inadequate ventilation, vapours can travel considerable distances to a source of ignition and flash back to the flammable liquid. It may be difficult to extinguish a burning flammable liquid with water because water may not be able to cool the liquid below its flash point.

Flash Back

Flash back occurs when a trail of flammable gas, vapour, or aerosol is ignited by a distant spark, flame or other source of ignition. The flame then travels back along the trial of gas, vapour or aerosol to its source. A serious fire or explosion could result.

Flash Point

The flash point is the lowest temperature at which a liquid or solid gives off enough vapour to form a flammable air-vapour mixture near its surface. The lower the flash point, the greater the fire hazard. The flash point is an approximate value and should not be taken as a sharp dividing line between safe and hazardous conditions. The flash point is determined by a variety of test methods, which give different results. Two types of methods are abbreviated as OC (open cup) and CC (closed cup).

Fumes

Fumes are very small, airborne, solid particles formed by the cooling of a hot vapour. For example, a hot zinc vapour may form when zinc-coated steel is welded. The vapour then condenses to form fine zinc fume as soon as it contacts the cool surrounding air. Fumes are smaller than dusts and are more easily breathed into the lungs.

Harmful Substance

A substance which by its nature, application or presence creates or would create a danger tot he health or safety f any worker exposed to it.

Hazard, Hazardous

Hazard is the potential for harmful effects. Hazardous means potentially harmful. The hazards of a material are evaluated by examining the properties of the material, such as toxicity, flammability and chemical reactivity, as well as how the material is used. How a material is used can vary greatly from workplace to workplace and therefore, so can the hazard.

IDLH

IDLH stands for Immediately Dangerous to Life or Health. For the purposes of respirator selection, the National Institute for Occupational Safety and Health (NIOSH) defines the IDLH concentration as the airborne concentration that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment. The purpose of establishing an IDLH exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment. The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment. In the event of failure of respiratory protective equipment, every effort should be made to exit immediately.

Irritancy, Irritation

Irritancy is the ability of a material to irritate the skin, eyes, nose, throat or any other part of the body that it contacts. Signs and symptoms of irritation include tearing in the eyes and reddening, swelling, itching and pain of the affected part of the body.

Irritancy is often described as mild, moderate or severe, depending on the degree of irritation caused by a specific amount of the material. Irritancy may also be described by a number on a scale of 0 to 4, where 0 indicates no irritation and 4 means severe irritation. Irritancy is usually determined in animal experiments.

The Canadian Controlled Products Regulations (part of the Workplace Hazardous Materials Information System (WHMIS)) and the U.S. OSHA Hazcom Standard describe technical criteria for identifying materials which are skin or eye irritants for the purposes of each regulation.

LC50

LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. The LC50 helps determine the short-term poisoning potential of a material.

LD50

LD stands for lethal dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. The LD50 can be determined for any route of entry, but dermal (applied to skin) and oral (given by mouth) LD50's are most common. The LD50 is one measure of the short-term poisoning potential of a material. (See also LC50)

Material Causing Immediate and Serious Toxic Effects

The Canadian Controlled Products Regulations describe technical criteria for identifying materials that cause immediate and serious toxic effects. These criteria use information such as the LD50 or LC50 for a material. Based on the specific information, a material may be identified as toxic or very toxic in the class D - Poisonous and Infectious Material.

Material Causing Other Toxic Effects

The Canadian Controlled Products Regulations describe technical criteria for identifying materials that cause toxic effects such as skin or respiratory sensitisation, mutagenicity and carcinogenicity. Based on the specific information a material may be identified as toxic or very toxic in the class D - Poisonous and Infectious Material.

Mist

A mist is a collection of liquid droplets suspended in air. A mist can be formed when spraying or splashing a liquid. It can also be formed when a vapour condenses into liquid droplets in the air.

MSDS

MSDS stands for Material Safety Data Sheet. The MSDS is a document that contains information on the potential health effects of exposure and how to work safely with the material it is written about. It is an essential starting point to a health and safety program. It contains hazard evaluations on the use of storage, handling, and emergency procedures all related to the material.

In Canada, all products or material covered by the Controlled Products Regulations review an MSDS before the product or material can be used in the workplace. The Controlled Products Regulations is part of the Workplace Hazardous Materials Information System (WHMIS).

Vapour Density

Vapour density is the weight per unit volume of a pure gas or vapour. The vapour density is commonly given as the ratio of the density of the gas or vapour to the density of air. The density of air is given a value of 1. Light gases (density less than 1) such as helium rise in air. If there is inadequate ventilation, heavy gases and vapours (density greater than 1) can accumulate in low-lying areas such as pits and along floors.

Vapour Pressure

Vapour pressure is a measure of the tendency of a material to form a vapour. The higher the vapour pressure, the higher the potential vapour concentration. In general, a material with a high vapour pressure is more likely to be an inhalation or fire hazard than a similar material with a lower vapour pressure.

Ventilation

Ventilation is the movement of air. One of the main purposes of ventilation is to remove contaminated air form the workplace. There are several different kinds of ventilation.

- General ventilation, also known s dilution ventilation, is the removal of contaminated air from the general area and the bringing in of clean air. This dilutes the amount of contaminant in the work environment. General ventilation is usually suggested for non-hazardous materials.

- Local exhaust ventilation is the removal of contaminated air directly at its source. This type of ventilation can help reduce worker exposure to airborne materials more effectively than general ventilation. This is because it does not allow the material to enter the work environment. It is usually recommended for hazardous airborne materials.

- Mechanical ventilation is the movement of air by mechanical means (for example, a wall fan). There are two kinds of mechanical ventilation: general ventilation and local exhaust ventilation.

- Natural ventilation is a type of general ventilation that depends on nature instead of mechanical means for air movement. Natural ventilation can depend on the wind or the difference in temperature from one are to another to move air through a building. Therefore, it is unpredictable and unreliable.

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PARAMOUNT RESOURCES LTD.

EMERGENCY RESPONSE PLAN

DRILLING & COMPLETION

1999 – 2000

DELINEATION WELLS

Paramount et al Liard	I-23	Grid Area	60° 10', 123° 15'
	L-24	Grid Area	60° 10', 123° 15'
	M-25	Grid Area	60° 10', 123° 15'
	O-35	Grid Area	60° 10', 123° 15'
	E-37	Grid Area	60° 10', 123° 15'
	I-46	Grid Area	60° 10', 123° 15'
	G-47	Grid Area	60° 10', 123° 15'

EXPLORATORY WELLS

TABLE OF CONTENTS

INTRODUCTION

Paramount Resources Ltd. intends to drill 4 wells in the Liard area and to conduct completion operations at the same time. Two drilling rigs will be utilized.

A central base camp will be established for each drilling operation.

This manual in intended to provide Operating Personnel with guidelines for project management and to handle emergency situations in accordance with the Canadian Oil and Gas Drilling Regulations.

During the operations of the project, the following precautions must be taken:

1. **Protect the health and safety of all employees and area occupants from hazards.**

2. **Protect the environment.**

PLAN RECEIPT FORM

DATE: _____

TO:

Re: Emergency Response Plan For Liard Project

I have received the above mentioned plan. The manual has been reviewed by the undersigned and the contact, phone numbers, and duties appear to be correct. Any changes to this plan will require notification to Paramount Resources Ltd.

_____

Plan Holder's Signature

EMERGENCY DEFINITIONS AND PROCEDURES

Three Stages of Alert are discussed in this section:

STAGE I ALERT

Criteria

Stage I will include all minor situations where the emergency is confined to the immediate area of the wellsite. No hazard to the workers exists and outside help is not required.

No immediate hazard to people exists but the situation has the potential to escalate to Stage II.

Stage I Includes

1. Emergency
   - Fugitive odor complaint from company personnel (H_2S or other contaminant).
   - Well kick but flow is controlled.
   - Problem encountered during operations.

   Action
   - Alert should be given to individuals in the 550 meter planning radius.
   - Monitoring will be initiated downwind by personnel with portable H_2S detectors.
   - Assemble non-essential wellsite personnel, brief and equip them to block access roads and evacuate camp (if required).

2. Emergency
   - Severe weather.

   Action
   - Travel advisory - all persons (Employee or support services) will be required to check in and out to insure no one is stranded.

STAGE II ALERT

Criteria

Stage II will include all minor situations which **have** escalated into a potential hazard to the public and outside help is required.

Stage II Includes

1. Emergency
   - Failure of control equipment while circulating well kick.
   - Partial control of flow.

   Action
   - Notify and mobilize company, government, and emergency services.
   - Monitor gas levels downwind and ignite if human safety cannot be assured.

2. Emergency
   - Minor fire/spill.

   Action
   - Alert wellsite/camp personnel - head count.
   - Extinguish fire.
   - Commence cleanup operations.
   - Notify company and government personnel.

3. Emergency
   - Minor injury.

   Action
   - Arrange for medi-vac (if required).
   - Report incident to company and government (Worker's Compensation, etc.) personnel.

STAGE III ALERT

Criteria

Stage III will include all major situations where the emergency cannot be controlled or eliminated with personnel and supplies on-site.

Stage III Includes

1. Emergency
   - Serious injury or death.

   Action
   - Alert medical and safety staff.
   - Arrange for medi-vac.
   - Suspend all operations. However, if failure to resume operations potentially endangers other personnel at the work site, corrective measures should be taken to eliminate the hazard, insuring that all evidence relating to the accident is preserved.
   - Report accident to company, R.C.M.P., and other government personnel.

2. Emergency
   - Major fire - camp.

   Action
   - Evacuate camp - head count.
   - Open all window covers - check each room.
   - Contact emergency services.
   - Contain fire/shut-in propane and other flame sources.
   - Notify applicable company and government personnel.

3. Emergency
   - Major fire - rig (other than blowout).

   Action
   - All of the applicable above and,
   - Shut in well - contain fire.
   - Evacuate rig - head count.

4. Emergency
   - Loss or disablement of drilling rig.

   Action
   - Shut in well.
   - Head count - evacuate rig (if required).
   - Commence remedial actions.
   - Notify applicable company and government personnel.

5. Emergency
   - Major pollutant spill including fuel truck rollover.

   Action
   - Alert medical and safety staff.
   - Contain spill (dyke using clay or bags of sawdust).
   - Arrange for fire protection.
   - Commence clean-up and disposal in accordance with federal regulations.
   - Notify company and governing agencies (i.e. Environment Protection Services, etc.).

6. Emergency
   - Loss of support craft (i.e. aircraft)

   Action
   - Alert medical and safety staff.
   - Contact emergency support services.
   - Notify Department of Transport and National Defense.
   - Notify company and other governing agencies.

7. Emergency
   - Uncontrolled flow from well containing H_2S.
   - Concentrations of H_2S in excess of 20 ppm in unevacuated areas.

   Action
   - Evacuate 550 meters planning radius - account for all persons.
   - Block access roads.
   - Notify company and government personnel.

NOTE: If the emergency has deteriorated and a **major** catastrophe (loss of aircraft) is imminent or has occurred, contact National Defense, Yellowknife.

SUMMARY OF DRILLING EMERGENCY PLAN BY ALERT STAGE AND ZONE

ALERT STAGE	WELL CONDITION OR EMERGENCY	ACTION WITHIN PLANNING ZONE	ADDITIONAL ACTION
0	• No Problem	• Awareness of Activities	
I	• Odor Complaint (H2S)	• Alert Wellsite/Camp Personnel • Prepare to Don Breathing Apparatus	• Investigate Odor Source and Contain

	• Well Kick (Flow Controlled) or other Severe Drilling Problem
	  • Failure of Essential Well Control or Safety Equipment
	  • BOP System
	  • Mud Circulating System Due to:
	  • Pump Failure
	  • Drill Pipe Separation
		• Alert Wellsite/Camp Personnel
		• Block Access Roads (Using Non-Essential Personnel)
			• Notify Company Personnel

	• Severe Weather	• Travel Advisory - Check In and Out	• Advise Support Services
II	• Control Equipment Failure while Circulating Kick • Partial Control Flow	• Block Access Roads (Using Non-Essential Personnel)	• Notify and Mobilize Company and Government Personnel • Monitor Gas Levels Downwind and Ignite if Human Safety Cannot be Assured
	• Minor Fire	• Alert Wellsite/Camp Personnel • Extinguish Fire	• Consider Outside Help
	• Minor Pollutant Spill	• Contain Spill (Saw Dust) • Commence Cleanup Operations	• Report Incident to Authorities and Company
	• Minor Injury	• Alert Medical Staff • Preserve Incident Site	• Arrange for Medi-Vac if required • Report Incident to Company and Government Personnel

SUMMARY OF DRILLING EMERGENCY PLAN BY ALERT STAGE AND ZONE - Continued

ALERT STAGE	WELL CONDITION OR EMERGENCY	ACTION WITHIN PLANNING ZONE	ADDITIONAL ACTION
III	• Serious Injury or Death	• Alert Medical and Safety Staff • Eliminate Hazards to Others • Preserve Accident Site • Suspend Operations	• Arrange for Medi-Vac • Report Incident to Company and Government Personnel
	• Major Fire – Camp - Rig, Other than Blowout	• Evacuate Camp - Head Count • Contain Fire • Shut in Well • Evacuate Rig - Head Count • Contain Fire	• Contact Emergency Support Services • Notify Company and Government Personnel • Contact Emergency Support Services • Notify Company and Government Personnel
	• Loss or Disablement of Drilling Rig	• Shut in Well • Evacuate Wellsite - Head Count	• Contact Emergency Support Services • Notify Company and Government Personnel
	• Major Pollutant Spill (Including Fuel Truck Roll Over) • Loss of Support Craft (i.e. Air Craft)	• Arrange for Fire Protection • Contain Spill (Dyke Using Clay or Bags of Sawdust) • Alert Medical and Safety Staff	• Report Incident to Company and Government Personnel • Notify National Defense • Contact Emergency Support Services • Notify Company Government Personnel
	• Uncontrolled Flow from Well • Concentrations of H2S in Excess of 20 ppm in Unevaluated Areas	• Evacuate Wellsite and Camp as Required • Block Access Roads (Using Non-Essential Personnel)	• Initiate Sour Gas Emergency Response Plan • Monitor Downwind Area and Ignite if Human Safety Cannot be Assured

RESPONSIBILITIES OF COMPANY PERSONNEL

ON-SITE CONSULTANTS

In the event of an emergency, the On-Site Consultant will become the on-scene commander.

In the event the On-site Consultant is unable to perform his responsibilities, for whatever reasons, the chain of authority will be as follows: First: Rig Manager, Second: Driller

Immediate Actions

On-Scene Commander has the responsibility to evaluate the situation, commence with remedial actions, insuring preservation of human life and protection of the environment.

Assess The Situation

Initiation of notification procedures beginning with an assessment of the situation determining whether emergency is minor or major.

1. Current Situation
   - Area of gas flow - i.e. drill pipe (tubing) or annulus.
   - Status of BOP Equipment - i.e. good, failed, burned, etc.
   - Status of major rig equipment - i.e. pumps, motors, mud systems.
   - Estimate of flow rate.
   - Shut in pressures (if possible).
   - Define status of support equipment - i.e. power, lights, communications.

2. Potential Hazards
   - Gas release.
   - Risk of fire.
   - Risk of explosion.
   - Hazardous materials in vicinity.

3. Weather Conditions
   - Wind speed and direction.
   - Visibility.
   - Air temperature.
   - Rain, snow, sleet.

4. Wellsite & Campsite
   Evacuation
   - if wind - evacuate upwind.
   - if no wind - evacuate uphill.

On-Scene Commander will notify Safety Personnel to begin immediate evacuation of on-site personnel who may be affected by the hazards (i.e. - H_2S, fire).

On-Scene Commander will then contact the Superintendent on call who will determine further action.

SUPERINTENDENT ON CALL

The Superintendent on call, will receive a call from the lease. He will discuss the situation with the On-Scene Commander and assess:

1. The severity of the situation.
2. Whether evacuation is required.
3. Additional personnel and services that may be required.
4. Remedial actions.

Superintendent on Call Duties:

1. Call and brief the Off-Duty Supervisor.

The Superintendent will then proceed by the quickest means possible to the emergency area where he will further assess the situation and commence appropriate steps to bring the emergency to an end.

OFF – DUTY SUPERVISOR

The Off-duty Supervisor will contact all company personnel and governing agencies required depending on the type and severity of the emergency.

Stage I Emergency

- Notify company personnel.
- Notify governing agencies.
- Notify emergency support services.

Stage II Emergency:

- Notify company personnel.
- Notify governing agencies.
- Notify emergency support services.

Stage III Emergency:

- Notify company personnel.
- Notify governing agencies.
- Notify emergency support services.

He will then open communications to receive information from lease representatives, etc.

SAFETY SUPERVISOR ON-SITE

On-Duty Safety Supervisor:

Is responsible for coordinating the following:

- Safety of on-site personnel, insuring all well site personnel have quick access to breathing apparatus.

- After receiving order from On-Site Consultant, ignition of gas plume - follow ignition guidelines.

MEDICAL STAFF

Each employee will report to the medic prior to commencing the first shift. A well maintained, confidential medical record system is essential to assessing the nature and origin of health problems that arise during employment. Relatively minor injuries can be treated at the site; other, the patient will be stabilized in preparation for medi-vac to the hospital.

- The Medical Staff will be responsible for ground to air communication for all incoming and out-going flights.

- The Medical Staff will prepare a passenger and cargo manifest for all out-going flights (first copy to the pilot, second to the wellsite supervisor, third to keep).

- The Medical Staff will be responsible for issuing a severe weather warning and completing the severe check-in form.

ISOLATION OF THE HAZARD AREA

The well will penetrate one formation that contains hydrogen sulphide (H_2S) in an amount that may pose a hazard should the well effluent reach surface, it is:

Nahanni @ ± 2.0% H_2S

The maximum flow rate potential was calculate for the above mentioned formation at .104 m^3/sec. The calculations indicate a 538 meter hazard zone. For the purpose of this plan and as an additional safety fact, a 550 meter planning and evacuation radius will be used.

The probability of an uncontrolled H_2S release is very remote; however, should the situation occur, evacuate the 550 meter planning radius and block access roads. (See Map)

ISOLATION OF THE HAZARDOUS AREA

The hazardous area is the region lying within the 550 meter planning radius. Only authorized Personnel may enter this area and they must take the following precautions:

1. Use the Buddy System.

2. Every individual entering the Hazard Area must be equipped with breathing apparatus.

3. Individuals entering the Hazard Area must continuously monitor Hydrogen Sulphide levels using one of the following:
   a) Sampling tubing, i.e. Drager or Gas Tech.
   b) Electronic Sensor.

NOTE: THE LEAD ACETATE AMPULE IS NOT ACCEPTABLE.

4. Individuals entering the Hazard Area must keep in contact through the use of two-way radios or mobile telephones with those giving them authorization of entry. This would most likely be the On-Scene Commander (i.e. report in every 10-15 minutes). Anyone in the Hazard Area, other than authorized Emergency Personnel, must be evacuated immediately.

ROAD BLOCK EQUIPMENT

Any roads which may be effected are under Paramount control and being used only by Paramount and their contractors. Road blocks will initially be set up by off-duty crews and non-essential personnel. Road blocks will be manned, personnel can place their vehicles across the road, blocking access. Signs warning of the hazards and area closure will be posted. Should the area closure be required for long term (i.e. over 12 hours), additional personnel will be contacted to operate the road blocks.

MONITORING

Short Term

Downwind monitoring will be initiated to monitor and track the H_2S and/or SO_2 gas plume on the first indication of a gas release. Personnel will be dispatched from the wellsite to evacuate area occupants and block access roads. While travelling in the area the planning zone(s), personnel will continuously test for ambient levels of H_2S and SO_2.

Long Term

A mobile monitoring unit will be dispatched to the emergency area if an uncontrolled gas release occurs.

Protection

1. Use Buddy System when possible.
2. Breathing apparatus for all personnel.
   - be prepared to don apparatus quickly.

Detection

1. Multi-gas detector (Draeger c/w SO_2 and H_2S tubes).
2. Record all information.
   a. Concentrations in ppm or ppb.
   b. Location and time of readings.
   c. Wind speed and direction.
   d. Who was evacuated and where they are going

Wind

Speed and direction of wind may vary, therefore, be prepared to track gas plume.

Communication

1. Notify On-Scene Commander of events taking place.
2. Notify Road Block Personnel and work crews of hazard area changes.

SAFETY EQUIPMENT LIST

On-Site Safety Equipment To Be Brought In May Include:

Wellsite

- Wellsite Trailer
- Service Vehicles
- Mobile & 2-Way Communications
- H_2S Detection Device(s)
- (8) 30 Minute Self-Contained Air Paks
- (1) O_2 Resuscitator
- (1) Flare Gun
- (1) Electronic H_2S Detector
- (1) Ignition Kit
- Wind Socks
- (1) 350 lb. Wheeled Fire Extinguisher
- (5) Hand Held Radios

Safety Trailer

- (10) 300 Cu. Ft. Cylinders Air
- (6) 7 Cu. Ft. Airline Paks
- (2) 40 Cu. Ft. Air Paks
- (1) Resuscitator
- 300 Ft. 1/2" Air Hose
- 600 Ft. 1/4" Air Hose
- (2) Air Line Manifolds
- H_2S Warning Signs
- Folding Stretcher
- First Aid Kit

Campsite

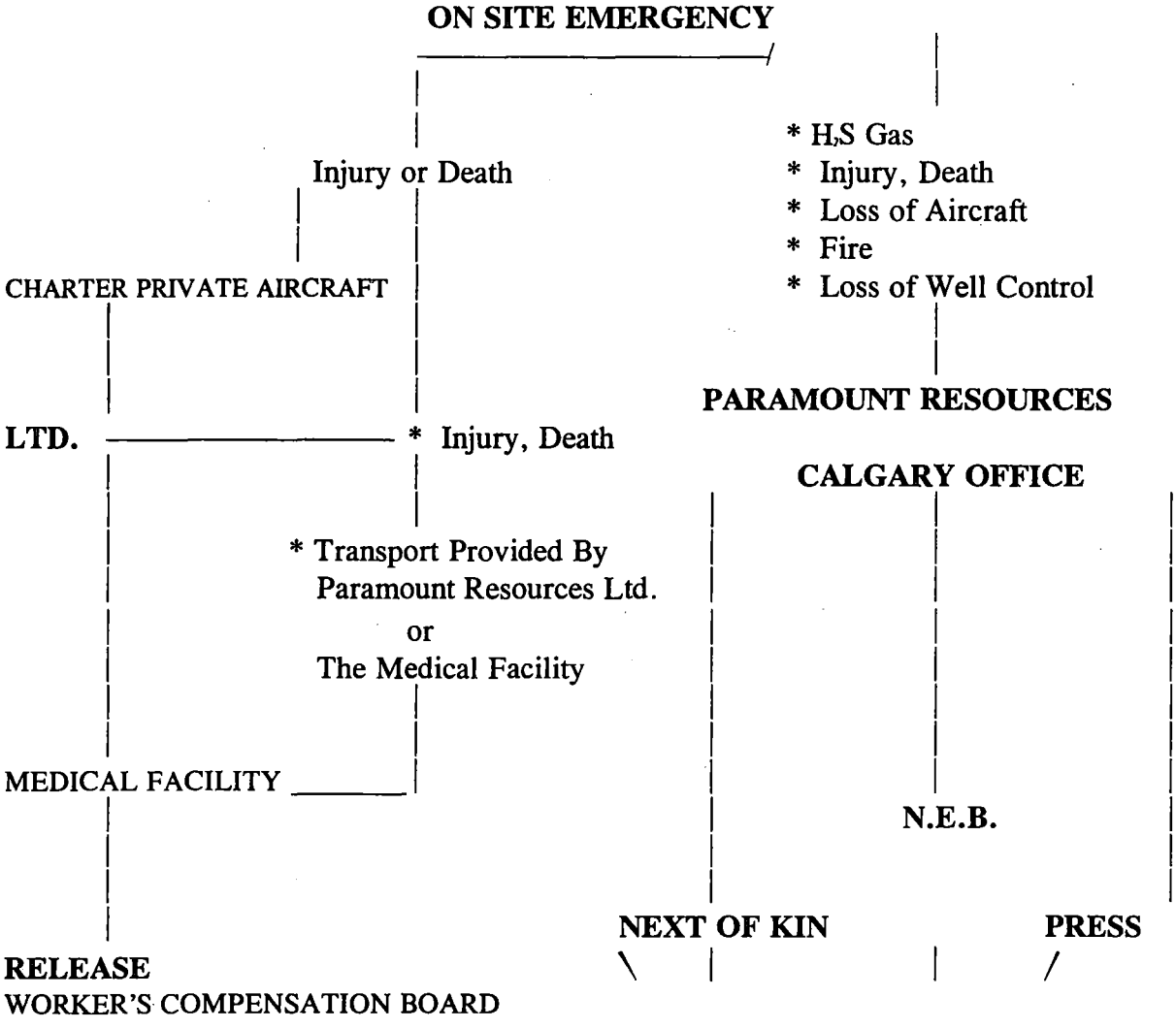
- (6) 30 Minutes Self-Contained Air Paks
- (1) H_2S Detector (Hand-Held)
- (1) 150 lb. Wheeled Fire Extinguisher
- (1) Hand Held Radio (Medical Shack)
- (1) Base Station (Camp)

Emergency Equipment On Standby:

- Road Block Kits (As Necessary)
- Continuous Monitor Unit
- (6) 2-Way Radios - Compatible With Monitor Units
- Additional Electronic H_2S Detector
- Additional Air Paks
- Security Personnel For Road Blocks

COMMUNICATIONS

CONTACT PROCEDURE IN THE EVENT OF AN EMERGENCY

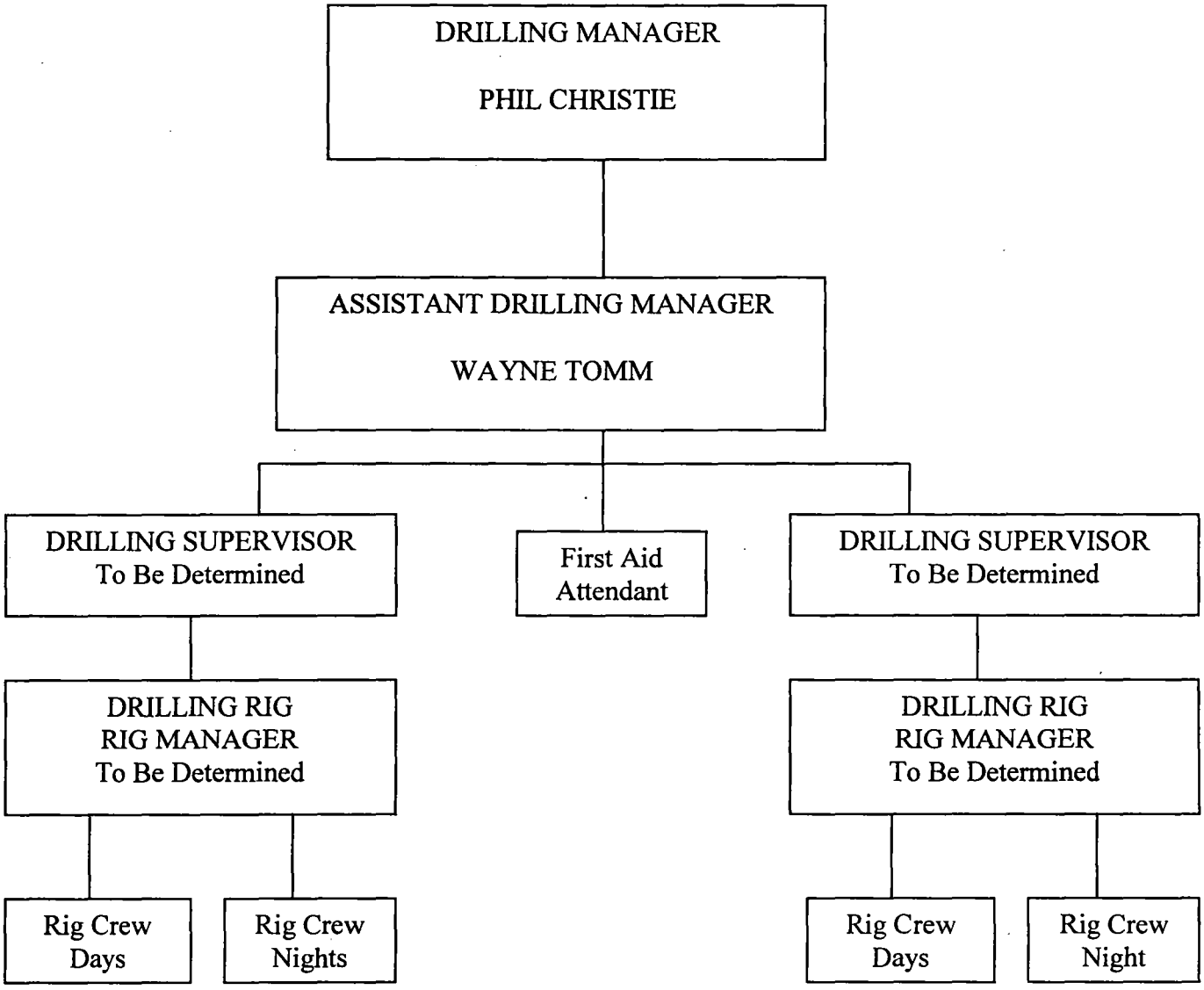


LIARD

DRILLING AND COMPLETION

EMERGENCY RESPONSE PLAN

ORGANIZATION CHART



EMERGENCY OPERATIONS CENTRE

During all emergency situations it is essential that an individual or group of people be aware of all that is happening in the area at all times. The location from which this takes place is the emergency Operations Centre.

Location: 1. Campsite
2. Road Block

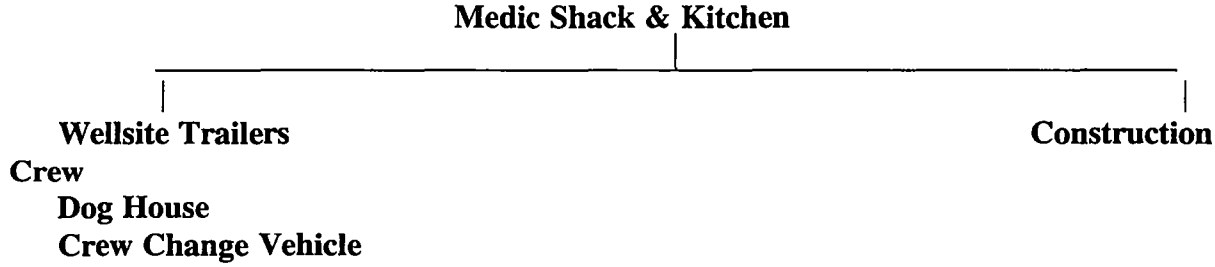
COMMUNICATION SYSTEM

Communications are essential for effective Emergency Response. A system of hand held radios will be on-site prior to penetrating the H_2S bearing formation(s). The radios will be distributed and maintained by the On-duty Safety Supervisor. Additional radios will be provided should the need arise.

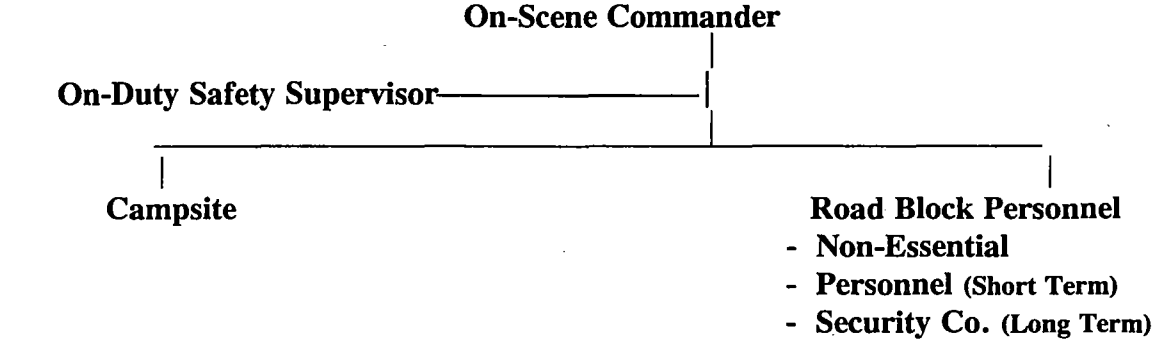
The following charts show the radio locations prior and during an emergency:

RADIO DISTRIBUTION CHART

Non-Emergency



Emergency



TELEPHONE CONTACTS

1. Paramount Resources Ltd.
   4000 First Canadian Centre
   350 - 7th Avenue S.W.
   Calgary, Alberta T2P 3W5

   (403) 290-3600
   Fax (403) 266-6032

3. Drilling Contractors:

   To be determined

3. Wellsite & Camp

   Drilling Supervisor - To Be Determined
   Drilling Supervisor - To Be Determined

   Rig Manager - To Be Determined
   Rig Manager - To Be Determined

4. Superintendent On-Call

   Paramount – Wayne Tomm

   Off: (403) 290-3626
   Res: (403) 251-0456
   Cell: (403) 861-8473

   Drilling Contractors – To be determined

   National Defense
   Yellowknife, NWT

   (867) 873-4011

5. National Energy Board
   5th Flr., 311 - 6th Avenue S.W.
   Calgary, Alberta T2P 3H2

Rick Fisher	Off: (403) 299-2798 Res: (403) 220-0893
Andy Graw	Off: (403) 299-2790 Res: (403) 547-3073
Chris Knoechel	Off: (403) 299-3866 Res: (403) 241-0047
Terry Baker	Off: (403) 299-2792 Res: (403) 239-5032
John McCarthy	Off: (403) 299-2766 Res: (403) 240-2345

6. Indian And Northern Affairs — (867) 669-2671
   P.O. Box 1500 — Fax (867) 669-2713
   Yellowknife, N.W.T. X1A 2R3

7. Emergency Medical Assistance, Hospitals & Transportation

   a. Yellowknife, N.W.T.

      i. Department of Health — (867) 920-8496 (24 hrs.)

   b. Ft. Liard, N.W.T.

      i. Nursing Station — (867) 770-4301
      ii. RCMP — (867) 770-4221
      iii. Protective Services — (867) 770-3388
      iv. Department of Transportation — (867) 770-3361
      v. Fixed Wing Aircraft
         DEH CHO Air — (867) 770-4103
      vi. Band Council — (867) 770-4141

   c. Ft. Nelson, B.C.

      i. Hospital — (250) 774-6916
      ii. RCMP — (250) 774-2777
      iii. Ambulance — 1-800-461-9911
      iv. Helicopter
         Highland — (250) 774-6106
         Northern Mountain — (250) 774-6119
         Canadian — (250) 774-6171
      v. Fixed wing Aircraft
         Villers — (250) 774-2072
         North Caribou (Ft. St. John) — (250) 787-0311

   d. Environmental Services

      i. Western Oilfield Environmental — (403) 266-3286

   e. Firefighting & Blowout

      i. Safety Boss — (403) 342-1310
      ii. Firemaster — (403) 341-3000

   f. Waste Disposal

      i. Newalta — (250) 789-3051

IGNITION GUIDELINES AND PROCEDURES

IGNITION GUIDELINES

In the event of a major emergency where H_2S is being released and public safety cannot be assured, the Senior On-site Company Representative is responsible for the ignition of the uncontrolled flow. The criteria for the ignition, as set out by the E.U.B. in its Decision Report D 84-28 are:

The Well **must** be ignited **as soon as** all personnel working at the site can be cleared to a safe distance under any of the following conditions:

1. The well is experiencing an uncontrolled flow, the well effluent has reached the surface, and the flow may lead to loss of life.

2. The well is flowing sour gas to surface and public safety cannot be assured because:

   a) Evacuations of residents within the Emergency Planning Zone has not been accomplished, and:

   b) Monitoring data indicate H_2S levels in excess of 20 ppm in unevacuated areas, or:

   c) Monitoring is not taking place due to unforeseen circumstances, such as bad weather, or in the event of communications breakdown and public safety cannot be assured.

NOTE: Uncontrolled flow defined as: Flow to surface that cannot be shut off at operator's discretion.

IGNITION PROCEDURES

1. Take the appropriate mask up and buddy system precautions.

2. Approach the well from the upwind side while monitoring with an explosive meter and an H_2S detector. Ignition should be implemented from the maximum upwind range of the flare-gun. Flare shells should be shot towards the sour gas release point in such a manner that ignition will occur at the farthest outside radius of the explosive gas plume.

3. Approach no further than warranted and make sure that an explosive mixture does not exist in your immediate proximity.

4. Ignite the gas release.

5. If possible, have a radio and vehicle equipped with safety backup team on standby at a safe distance.

6. If possible, remain on standby at the ignited source to re-ignite if required.

EVACUATION

EVACUATION EXPOSURE LEVELS FOR AREA OCCUPANTS

These are the standards adopted to protect Human Health from Emission of H_2S and SO_2 and shall be used as guidelines pending decision by the Board of Health.

Hydrogen Sulphide

a) If concentrations exceed 5 ppm for 1 hour
   - advise occupants, evacuate the area, and

b) If concentrations exceed 20 ppm (3 minute average)
   - evacuation will be considered mandatory

c) Occupants with health problems will be evacuated at 1 ppm.

Sulphur Dioxide

a) If concentrations exceed 1 ppm for 2 to 3 hours
   - evacuation will be considered mandatory.

METHOD OF CONTACT

In the event of an emergency resulting from operations, all persons in the exposed area will be contacted by visitation and advised as to the nature of the emergency situation. Occupants in the planning radius will be notified and required to evacuate their premises immediately. Starting with those downwind.

NOTE: USE THE BUDDY SYSTEM IF POSSIBLE.

- Each vehicle must be equipped with breathing apparatus, gas detection equipment and communication system.

Occupants contacted for evacuation will be given the direction to take to exist the affected area. Transportation will be made available for those who do not have a means of leaving the area.

Evacuation, unless under extreme circumstances, should only be required for a short period of time until elimination of the emergency has taken place.

NOTE: RCMP will not enter hazardous areas unless trained on the hazards of H_2S and the use of breathing apparatus.

SUPPLEMENTAL INFORMATION

NEWS RELEASES

Written statements will be released to media by the Office of the President, Paramount Resources Ltd., in Calgary.

NO news releases, written or otherwise, will be released by Company or Contact Personnel.

RETURN TO NORMAL

Once the emergency is over, an orderly return to normal affairs must be initiated. Contact all persons (i.e. occupants, agency, and company personnel) who were informed about the emergency. Ensure that they understand it is over. Provide assistance to these requiring help to return home. Provide instruction for settlement of out-of-pocket expenses or other costs directly caused by the emergency.

EMERGENCY RESPONSE PLAN SUMMARY

1. Have Kick Procedures been followed? _____

2. Are BOP's shut in? _____
   a. What is the sequence:

   Blind Ram _____ How Many? _____

   Pipe Ram _____ How Many? _____

   Hydril _____ How Many? _____

3. Are all motors killed with air shut offs? _____

4. Are all electrical controls shut off? _____

5. Is all personnel account for? _____

   Number Dead _____

   Number Missing _____

   Number Trapped _____

   Number Present _____

6. Is medical aid required by any people? _____

   Name _____ Position _____

   Name _____ Position _____

   Name _____ Position _____

   Name _____ Position _____

   Name _____ Position _____

   Name _____ Position _____

   Name _____ Position _____

   Name _____ Position _____

7. Has gas been ignited? _____

8. Where is the gas directed to? _____

EMERGENCY RESPONSE PLAN SUMMARY - Continued

9. In what direction is the wind blowing? _____

10. What is the mud weight? _____

11. What depth are we at? _____

12. What time did this occur? _____

13. What was the status at this time? _____

14. Who has been contacted? _____

_____

_____

_____

_____

_____

_____

_____

15. Is the safety company there? _____

Who is it? _____

Company Representative? _____

16. Is an evacuation required? _____

17. Has it commenced? _____

18. What other steps have been taken? _____

_____

_____

_____

SEVERE WEATHER CHECK-IN FORM

NAME	COMPANY	STARTING POINT PHONE NO.	DEPARTURE TIME	ESTIMATED TRIP TIME	DESTINATION POINT PHONE NO.	ARRIVAL TIME

PARAMOUNT RESOURCES LTD.

SPILL MITIGATION PLAN

Potential Concerns

Poor planning can result in delayed or ineffective response to unexpected line break during testing when methanol is used as a deicing agent, and for fuel and other hazardous materials spills. In turn, this delay could result in short or long term environmental impacts and has the potential to threaten worker and public safety. The following is a list of measures to take.

Condition/Concern	Mitigative Measures
General	
	1. Carry a minimum of 10 kg of suitable commercial sorbent Material, 30 m^2 of 6 mil polyethylene, a shovel and one empty fuel barrel without a top on all fuel and service vehicles for use on small fuel or oil spills.
	2. Store large volumes of fuels (2000 L or more) in bermed area with an impervious liner.
	3. Ensure movile construction equipment is not serviced or refueled within 30 m of watercourses.
Initial Response	
	4. In the event of a spill of hazardous material, the first responder will follow the actions presented in the Spill Scene Checklist (see below). Refer also to Paramount's Corporate Emergency Response Plan Producing Operations.
	5. When notified of a spill, the project supervisor will immediately ensure that:
	a) Action is taken to control danger to human life;
	b) Paramount's Emergency Response Plan will be implemented such that necessary equipment is mobilized and measures are implemented to stop the source of the spill or isolate the spill area. The Contractor will be required to make all resources available to contain and clean up a spill;
	c) The appropriate government authorities, Paramount's Environmental group, the DIAND Land Use Administrator are notified of the spill and the initial response being undertaken.

Initial Response (continued)

6. The successful containment of a spill on land or water depends on a variety of factors including: ground cover and topography, hydrogeology, solubility of the material, viscosity of the liquid, water currents, soil permeability and climatic conditions.

The following general guidelines will be followed for containment of most hazardous materials.

7. Identify the product, stop source and physically contain spill as soon as practical.

8. Unless it is necessary to control a fire or prevent an explosion, water or fire extinguishing chemicals will not be used on non-petroleum product spills as many chemicals react violently with water and chemicals extinguishing agents may release toxic fumes. In addition, chemicals may be soluble in water and dispersal makes containment and clean-up more difficult.

9. Minimize traffic on contaminated soils.

10. If the spill is on land, natural depressions or berms constructed with materials and equipment in proximity to the site will be used to physically contain the spill. Deployment of booms may be necessary if the spill is on water.

11. Clean-up will not be attempted without competent advice from Paramount's Environmental group, however, general clean-up guidelines for specific accidents are outlined below.

Transportation by Truck

12. Contain spilled petroleum product.

13. Pump tanks dry into appropriate containers or another tanker.

14. Remove vehicle and tanks from site.

15. Pick up spilled product.

16. Clean up contaminated area.

17. Dispose of contaminated sorbent materials at an approved facility. On contaminated soil areas where remediation is feasible, add amendments, repeat as required, sample soil, and seed as appropriate. Repeat as required.

Spills Adjacent to or into a Water Body

18. Construct berm and/or trenches to contain spilled product prior to entry in to water body.

19. Deploy booms, skimmers, sorbents, etc., if feasible, to contain and recover spilled material from waterbody.

20. Pick up spilled product.

21. Clean up contaminated area including downstream shorelines.

22. Dispose of contaminated sorbent materials at an approved facility. On contaminated soil areas where restoration is feasible, fertilize and then cultivate beyond depth of contamination. Repeat as required.

Spot Spills

23. Since impacts from small spot can generally be minimized if appropriate actions are implemented, all small spills of fuels or noxious materials must be reported immediately to the project construction superintendent.

24. Suspend construction activity in the immediate vicinity of the spot spill until permission to resume activity has been granted.

25. Locations where spot spills occur are to be flagged or otherwise marked to ensure that post construction monitoring of the site can be undertaken. Prepare a sketch map of the area, including measured dimensions, and provide the map to Paramount's Environmental group.

26. Lightly contaminated soil areas where restoration is feasible will be fertilized and then cultivated to a depth below the depth of contamination, then repeated as required.

SPILL SCENE CHECKLIST

Note:

The following activities should be performed by the person first on the scene of a hazardous material spill or release. Refer also to Paramount's Corporate Emergency Response Plan - Producing Operations.

a) If possible without further assistance, control danger to human life and identify the composition of the spilled material.

b) If possible, isolate and shut in the source of the spill. While efforts are immediately begun to clean up and contain the spill, immediately notify the project construction superintendent. If the construction superintendent cannot be immediately contacted, notify Paramount's Construction Manager. These people will contact the appropriate government agency.

c) Once the source has been stopped, attempt to contain the spilled area.

d) Before any reports are filed, take notice of dangers to the environment. For example, proximity of watercourses and any additional clean-up actions that might be necessary.

e) If any of the above are beyond the capabilities at hand, do not hesitate to ask for qualified assistance.