



NWT OFFICE OF THE REGULATOR OF OIL AND GAS OPERATIONS

Office of the Regulator of Oil and Gas Operations

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Mr. Patrick Kelly  
Area Operations Manager  
Paramount Resources Ltd  
4700 Bankers Hall West  
888 3 STREET SW  
CALGARY AB 42P 5C5

March 6, 2017

Dear Mr. Kelly:

**Approval of Amendments - Fort Liard N-01 (ACW-2016-006)**

This letter is to confirm my approval of requested amendments to the program for the abandonment of the Fort Liard N-01 well. Following the Office of the Regulator of Oil and Gas Operations (OROGO) technical review of Paramount Resources Ltd.'s request for amendment, a verbal approval was issued on February 28, 2017. Approved amendments related to issues with removing the packer through the production casing.

Attached is a copy of the amended abandonment program as submitted by Paramount Resources Ltd. which will be posted to the public registry.

If you have any questions, please contact me at 867-767-9097 or by email at [James.Fulford@gov.nt.ca](mailto:James.Fulford@gov.nt.ca).

Sincerely,

James Fulford  
Chief Conservation Officer

Encl.

# Abandonment Program for Paramount et al Southeast Fort Liard N-01

## Revision 2: 20170301

### WELL INFORMATION:

Well Name: Para et al Southeast Fort Liard N-01  
Location: 60-10-123-15  
Coordinates : Latitude: 60° 00' 52.3" 60.01452  
Longitude: 123° 15' 58.5" -123.26625  
UWI: 300N016010123153  
WID: 1902  
Pool : Fantasque  
Field: Fort Liard  
Province: NWT  
Well Status: Suspended (2 plugs in tubing)

KB Elevation: 492.1 m  
Ground Elevation: 487.0 m KB to Grd: 4.9m  
PBD: 1928 mKB  
TD: 1940 mKB

Surface Hole: 311 mm to 501 mKB  
Surface Casing: 244.5 mm 53.57 kg/m, J-55, LT&C set at 501 mKB.  
Cemented with 27t 0:1:0 'G' - Cement returns to surface 10 m3.

Main Hole: 222 mm to 1940 mKB  
Production Casing: 177.8 mm, 38.69 kg/m, J-55, LT&C set at 1940 mKB.  
Cemented with 28t 1:1:2 and 30t 0:1:0 'G' - Cement returns to surface 7 m3.

Casing Bowl: 279 mm x 244 mm x 21 mPa  
Tubing Head: 279 mm x 179 mm x 21 mPa  
Production Tubing: 60mm J-55 EUE with Baker Hornet Packer @ 1439  
See Attached Diagram

## **Operational Program:**

This program forms a part of the "Liard 2016/17 Abandonment" and is governed by the existing Operations Authorization and supporting documents (Safety Plan, Environmental Protection Plan, and Emergency Response Plan which are already on file with OROGO). These documents will be onsite for reference by the site supervisor, along with a bridging document including site specific extracts, emergency contact numbers etc.

This document focuses on the describing the operations planned for the well.

## **Overview:**

The Paramount et al Southeast Fort Liard N-01 well, in this field, was initially completed as a Mattson sweet gas well. Over its life five Mattson zones have been produced, followed by the Fantasque zone. The well is now depleted and following an unsuccessful recompletion, was suspended in 2007. The field is shut-in with some of the facilities decommissioned. The associated Shiha trans-border pipeline (under NEB jurisdiction) was deactivated in 2008. The Mattson perforations were suspended by setting a bridge plug at 1560 mKB (above the existing packer assembly @ 1573 mKB) and dumping 3 meters of sand on top of the plug. The Fantasque perforations (and simultaneously the Mattson) will be abandoned by circulating a cement plug to approximately 1430 m (20m above the top Fantasque perforation) and squeezing the perforations. This procedure (details below) is drawn from the requirements of AER Directive 20 Section 5.3.5.2 - Option 4 and complies with the requirements of OROGO OGDPR 56 (a) and (b).

The surface and production casing were both cemented full length with returns to surface. Therefore all zones are believed to be isolated outside the casing.

The casing strings will be cut 1 meter below ground level resulting in a permanent abandonment.

## **Operations:**

### **1. Preliminary Operations**

(Note: SI pressures Oct 2016 – Tubing 400kPa, Casing 1400kPa)

- a. Perform a surface casing vent check (bubble test).  
Report results on AM report  
(there was no indication of casing vent flow or gas migration in 2015 or 2016 inspections)
- b. Isolate field piping and bleed down (if needed).
- c. Check for combustible gas & H<sub>2</sub>S (note there is no history of H<sub>2</sub>S on this well).

### **2. Pull tubing plugs**

- a. Rig up slick line
  - b. Pull top plug  
(collar stop, G-pack-off, slip-stop at 57mKB)
  - c. The spring from a previous slip stop has fallen downhole and is assumed to be on top of the plug at 1435mKB.  
According to Lonkar (who ran it), the FSG plug below can still be retrieved with a regular overshot.  
If the plugs below cannot be retrieved, the sliding sleeve cannot be opened.  
In this case, punch or perforate the tubing to eliminate a wet trip.  
See caution below.
  - d. Pull 1.87" (47.5mm) FSG plug from F profile in sliding sleeve @ 1435mKB.
  - e. Pull 1.81" (46.0mm) FSG plug from R profile @ 1445mKB.
  - f. Open Baker 'L' sliding sleeve at 1435mKB
3. Remove existing tubing & packer
- a. Move in service rig.
    - i. Bleed off pressure & kill/fill well with fresh water if needed.
    - ii. Install BOPs & and pressure test.
    - iii. Circulate via sliding sleeve
    - iv. Release Baker Hornet packer (Double-grip Jay - 1/4 turn right to release)  
Set down and get ¼ turn to right at the packer. Pull up.
    - v. Circulate out any gas trapped below packer.  
Check returns for salinity with refractometer.  
TDS must be below 4000 ppm or well will have to be displaced to fresh water after setting cement plug and squeezing, and returns hauled to disposal.  
Ensure ticket to confirm acceptance at disposal location is sent to dickheenan@shaw.ca with original sent to Paramount Resources.  
Note: If TDS is over 4000 or if water appears cloudy (e.g. from cement or precipitate),  
water may be filtered through a coffee filter (or several layers of paper towel) and re-checked.  
(It is the dissolved not the suspended solids that matter.)

- b. As the packer cannot be pulled through the collapsed casing in the casing bowl, run the packer to bottom (approximately 1557mKB).  
Pressure test the bridge plug at 1560m to 7 MPa through the packer.  
Set the packer and release the on-off tool, leaving the top of the packer at approximately 1527mKB.

#### 4. Spot cement plug & squeeze

- a. Mix +3.2 m3 (160 linear meters) of Class G cement to 1900 kg/m3.  
Spot a minimum of 3.2 m3 cement as a balanced plug.
- b. Slowly pull tubing up to 1370mKB and reverse circulate a minimum of 2 tubing volumes or until returns are free of cement.
- c. Pull tubing up to 1360mKB.
- d. Squeeze cement down annulus. Maximum squeeze pressure is 14MPa.  
(80% of casing burst is 27MPa.)  
Minimum pressure is 7 MPa – perform hesitation squeeze if necessary to achieve this pressure (likely not needed.)  
Note: If more than 0.7 m3 is squeezed away the plug will likely need to be topped up to 1435 mKB minimum. (Check plug top as below.)
- e. WOC until surface cement samples are firm.
- f. Feel for cement top with tubing. Plug must take a minimum of 1800 decanewtons string weight.  
Record “felt depth” in tour book and daily report.  
Plug top must be 1435mKB or higher. If not the plug must be topped up to 1435mKB.  
Contact Calgary office for revised program if plug top is felt below 1450m.
- g. Pull up 2 joints and break circulation (forward circulation) to ensure tubing is clear.
- h. Pressure test the plug to 7000 kPa for 10 minutes.
- i. Pull out of hole and lay down tubing.  
Do not fill hole when pulling last 10 joints of tubing.  
This should leave the water level +/- 5 m below ground level

5. Rig down service rig & BOPs.  
Do not install wellhead.

## 6. Cut and Cap well

- a. Perform bubble test on surface casing vent again.  
Include confirmation of negative test (no bubbles) on AM report.  
If the test is not negative, contact Calgary office before proceeding.
- b. Excavate around wellbore approximately 1.5 meters below ground level).  
Slope sides 1:1 or shallower.
- c. Cut and remove rathole/mousehole 1m below ground if present.  
Backfill hole with 1 m cement plug if required.
- d. Check for combustible gas in top of casing.
- e. Cut and remove conductor pipe at least 1.2m below ground level (not ice-pad level).
- f. Support casing bowl with picker or similar.
- g. Cut three 60 degree windows in surface casing just below the bowl,  
and then cut production casing. Production casing may drop.
- h. Cut surface and production casing at least 1 meter below ground level (not ice-pad level).
- a. Stitch weld a 6mm steel plate over the casing stubs (do not seal).  
Bead weld SE Fort Liard N-01 on capping plate.

## 7. Prepare and install well sign

- a. Bead weld well coordinates and date on 5mm plate (500mm X 300mm) as follows:  

**SE Fort Liard N-01 60-60-123-15**  
**YYYY-MM-DD**
- b. Install abandoned well sign on a piece of 60mm tubing (or similar – minimum 25mm)  
Signpost to be located 1 meter north of the well and set in a suitable cement plug (e.g. a 22 liter pail or a section of 244mm surface casing full of cement at least 1 meter below ground level).  
Finished sign should be approximately 1.5 m above ground level and painted iridescent orange.

8. Backfill the hole with a 0.3m crown to allow for possible subsidence.  
Note: Re-use of excavated backfill material is contingent on a satisfactory result of test from environmental consultant. If material around well center is contaminated (e.g. with diesel from previous operations), new fill material will have to be brought in.
9. Rig down and remove all equipment and material used in the operations from the lease.  
Haul any remain fluid to an approved waste disposal location.  
Ensure ticket to confirm acceptance at disposal location is sent to [dickheenan@shaw.ca](mailto:dickheenan@shaw.ca) with original sent to Paramount Resources.

END

Calgary contact (always phone rather than email for urgent matters)

Dick Heenan      403 818-4408      [dickheenan@shaw.ca](mailto:dickheenan@shaw.ca)

R Heenan

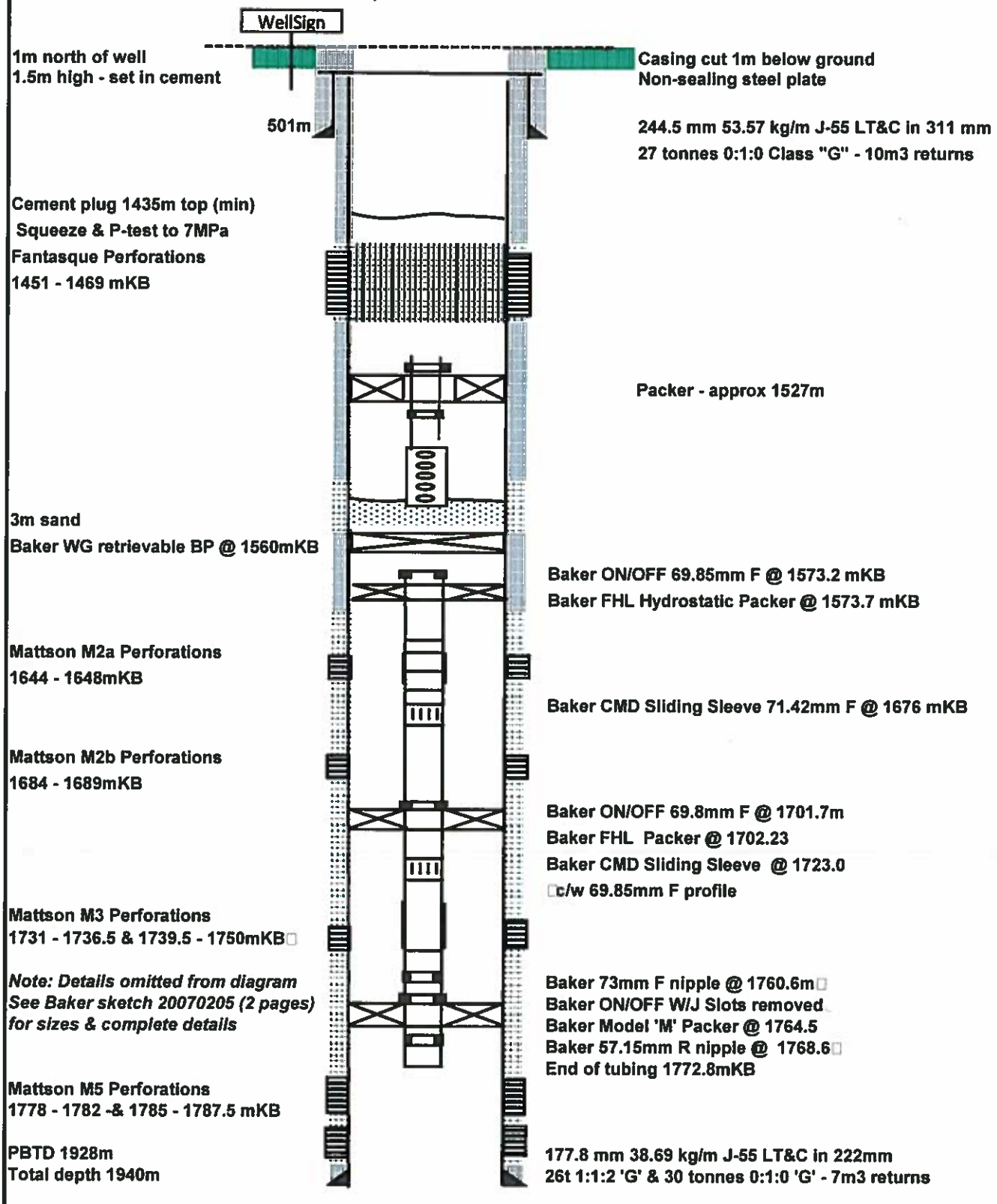
20170303



<b>PERMIT TO PRACTICE</b>	
<b>HEENAN ENERGY SERVICES LTD.</b>	
Signature	<i>R Heenan</i>
Date	<i>2017/09/03</i>
<b>PERMIT NUMBER: P 827</b>	
NT/NU Association of Professional Engineers and Geoscientists	

# PARA ET AL FORT LIARD N-01

60deg 10' N, 123deg 15' W  
Proposed Abandonment



Well Sign

1m north of well  
1.5m high - set in cement

Casing cut 1m below ground  
Non-sealing steel plate

501m

244.5 mm 53.57 kg/m J-55 LT&C in 311 mm  
27 tonnes 0:1:0 Class "G" - 10m3 returns

Cement plug 1435m top (min)  
Squeeze & P-test to 7MPa  
Fantasque Perforations  
1451 - 1469 mKB

Packer - approx 1527m

3m sand  
Baker WG retrievable BP @ 1560mKB

Baker ON/OFF 69.85mm F @ 1573.2 mKB  
Baker FHL Hydrostatic Packer @ 1573.7 mKB

Mattson M2a Perforations  
1644 - 1648mKB

Baker CMD Sliding Sleeve 71.42mm F @ 1676 mKB

Mattson M2b Perforations  
1684 - 1689mKB

Baker ON/OFF 69.8mm F @ 1701.7m  
Baker FHL Packer @ 1702.23  
Baker CMD Sliding Sleeve @ 1723.0  
c/w 69.85mm F profile

Mattson M3 Perforations  
1731 - 1736.5 & 1739.5 - 1750mKB

Baker 73mm F nipple @ 1760.6m  
Baker ON/OFF W/J Slots removed  
Baker Model 'M' Packer @ 1764.5  
Baker 57.15mm R nipple @ 1768.6  
End of tubing 1772.8mKB

Note: Details omitted from diagram  
See Baker sketch 20070205 (2 pages)  
for sizes & complete details

Mattson M5 Perforations  
1778 - 1782 - & 1785 - 1787.5 mKB

177.8 mm 38.69 kg/m J-55 LT&C in 222mm  
26t 1:1:2 'G' & 30 tonnes 0:1:0 'G' - 7m3 returns

PBTD 1928m  
Total depth 1940m



# PARA ET AL FORT LIARD N-01

60deg 10' N, 123deg 15' W  
(as completed 20070206)

