



# TUNDRA OIL & GAS PARTNERSHIP

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March 5, 2012

Attn Allan Gervin:

RE: Battery Application for Cromer 13-10-9-28 W1M

Tundra Oil & Gas Partnership would like to propose the construction of a battery at location 13-10-9-28 W1M. Tundra will comply with all the regulations set out by the Manitoba Science, Technology, Energy and Mines. Please review the following application.

75 (1) Battery start-up is scheduled for: November 19, 2012

- a) A cheque for \$1000 is attached.
- b) Tundra Oil & Gas Partnership has been operating in the province for 25 years and should be in good standing with the government. Therefore, there should not be a requirement for a performance deposit.
- c) Two copies of the survey plan of the battery location are attached.
  - c.1) The names and addresses of all landowners and occupants within 1.5km of the proposed site are shown in an attached document. A sample consultation letter is also attached. A summary of the consultations will be submitted upon completion.

d) The wells that will be tied into the battery are as follows:

1-18-9-27 hz	13-10-9-28	16-11-9-28
12-12-9-28	2-14-9-28	6-14-9-28
10-14-9-28	14-14-9-28	3-23-9-28
5-23-9-28	6-23-9-28	7-23-9-28
10-23-9-28	11-23-9-28	12-23-9-28
13-23-9-28	14-23-9-28	15-23-9-28
9-24-9-28 hz	1-9-9-28 hz	5-10-9-28 hz
1-3-9-28 hz	3-1-9-28 hz	9-36-8-28 hz
1-36-8-28 hz	1-26-8-28 hz	

Affiliate of JAMES RICHARDSON & SONS, LIMITED Established 1857

i) We will be drilling wells up until the battery construction is complete and our best estimate is that we will have 10 more wells drilled by battery start-up. These wells will also be tied into the battery.

e) An estimate of the production rates for oil, water and gas are as follows:

Estimated Oil Production	Estimated Water Production	Estimated Gas Production
250m <sup>3</sup> /day	700m <sup>3</sup> /day	2500m <sup>3</sup> /day

It is anticipated that this battery will be classified as a Class 3 Battery due to the volume of oil that is expected to be produced. Tundra Oil & Gas used separators with gas runs in order to obtain an accurate GOR of the wells in this field. Tundra tested different wells in the field and the results showed that a GOR of 10 is a representative GOR for this field. The charts were read by an independent company out of Calgary called Critical Control Energy. A 0.25" orifice was used to determine the differential for an accurate GOR. A 0.125" orifice could be used to obtain a larger differential for low producing gas wells, however, this orifice is not recommended by the American Petroleum Industry (API). Since the oil industry uses API standards to regulate its practices, Tundra has used a GOR of 10 for all calculations in this battery application. This will provide worse case scenarios for gas production and associated flared volumes.

An estimate of the allocation of the gas volumes are as follows:

Used for fuel	Flared	Vented
25%	75%	0%

e.1) Copies of a representative gas analysis from wells in the area are attached. These tests show that the wells in the area range from 0.00% and 1.22% H<sub>2</sub>S. The highest H<sub>2</sub>S reading was used in the Screen 3 analysis.

f) The specifications of the process vessels to be used are as follows:

Equipment	Dimensions	Min. Flow	Max Flow	AOP	AOT
Test Separator	2' x 6'	5 m <sup>3</sup>	100 m <sup>3</sup>	35 psi	60 F
Free Water Knock Out	8' x 30'	100 m <sup>3</sup>	1100 m <sup>3</sup>	35 psi	60 F
Group Treater	6' x 20'	50m <sup>3</sup>	250m <sup>3</sup>	35 psi	95 F
2-Fiberglass water tanks	1000 bbl each		1000m <sup>3</sup>		



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3-Steel Welded Oil tanks	1000 bbl each		250m3		
Disposal pump	1-100 Hp National	400 m3/day	800 m3/day	933 psi	
Charge pump	Grundfos	600 m3/day	1500 m3/day	15 psi	
Injection Boost Pump	Viking	10 m3/day	100 m3/day	100 psi	
Recycle Pump	1 ½ “ Moyno	25 m3/day	100 m3/day	35 psi	
Recycle Pump	Roper	100 m3/day	300 m3/day	35 psi	
Dual Flare Stack	Smokeless 3” x 4”x 40’	3” HP – 2 m3/day 4” LP – 0.2 m3/day	3” HP – 8 m3/day 4” LP – 3 m3/day	HP – 1 psi LP – 0.2 psi	
Pop Tank	400 bbl		63 m3		
LACT Unit	1 – 10 hp Grundfos pump	100 m3/day	250 m3/day	110 psi	

The following information is not yet available because we have just ordered it: name of manufacturer and CRN. This information will be forwarded to the Petroleum Branch as it becomes available.

- g) Well testing will be done both at the battery site and in the field at specific satellite locations with a header and a 2’ x 6’ test separator. Each well will be tested for a minimum 24 hour period at least once every three months, in order to comply with well testing regulations.
  - g.1) At this time Tundra proposes to install a smokeless flare stack. This stack has an automatic propane fired igniter. With the propane as a source of ignition, there is no concern with the pilot going out by a lack of produced gas. All vessels and tanks will be tied into a vapour recovery system. This system keeps positive pressure in the tanks with all excess being sent out to the flare. Therefore, no oxygen will be able to enter the tanks.
  - g.2) Tundra will be running a closed system so there will be no gas vented to the atmosphere. The ESD valve will be used if the battery ever upsets and floods the flare knock out vessel. In the event of an ESD, the valve would close and only the gas in the lines and tanks would be flared (very minimal gas).



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- g.3) A copy of the Screen 3 air dispersion modeling is attached. The worst case scenario is the dispersion model using the flare as the point source when the flame goes out. The modeling showed that the  $H_2S$  is over acceptable levels:  $324.5\mu g/m^3 \times 0.706 = 229.1$  parts per billion (acceptable levels are 11.0 parts per billion). This concentration would only happen if the flare went out and, at the same time, the automatic propane fired igniter for the flare stack failed. In this situation, the flare stack may vent gas. However, it is very unlikely that both of these situations would occur at the same time and if they did, it would be considered an emergency situation. The flame out sensor alarm on the flare stack would alert the operator to the problem, who would respond immediately to the call out. The failure would be corrected immediately or the facility would be isolated.  
The  $SO_2$  modeling showed that the worst case  $SO_2$  reading is  $1282 \mu g/m^3$ .
- h) Two copies of a preliminary plot drawing showing the location of each vessel, tank, salt water disposal facility, containment, flare line, pop tank or any other equipment is attached. Once construction is complete, a surveyed As-built plot plan will be forwarded to the Petroleum Branch.
- i) Two copies of a proposed schematic process flow are attached.
- j) Repealed
- k) The plans for disposal are as follows: Tundra will dispose of the produced water into the existing disposal wellbore at 9-9-9-28W1M. A side stream of produced water will be used for an existing injection system at 11-14-9-28.
- l) We anticipate that the Petroleum Branch will be requesting additional information which can be submitted as an addendum to this application.

If you have any additional questions, comments, or concerns please contact Ashleigh Poppel in the Virden office at (204)748-4440.

Sincerely,

Ashleigh Poppel, E.I.T.  
Production & Facilities Engineer