# PROPOSED BIRDTAIL UNIT NO. 3

## Application for Enhanced Oil Recovery Waterflood Project

## Bakken Formation

## Bakken-Three Forks A Pool (62A)

## Birdtail, Manitoba

October 8, 2014
Tundra Oil and Gas Partnership

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## **INTRODUCTION**

Birdtail Units No. 1 and No. 2, located in Township 16 Range 27 west of the prime meridian, first produced in September 1996 and January 1997, respectively (Figure 1). The main production targets in the units are the Middle Bakken and Three Forks A pools.

For the lands north of Birdtail Unit No. 1 and Birdtail Unit No. 2, potential exists for incremental production and reserves from a Waterflood EOR project in the Three Forks and Middle Bakken oil reservoirs. The following represents an application by Tundra Oil and Gas Partnership (Tundra) to establish Birdtail Unit No. 3 (W/2 of Section 29, Section 30, S/2 of Section 31-16-27W1 and Section 25-16-28W1) and implement a Secondary Waterflood EOR scheme within the Three Forks and Middle Bakken formations as outlined on Figure 2.

The proposed project area falls within the existing designated 15-62A Bakken-Three Forks A Pool of the Birdtail Oilfield (Figure 3).

## SUMMARY

1. The proposed Birdtail Unit No. 3 will include 1 vertical and 22 horizontal wells within 48 Legal Sub Divisions (LSD's) of the Middle Bakken/Three Forks producing reservoir. The project is located north of Birdtail Unit No. 2 (Figure 2).

2. Total Net Original Oil in Place (OOIP) in Birdtail Unit No. 3 (BTU3) which includes undrilled LSDs has been calculated to be 2,187 $E^3m^3$ (13,755 MBBL) for an average of 45.6 net $E^3m^3$ OOIP per 40 acre LSD.

3. Cumulative production to the end of June 2014 from the 22 productive wells within the proposed Birdtail Unit No. 3 project area was 70.2 $E^3m^3$ of oil, and 57.9 $E^3m^3$ of water, representing a 3.2% Recovery Factor (RF) of the OOIP.

4. Estimated Ultimate Recovery (EUR) of current wells with Primary Proved Producing oil reserves in the proposed Birdtail Unit No. 3 project area is estimated to be 155.0 $E^3m^3$ (975 MBBL) with 84.8 $E^3m^3$ (533 MBBL) remaining as of the end of June 2014.

5. Ultimate Recovery Factor for the proposed Birdtail Unit No. 3 OOIP, under the current Primary Production method, is forecasted to be 7.1%. The proposed unitization will also have 2 additional locations which are expected to recover 12.7 $E^3m^3$ (80 MBBL) bringing the Primary Incremental Recovery Factor to 7.7%.

6. Figure 4 shows the production from Birdtail Unit No. 3 peaked in April 2012 at 79.7 $m^3$ of oil per day (OPD). As of June 2014, production was 40.3 $m^3$ OPD, 51.4 $m^3$ of water per day (WPD) and a 56.1% watercut.

7. In April 2012, production averaged 4.0 $m^3$ OPD per well in Birdtail Unit No. 3. As of June 2014, average per well production has declined to 1.9 $m^3$ OPD. Decline analysis of the group primary production data forecasts total oil to continue declining at an annual rate of approximately 25% in the project area.

8. Estimated Ultimate Recovery (EUR) of proved oil reserves under Secondary WF EOR for the proposed Birdtail Unit No. 3 has been calculated to be 335.5 $E^3m^3$ (2110 MBBL) with 265.3 $E^3m^3$ (1669 Mbbl) remaining. An incremental 167.8 $E^3m^3$ (1055 MBBL) of proved oil reserves, or 7.7%, are forecasted to be recovered under the proposed Unitization and Secondary EOR production versus the existing Primary Production method.

9. Total RF under Secondary WF in the proposed Birdtail Unit No. 3 is estimated to be 15.4%. Primary accounts for 7.7% (includes 2 infill locations with a RF of 0.6%) and secondary for 7.7%.

10. Based on waterflood response in the analog in the Birdtail Units 1 & 2, the Three Forks and Middle Bakken Formations in the proposed project area are believed to be suitable reservoirs for WF EOR operations.

11. Tundra's first phase of development will require 2 new primary wells to be drilled to complete an effective 20 acres spacing. The results of this phase will dictate if the further infill drilling is required or a 40 acre development such as Birdtail Unit 1 and 2 are sufficient in maximizing the overall recovery from this new unit.

12. Future horizontal injectors, potentially left openhole or completed with multi-stage hydraulic fractures, will be drilled in the proposed Unit (Figure 5), to complete waterflood patterns with alternating horizontal producers, for an effective 40 acre spacing, similar to that of Birdtail Unit 2.

## TECHNICAL DISCUSSION

The proposed Birdtail Unit No. 3 project area is located within Township 16, Range 27 W1 of the Birdtail oil field. The proposed Birdtail Unit No. 3 currently consists of 1 vertical and 22 horizontal wells within an area covering the W/2 of Section 29, Section 30, S/2 of Section 31-16-27W1 and Section 25-16-28W1 (Figure 2). A project area well list complete with recent production statistics is attached as Table 3.

Tundra believes that the waterflood response in Birdtail Units No. 1 and 2 demonstrate potential for incremental production and reserves from a WF EOR project in the subject Middle Bakken and/or Three Forks oil reservoirs in the proposed Birdtail Unit No. 3.

### Geology

**Stratigraphy:**

The stratigraphy of the reservoir section in Birdtail Unit 3 is shown in cross-section A – A' (***Appendix 1: Birdtail Unit 3 NW-SE Stratigraphic Cross-Section*)**. The cross section runs from the northwest to the southeast through the proposed unit. The producing sequence from youngest to oldest is: the Upper Bakken Shale, the Middle Bakken fine grained sand/siltstone, the Lyleton 'B' siltstone, and the Lyleton 'C' silty shale. The sequence is unconformably overlain by the Mississippian Lodgepole formation and unconformably underlain by the Devonian Birdbear Formation.

Within the sequence, the Mississippian Middle Bakken unconformably overlies the Devonian Three Forks Group (the Lyleton). The main productive zone is considered to be the Middle Bakken Formation. There may be some remnant Lyleton 'B' reservoir that locally, directly underlies the Middle Bakken and contributes a marginal amount of oil to the system.

**Sedimentology:**

The Middle Bakken reservoir consists of fine to coarse grained siltstone to sandstone (often tan colored when oil stained). It can be divided into two units – the upper Middle Bakken and the lower Middle Bakken. The upper Middle Bakken is about 0.5 – 1m thick in the Birdtail Unit 3 area and is mainly considered non-reservoir. It is composed of heavily bioturbated grey siltstone with small brachiopod shells and the occasional crinoid and coral fragments. Pyrite nodules are common. The environmental interpretation of the upper Middle Bakken is an offshore transition/lower shoreface.

The lower Middle Bakken consists of finely laminated grey and tan colored siltstone and fine grained sandstone interbeds with occasional bioturbation. Where there is a higher sand content, bioturbation is rare. The environmental interpretation of the lower Middle Bakken is of a tidal bar and intertidal flat. This is the main reservoir unit of the Middle Bakken and ranges from 2 to 3 meters thick in Birdtail Unit 3 (***Appendix 2*: *Middle Bakken Net Hydrocarbon Pay Map***).

The upper Lyleton 'B' reservoir unit is at the top and is composed of ripple-cross laminated dolo-siltstones increasingly interbedded with tight greenish/grey dolomitic shales with depth. The upper Lyleton 'B' is interpreted to have been deposited in a brackish bay type environment.

The mid to lower Lyleton 'B' and underlying Lyleton 'C' of the Three Forks Group are often called the 'Torquay' Formation. They are generally brick red, light green, and light brown and are mainly composed of very fine dolomitic siltstones and shales and are considered non-reservoir. The lower Lyleton 'B' and 'C' are interpreted to have been deposited in a sabkha environment.

**Structure:**

***Appendix 3: Middle Bakken Subsea Structure Map***, shows the Top Middle Bakken Subsea Structure integrated with proprietary seismic. Locally in the unit, the structure rises towards the East – Northeast and drops to the West – Southwest. All of the Middle Bakken within Birdtail Unit 3 is above the local oil/water contact of -45.0 to -47.5m subsea.

**Reservoir Continuity:**

Cross-Section A – A' (***Appendix 1: Birdtail Unit 3 NW-SE Stratigraphic Cross-Section***) and existing production (***Table 3: Birdtail Unit 3 Current Well List***) indicate that there is likely very good lateral continuity in the basal Middle Bakken formation within Birdtail Unit 3. Vertical reservoir continuity within the Middle Bakken and the underlying Lyleton is likely very poor to non-existent due to the heterolithic depositional environment and the multiple thin shale interbeds.

**Reservoir Quality:**

Five (5) of the wells within the proposed unit have core analysis in the Middle Bakken formation and have been summarized below:

1. 100/04-29-016-27W1/0, Kmax.h: 7.14 mD.m
2. 100/04-30-016-27W1/0, Kmax.h: 122.93 mD.m
3. 100/09-30-016-27W1/0, Kmax.h: 3.50 mD.m
4. 100/05-31-016-27W1/0, Kmax.h: 10.80 mD.m
5. 100/15-25-016-28W1/0, Kmax.h: 148.51 mD.m

   All of the 5 wells summarized above have Kmax.h values that would be acceptable to enhanced oil recovery. Their values indicate that the lower Middle Bakken has good reservoir in the area. As there are only 5 wells in the unit which have Kmax.h values, the values have been posted to the map but have not been contoured due to limited data points. (***Appendix 4: Middle Bakken Kmax.h Values Map***).

The good reservoir interpretation is also supported with the relatively high average porosity values seen in ***Appendix 5: Middle Bakken Average Porosity Map*** – where the limestone porosity values range from 16.6 to 21% throughout the proposed unit.

**Fluid Contacts:**

The oil/water contact locally is considered to be at -45.0 to -47.5m subsea and was mapped by integrating proprietary seismic and well control. The oil/water contact generally runs north south through the southwest quarter of Section 5-17-27W1 and then south through the eastern half of Sections 32 and 29-16-27W1. Please refer to ***Appendix 3: Top Middle Bakken Subsea Structure Map***.

**OOIP Estimates**

Original Oil in Place (OOIP) numbers were calculated by Tundra Geologist Kerri McNeil. Kerri holds a BSc in Geology from the University of Calgary and has 14 years of industry experience. Kerri has worked on properties all over Western Canada (W1M to W6M).

Each vertical well within the unit was petrophysically analyzed by Gille Montsion, incorporating existing conventional core analysis data. Gille comes with 20 years of experience as a Sr. Petrophysist with Canadian Hunter, ConocoPhillips, and Nexen. Gille does all his advanced petrophysics with Tundra's Geolog license and brings consistency to our evaluations.

The petrophysically defined net pay, phi.h, etc. values were then hand contoured in Geoscout by Kerri McNeil and OOIP was calculated on an LSD by LSD basis honoring the well values when present or the interpolated value by mapping if there was no vertical well in the LSD.

Total volumetric original oil-in-place (OOIP) for the Middle Bakken within the proposed Birdtail Unit No. 3 has been calculated to be 2,187 $E^3m^3$ (13,755 MBBL) which includes undrilled LSDs. The OOIP was calculated LSD by LSD using the equation OOIP= [Ah phi (1-Swi)/Boi], where,

A = Reservoir Area ($m^2$)
h = reservoir thickness (m)
phi = reservoir porosity
Swi = connate water saturation – assumed to be 0.48 in the area
Boi = Initial Formation Volume factor – assumed to be 1.003 in the area

Cut-offs for the Bakken applied were: porosity greater than or equal to 12% and a water saturation greater than 60%.

An analysis of Middle Bakken formation rock and fluid properties used to characterize the reservoir are provided in Table 5.

**Historical Production**

A historical group production history plot for the proposed Birdtail Unit No. 3 is shown as Figure 4. Oil production commenced from the proposed Unit area in November 2009 and peaked during April 2012 at 79.7 $m^3$ OPD.

As of June 2014, production was 40.3 $m^3$ OPD, 51.4 $m^3$ WPD and a 56.1% watercut.

Oil production is currently declining at an annual rate of approximately **25%** under the current Primary Production method.

The field's production rate indicates the need for pressure restoration and maintenance, and waterflooding is deemed to be the most efficient means of re-introducing energy back into the reservoir system and to provide areal sweep between wells.

## UNITIZATION

Unitization and implementation of a Waterflood EOR project is forecasted to increase overall recovery of OOIP from the current development by **7.7%**. The basis for unitization is to develop the lands in an effective manner that will be conducive to waterflooding. Unitizing will enable the reservoir to have the greatest recovery possible by allowing the development of additional drilling and injector conversions over time, in order to maintain reservoir pressure and increase oil production.

### Unit Name

Tundra proposes that the official name of the new Unit covering the W/2 of Section 29, Section 30, S/2 31-16-27W1 and Section 25-16-28W1 shall be Birdtail Unit No. 3.

### Unit Operator

Tundra Oil and Gas Partnership (Tundra) will be the Operator of record for Birdtail Unit No. 3.

### Unitized Zone

The Unitized zone(s) to be waterflooded in the Birdtail Unit No. 3 will be the Middle Bakken and Three Forks formations.

### Unit Wells

The 1 vertical and 22 horizontal wells to be included in the proposed Birdtail Unit No. 3 are outlined in Table 3.

### Unit Lands

The Birdtail Unit No. 3 will consist of 48 LSD's as follows:

W/2 of Section 29, of Township 16, Range 27, W1M
Section 30, of Township 16, Range 27, W1M
S/2 of Section 31, of Township 16, Range 27, W1M
Section 25, of Township 16, Range 28, W1M

The lands included in the 40 acre tracts are outlined in Table 1.

### Tract Factors

The proposed Birdtail Unit No. 3 will consist of 48 tracts based on the 40 acre LSD's containing the 1 vertical and 22 horizontal wells.

The Tract Factor contribution for each of the LSD's within the proposed Birdtail Unit No. 3 was calculated as follows:

- Gross OOIP by LSD, minus cumulative production to date for the LSD as distributed by the LSD specific Production Allocation (PA) % in the applicable producing horizontal or vertical well (to yield Remaining Gross OOIP)

- Tract Factor by LSD = the product of Remaining Gross OOIP by LSD as a % of total proposed Unit Remaining Gross OOIP

Unit tract factor calculations for all individual LSD's based on the above methodology are outlined within Table 2.

**Working Interest Owners**

Table 1 outlines the working interest (WI) for each individual tract within the proposed Birdtail Unit No. 3, and Tundra Oil and Gas Partnership holds a 100% WI ownership in all the proposed Tracts.

Tundra Oil and Gas Partnership will have a 100% WI in the proposed Birdtail Unit No. 3.

## WATERFLOOD EOR DEVELOPMENT

### Technical Studies

The waterflood performance predictions for the proposed Birdtail Unit No. 3 are based on the performance in Birdtail Units No. 1 and 2, documented annually in enhanced oil reports submitted to the Petroleum Branch.

Internal reviews included analysis of available open-hole logs; core data; petrophysics; seismic; drilling information; completion information; and production information. These parameters were reviewed to develop a suite of geological maps and establish reservoir parameters to support the calculation of the proposed Birdtail Unit No. 3 OOIP (Table 2).

Unitizing the proposed Birdtail Unit No. 3 will provide an equitable means of maximizing ultimate oil recovery in the project area, which is otherwise not currently achievable given the constraints on drilling full-length horizontals.

### Reserves Recovery Profiles and Production Forecasts

The primary waterflood performance predictions for the proposed Birdtail Unit No. 3 are based on oil production decline curve analysis, and the secondary predictions are based on internal engineering analysis performed by the Tundra reservoir engineering group.

### Primary Production Forecast

Cumulative production in the Birdtail Unit No. 3 project area, to the end of June 2014, was 70.2 $E^3m^3$ of oil, and 57.9 $E^3m^3$ of water for a recovery factor 3.2% of the calculated Net OOIP.

The estimated Ultimate Recovery (EUR) of current wells with Primary Proved Producing oil reserves in the proposed Birdtail Unit No. 3 project area is estimated to be 155.0 $E^3m^3$ (975 MBBL) with 84.8 $E^3m^3$ (533 MBBL) remaining as of the end of June 2014.

Primary production plots of the expected production decline and forecasted oil rate v. time and rate v. cumulative oil production are shown in Figures 7 and 8, respectively.

### Pre-Production Schedule/Timing for Conversion of Horizontal Wells to Water Injection

Upon receiving approval from the Petroleum Branch for unitization, Tundra is planning to drill an infill pilot with 2 horizontal wells at 20 acre spacing.  Once the impact of infill drilling has been determined, Tundra will proceed with converting the existing producer to water injection. Depending on the result of the first phase of WF, a development plan to maximize oil recovery will proceed accordingly.

### Criteria for Conversion to Water Injection Well

Tundra will monitor the following parameters to assess the best timing for each individual well to be converted from primary production to water injection service:

- Measured reservoir build-up pressures measured by shutting in production
- Fluid production rates, cumulative volumes, and any changes in decline rate over time
- Any observed production interference effects with adjacent wells
- Pattern mass balance and/or oil recovery factor estimates
- Reservoir pressure relative to bubble point pressure

The above schedule allows for the proposed Birdtail Unit No. 3 project to be developed equitably, efficiently, and moves the project to the best condition for the start of waterflood as quickly as possible. It also provides the Unit Operator flexibility to manage the reservoir conditions and response to help ensure maximum ultimate recovery of OOIP.

**Secondary EOR Production Forecast**

The proposed project oil production profile under Secondary Waterflood has been developed based on the response observed to date in the Birdtail Units No. 1 & 2 WF (Figure 6).

Estimated Ultimate Recovery (EUR) of proved oil reserves under Secondary WF EOR for the proposed Birdtail Unit No. 3 has been calculated to be 335.5 $E^3m^3$ (2110 MBBL) with 265.3 $E^3m^3$ (1669 MBBL) remaining. An incremental 167.8 $E^3m^3$ (1055 MBBL) of proved oil reserves, or 7.7%, are forecasted to be recovered under the proposed Unitization and Secondary EOR production versus the existing Primary Production method. Secondary Waterflood plots of the expected oil production forecast over time and the expected oil production v. cumulative oil are plotted in Figures 9 and 10, respectively.

**Estimated Fracture Gradient**

Completion data from the producing wells within the project area indicate an actual fracture pressure gradient range of 18.0 to 21.0 kPa/m true vertical depth (TVD). Tundra expects the fracture gradient encountered during completion of the proposed horizontal injection well will be somewhat lower than these values due to expected reservoir pressure depletion.

## WATERFLOOD OPERATING STRATEGY

### Water Source

Injection water for the proposed Birdtail Unit No. 3 will be supplied from the Lodgepole source water well at 100/02-32-016-27W1. Lodgepole water from the 100/02-32 source well is pumped to the main Birdtail Unit Water Plant at 8-30-16-27W1, filtered, and pumped up to injection system pressure. A diagram of the Birdtail water injection system and new pipeline connection to the proposed Birdtail Unit No. 3 project area injection wells is shown as Figure 9.

Produced water is not currently used for any water injection in the Tundra operated Birdtail Units and there are no current plans to use produced water as a source supply for Birdtail Unit No. 3.

Currently all produced waters are inherently a mixture of Three Forks and Bakken native sources. This mixture of produced waters has been extensively tested for compatibility with 100/02-32 source Lodgepole water, by a highly qualified third party. All potential mixture ratios between the two waters, under a range of temperatures, have been simulated and evaluated for scaling and precipitate producing tendencies. Testing of multiple scale inhibitors has also been conducted and minimum inhibition concentration requirements for the source water volume determined. At present, continuous scale inhibitor application is maintained into the source water stream out of the Birdtail injection water facility (Birdtail Units No. 1 & 2). Review and monitoring of the source water scale inhibition system is also part of an existing routine maintenance program.

## Injection Wells

As most of the existing wells in the proposed Unit area are completed as openhole, Tundra will be converting the existing producers into water injectors after infill impact and WF response time is validated by the first phase of WF development. The new future water injection conversion wells for the proposed Birdtail Unit No. 3 will be cleaned out, and configured downhole for injection as shown in Figure 11.

Any new water injection well will be placed on injection after the pre-production period and approval to inject. Wellhead injection pressures will be maintained below the least value of either:

1. The area specific known and calculated fracture gradient, or
2. The licensed surface injection Maximum Allowable Pressure (MOP)

Tundra has a thorough understanding of area fracture gradients. A management program will be utilized to set and routinely review injection target rates and pressures vs. surface MOP and the known area formation fracture pressures.

All new water injection wells will be surface equipped with injection volume metering and rate/pressure control (Figure 10). An operating procedure for monitoring water injection volumes and meter balancing will also be utilized to monitor the entire system measurement and integrity on a daily basis.

The proposed Birdtail Unit 3 horizontal water injection well rate is forecasted to average 10 – 25 $m^3$ WPD, based on expected reservoir permeability and pressure.

## Reservoir Pressure

The initial reservoir pressure for wells drilled in the Middle Bakken in the proposed Birdtail Unit No. 3 is shown in Figure 12. The estimated reservoir pressure for the proposed unit area is in the range of 3400 - 5000 kPa.

## Reservoir Pressure Management during Waterflood

Tundra expects to inject water for a minimum 2 – 4 year period to re-pressurize the reservoir due to cumulative primary production voidage and pressure depletion. Initial Voidage Replacement Ratio (VRR) is expected to be approximately 1.25 to 2.00 within the patterns during the fill up period. As the cumulative VRR approaches 1, target reservoir operating pressure for waterflood operations will be 75-90 % of original reservoir pressure.

**Waterflood Surveillance and Optimization**

Birdtail Unit No. 3 EOR response and waterflood surveillance will consist of the following:

- Regular production well rate, WOR and WCT testing to monitor waterflood response, breakthrough or fingering
- Daily water injection rate and pressure monitoring v. target
- Evaluation of Hall plots to observe positive or negative skin indicating channeling or out of zone injection
- Gas measurement at individual wells to monitor changes to GOR with waterflood
- Water injection rate/pressure/time vs. cumulative injection plot
- Reservoir pressure surveys as required to establish pressure trends
- Instantaneous and cumulative VRR by pattern and in the overall Unit
- Potential use of chemical tracers to track water injector/producer responses
- Use of some or all: Water Oil Ratio (WOR) trends, Log WOR vs Cum Oil, Hydrocarbon Pore Volumes Injected, Conformance Plots

The above surveillance methods will provide an ever increasing understanding of reservoir performance, and provide data to continually control and optimize the Birdtail Unit No. 3 waterflood operation. Controlling the waterflood operation will significantly reduce or eliminate the potential for out-of-zone injection, undesired channeling or water breakthrough, or out-of-Unit migration. The monitoring and surveillance will also provide early indicators of any such issues so that waterflood operations may be altered to maximize ultimate secondary reserves recovery from the proposed Birdtail Unit No. 3.

**Economic Limits**

Under the current Primary recovery method, existing wells within the proposed Birdtail Unit No. 3 will be deemed uneconomic when the net oil rate and net oil price revenue stream becomes less than the current producing operating costs. With any positive oil production response under the proposed Secondary recovery method, the economic limit will be significantly pushed out into the future. The actual economic cut off point will then again be a function of net oil price, the magnitude and duration of production rate response to the waterflood, and then current operating costs. Waterflood projects generally become uneconomic to operate when Water Oil Ratios (WOR's) exceed 100.

## WATER INJECTION FACILITIES

The Birdtail Unit No. 3 waterflood operation will utilize the Tundra operated well 100/02-32-016-274W1, sourced from the Lodgepole, and water plant (WP) facilities located at the Birdtail 8-30-16-27W1 battery (Figure 9).

A complete description of all planned system design and operational practices to prevent corrosion related failures is shown in Appendix 6. All surface facilities and wellheads will have cathodic protection to prevent corrosion. All injection flowlines will be made of fiberglass so corrosion will not be an issue. Injectors will have a packer set above the Middle Bakken and Three Forks formations, and the annulus between the tubing and casing will be filled with inhibited fluid. Refer to Appendix 6 for additional corrosion control details.

## NOTIFICATION OF MINERAL AND SURFACE RIGHTS OWNERS

Tundra is in the process of notifying all mineral rights and surface rights owners of this proposed EOR project and formation of Birdtail Unit No. 3. Copies of the Notices, and proof of service, to all surface rights owners will be forwarded to the Petroleum Branch, when available, to complete the Birdtail Unit No. 3 Application.

Birdtail Unit No. 3 Unitization, and execution of the formal Birdtail Unit No. 3 Agreement by affected Mineral Owners, is expected before the end of Q4 2014. Copies of same will be forwarded to the Petroleum Branch, when available, to complete the Birdtail Unit No. 3 Application.

Should the Petroleum Branch have further questions or require more information, please contact Anh Nguyen, P. Eng. at 403.513.1020 or by email at anh.nguyen@tundraoilandgas.com.

**TUNDRA OIL & GAS PARTNERSHIP**

Original Signed by Anh Nguyen, P. Eng. October 8th, 2014

**Proposed Birdtail Unit No. 3**

**Application for Enhanced Oil Recovery Waterflood Project**

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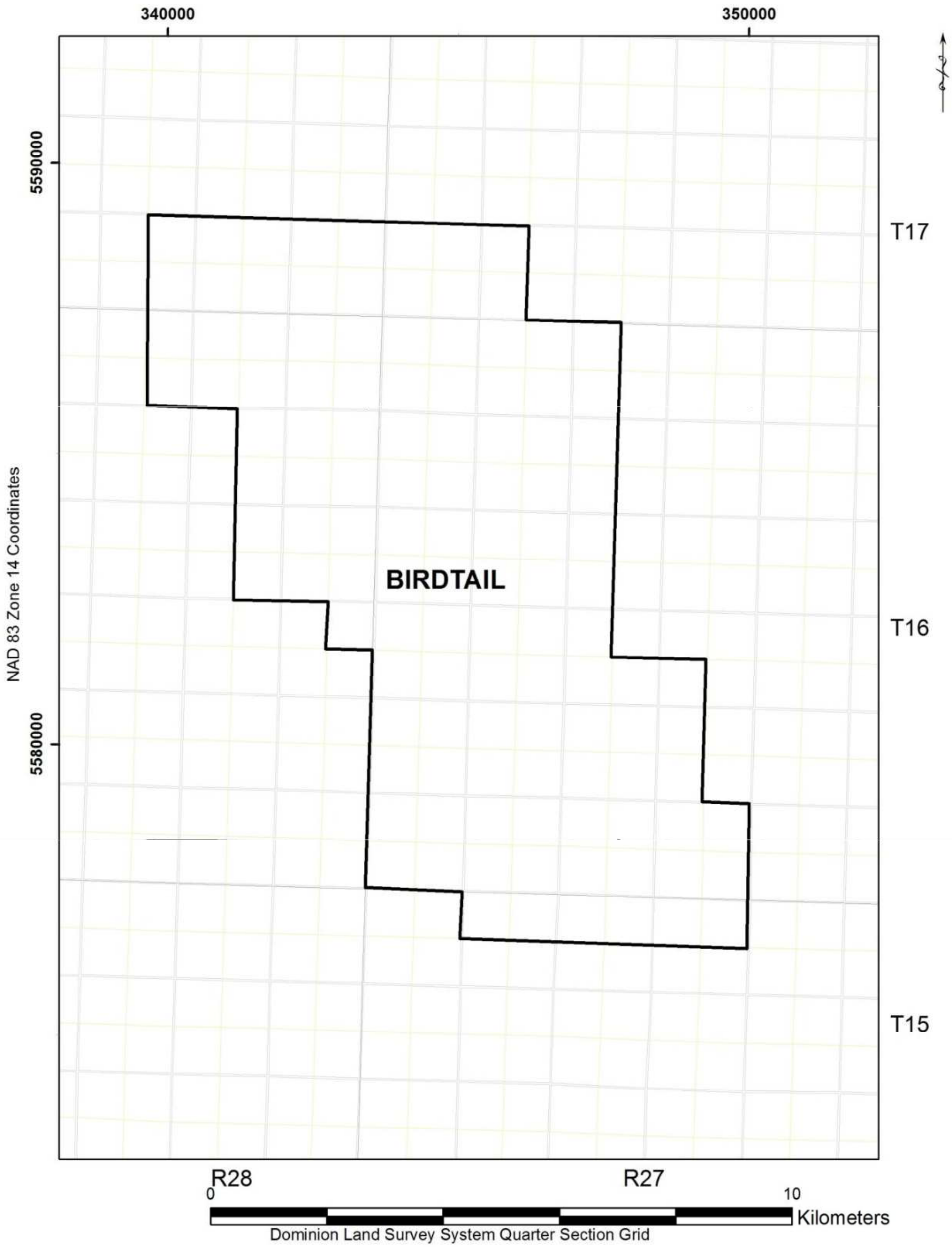
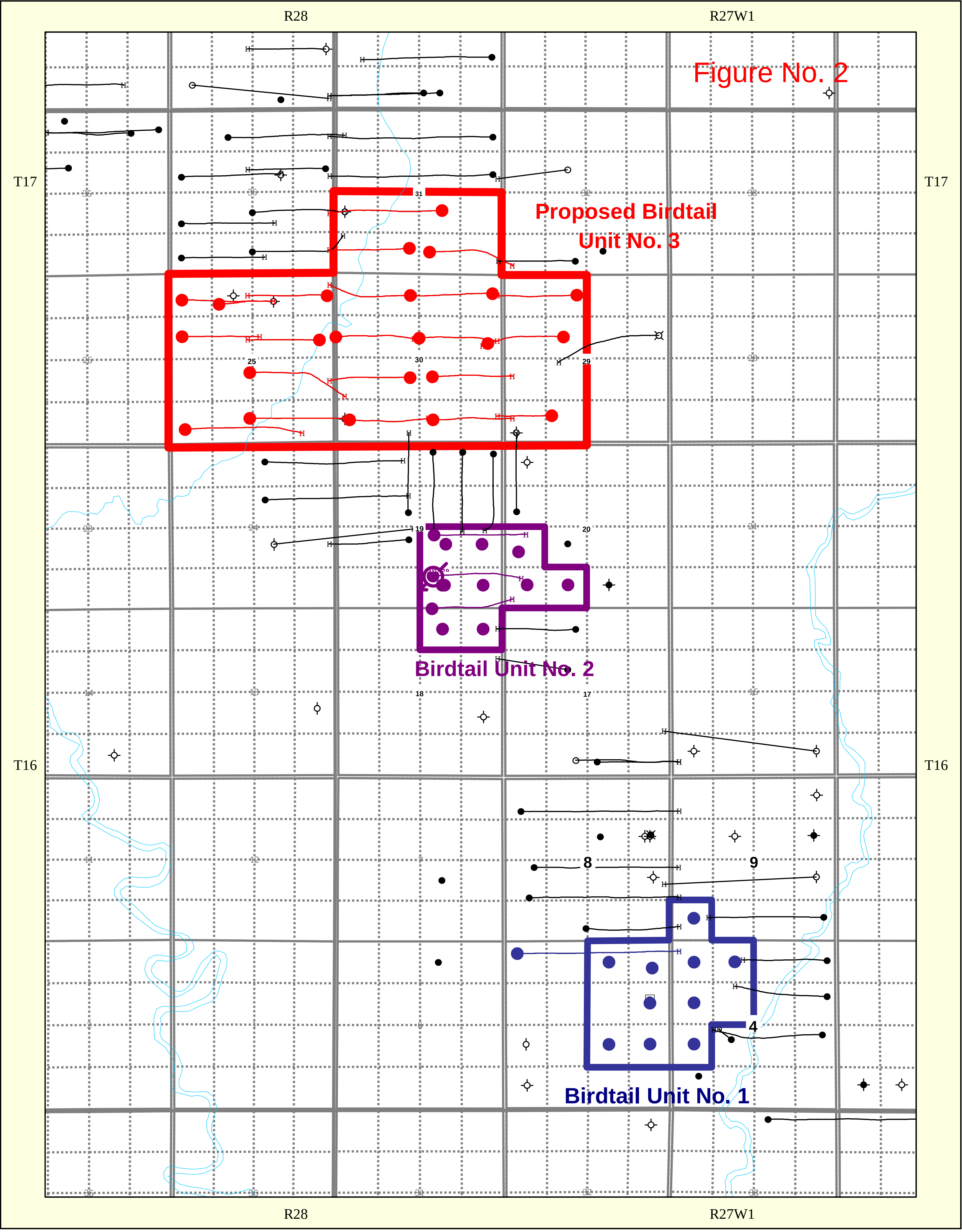



**Figure 10 – Birdtail Field (15)**




File: Birdtail Units.MAP Datum: NAD27 Projection: Stereographic Center: N50.37275 W101.17952 Created in AccuMap™, a product of IHS

Figure No. 3

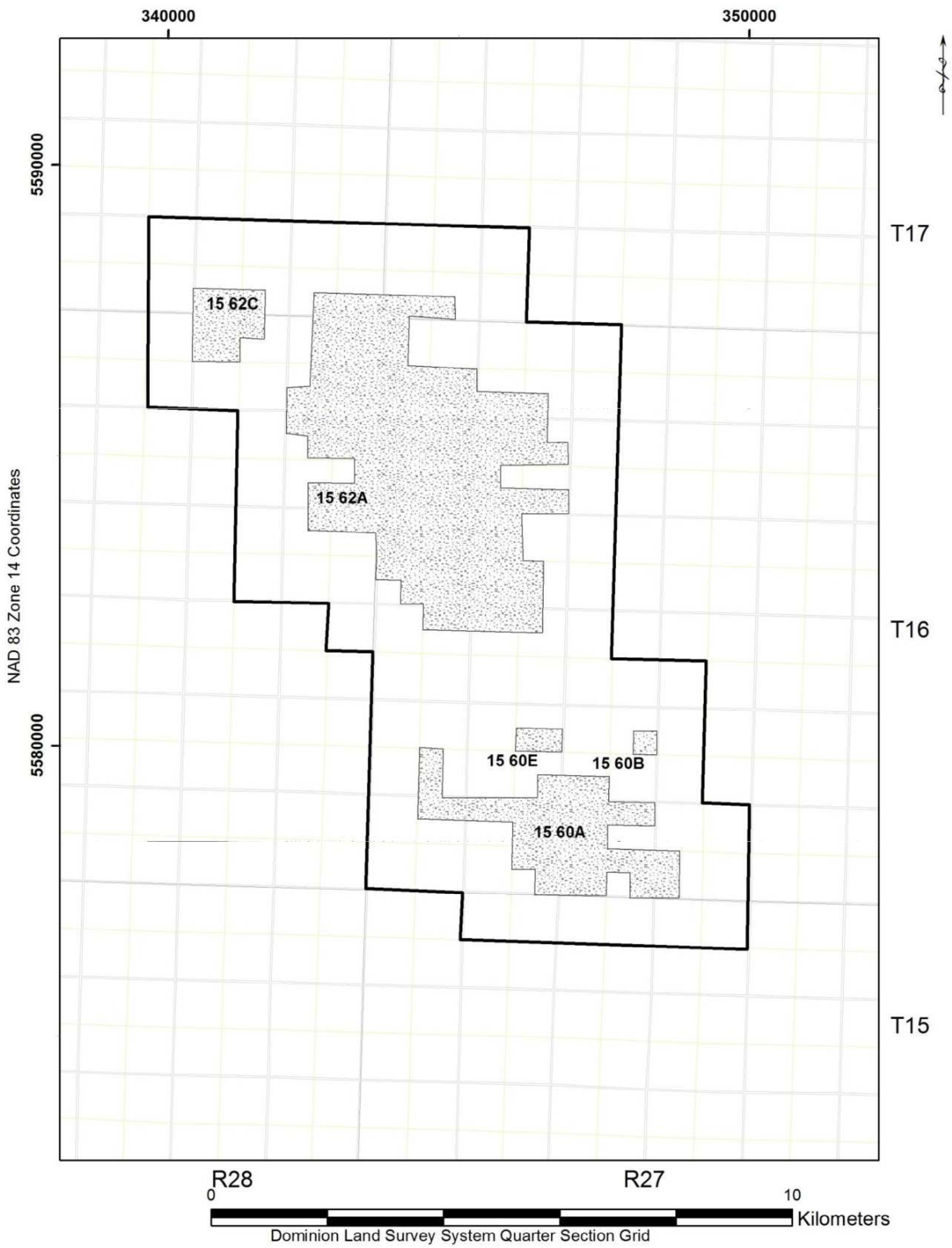


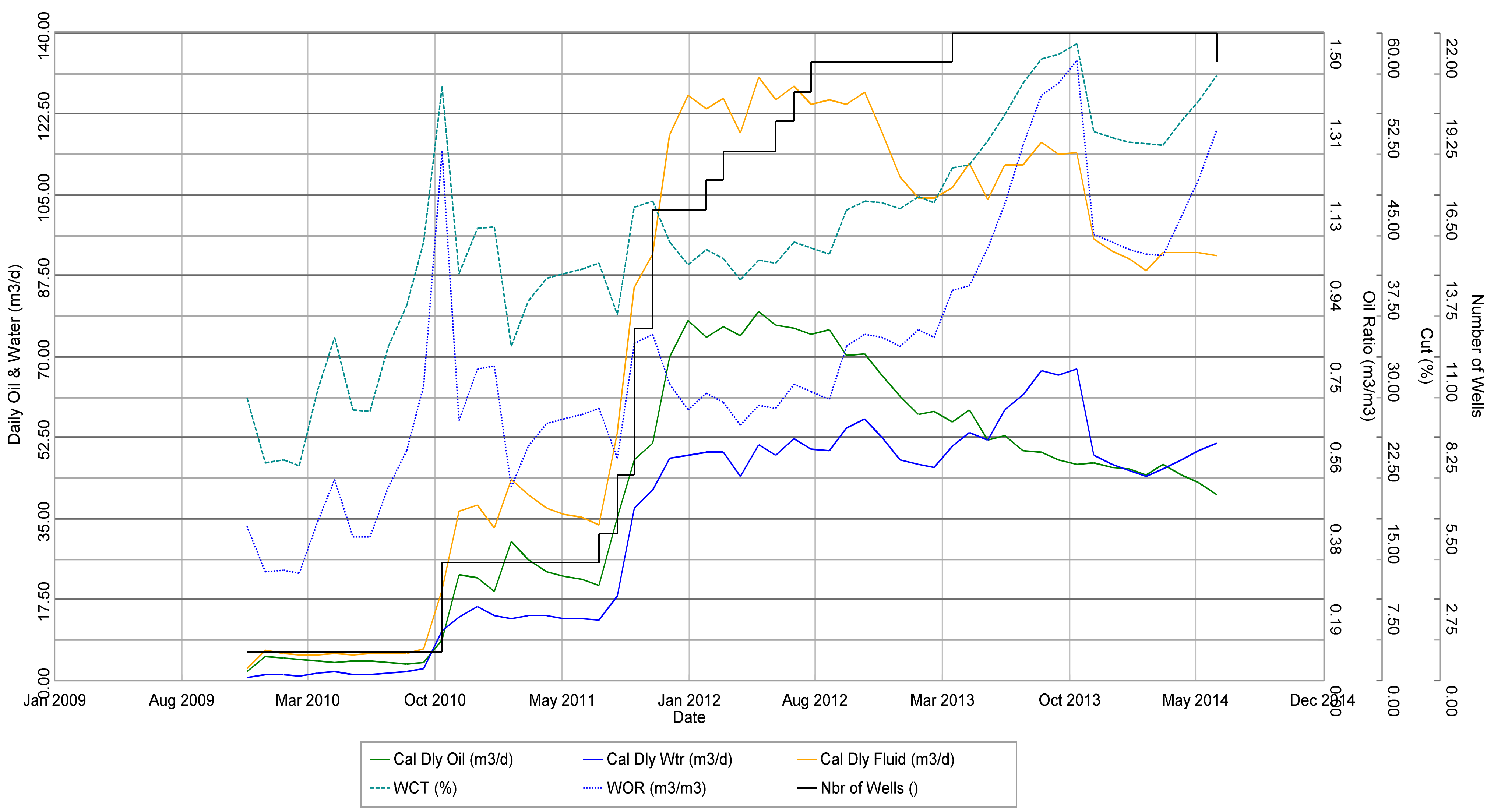

**Figure 39 - Birdtail Bakken & Bakken-Three Forks Pools (15 60A – 15 60E & 15 62A - 15 62B)**

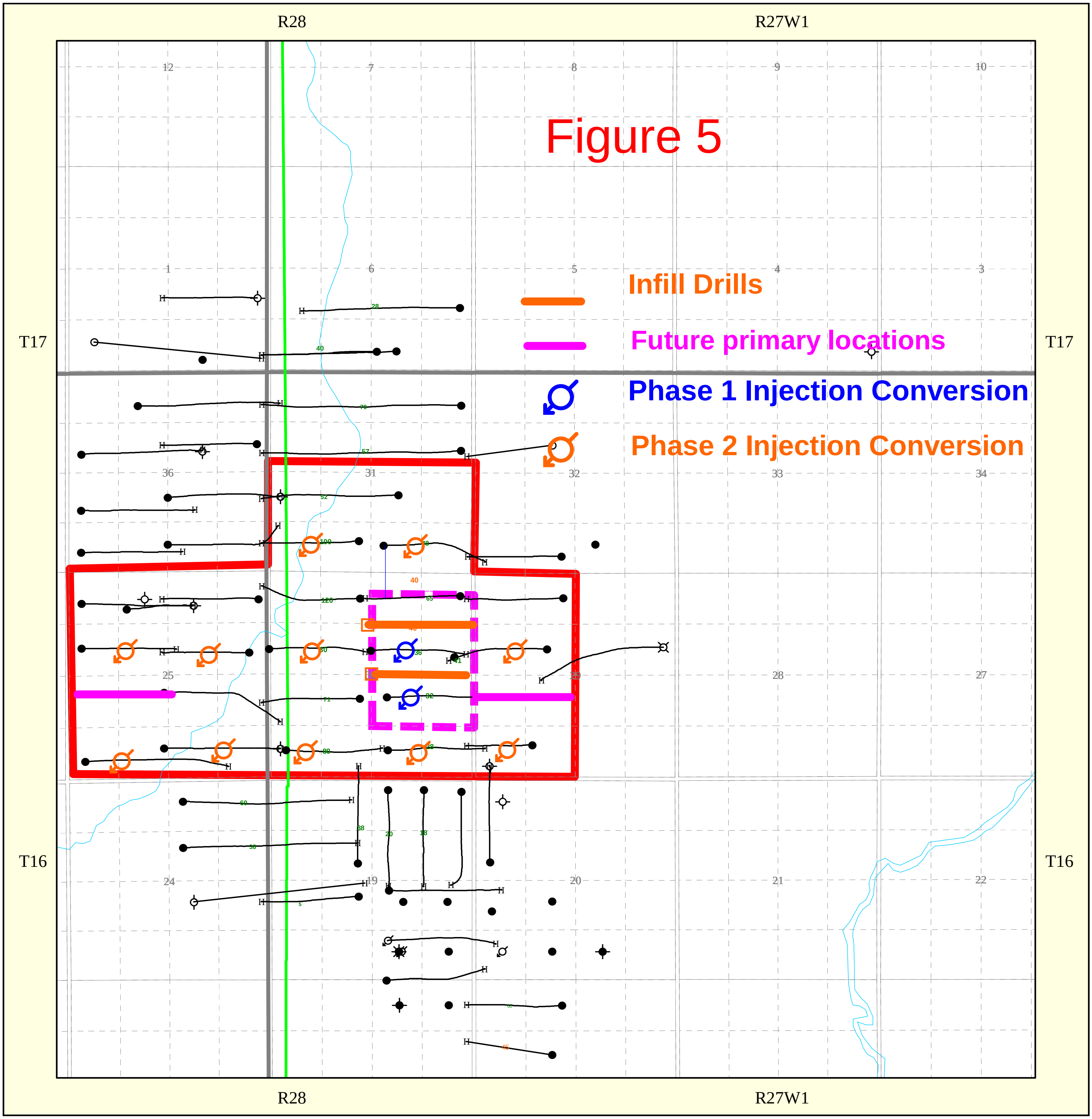
Well Information as of 9/5/2014 - Group Well Report

Figure No. 4

## Production Graph

| | | | | | |
|---|---|---|---|---|---|
| **# of Wells:** | 23 | **Prod Zone:** | BAKKEN; THREEFK | **On Prod:** | 2009-11 to 2014-06 |
| | | **Field:** | BIRDTAIL (15) | **Cum Oil:** | 70224.5 m3 |
| **Fluid:** | Oil | **Pool Code:** | 62A | **Cum Gas:** | 0.0 E3m3 |
| **Mode:** | Producing | **Unit Code:** | | **Cum Wtr:** | 57891.1 m3 |






**WELL LEGEND**

Bottom Hole Locations:

- Location
- Service or Drain
- Dry & Abandoned
- Injection
- Suspended
- Oil
- Abandoned Oil

Surface Hole Locations:

- Horizontal

## Tundra Oil & Gas

Proposed Birdtail Unit 3
WInj Conversion Schedule

Created in AccuMap™
Product of IHS
Datum: NAD27
Vol. 24 No. 08, Aug 5 2014
(403) 770-4646



Author: A.Nguyen
Date: September 25, 2014
File: 2013 Birdtail Unit 3 40 acre D
Scale: 1 : 42997
Projection: Stereographic
Center: N50.40383 W101.16818

Grid Information:
DLS: IHS Enhanced Grid
NTS: Theoretical Grid
FPS: Theoretical Grid
US: IHS US Grid

DLS Version Information:
AB: ATS 2.6
BC: PRB 2.0
SK: STS 2.5
MB: MLI07

Scale 1:42997

0 Kilometers 1.9

0 Miles 1.2

Well Information as of 9/5/2014 - Group Well Report

Figure No. 6a

## Birdtail Unit No. 1 Production Profile

Production Graph

| | | | | | |
|---|---|---|---|---|---|
| **# of Wells:** | 11 | **Prod Zone:** | BAKKEN | **On Prod:** | 1996-09 to 2014-06 |
| | | **Field:** | BIRDTAIL (15) | **Cum Oil:** | 46708.7 m3 |
| **Fluid:** | Water Injection; Oil | **Pool Code:** | 60A | **Cum Gas:** | 0.0 E3m3 |
| **Mode:** | Injection; Pumping; Abandoned; Producing | **Unit Code:** | 156000 | **Cum Wtr:** | 124349.0 m3 |

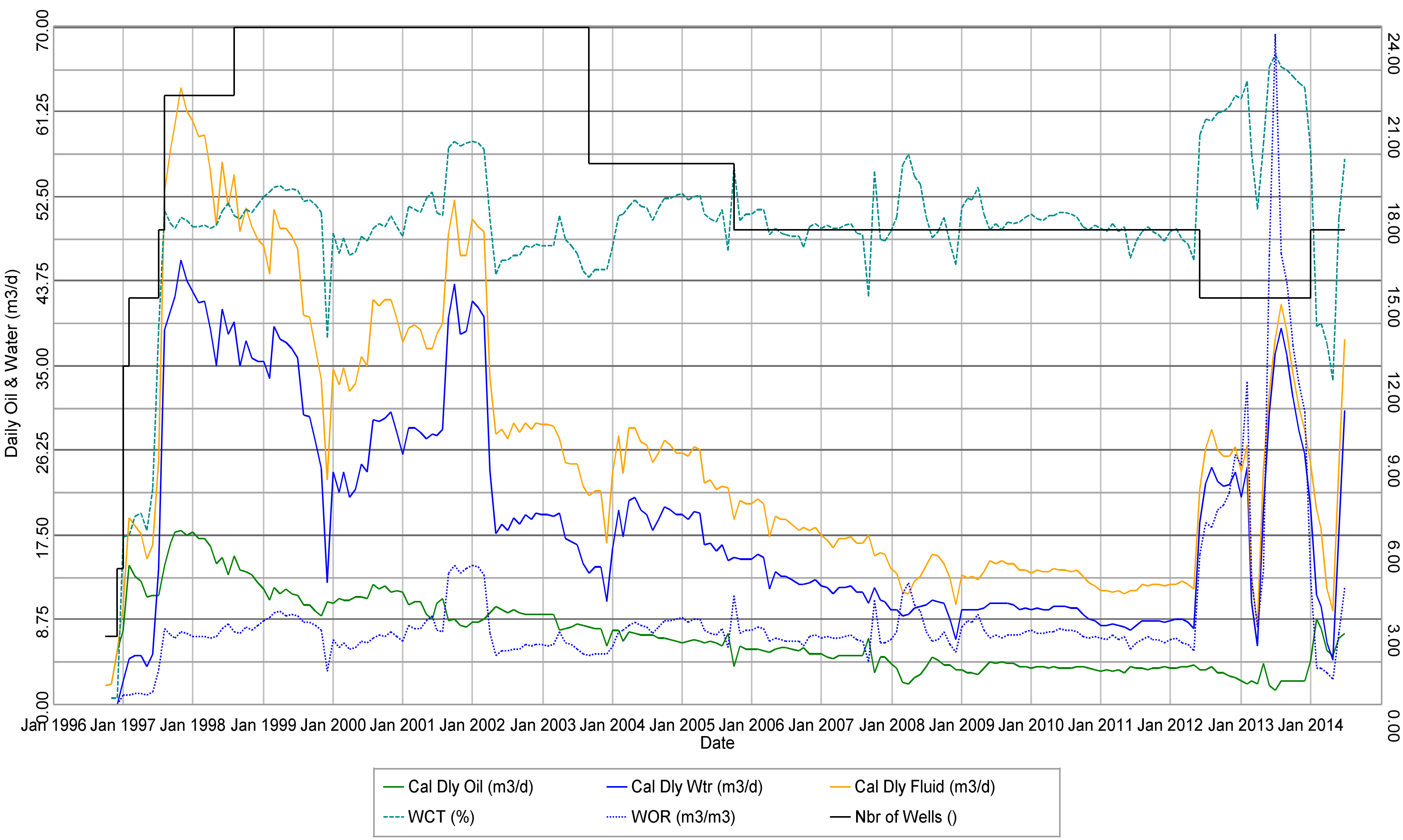


Figure No. 6b

# Birdtail Unit No. 2 Production Profile

Production Graph

| | | | | | |
|---|---|---|---|---|---|
| **# of Wells:** | 13 | **Prod Zone:** | BAKKEN; THREEFK | **On Prod:** | 1997-01 to 2014-06 |
| | | **Field:** | BIRDTAIL (15) | **Cum Oil:** | 48132.8 m3 |
| **Fluid:** | Oil; Water Injection | **Pool Code:** | 62A | **Cum Gas:** | 0.0 E3m3 |
| **Mode:** | Abandoned; Producing; Pumping; Injection | **Unit Code:** | | **Cum Wtr:** | 54690.7 m3 |

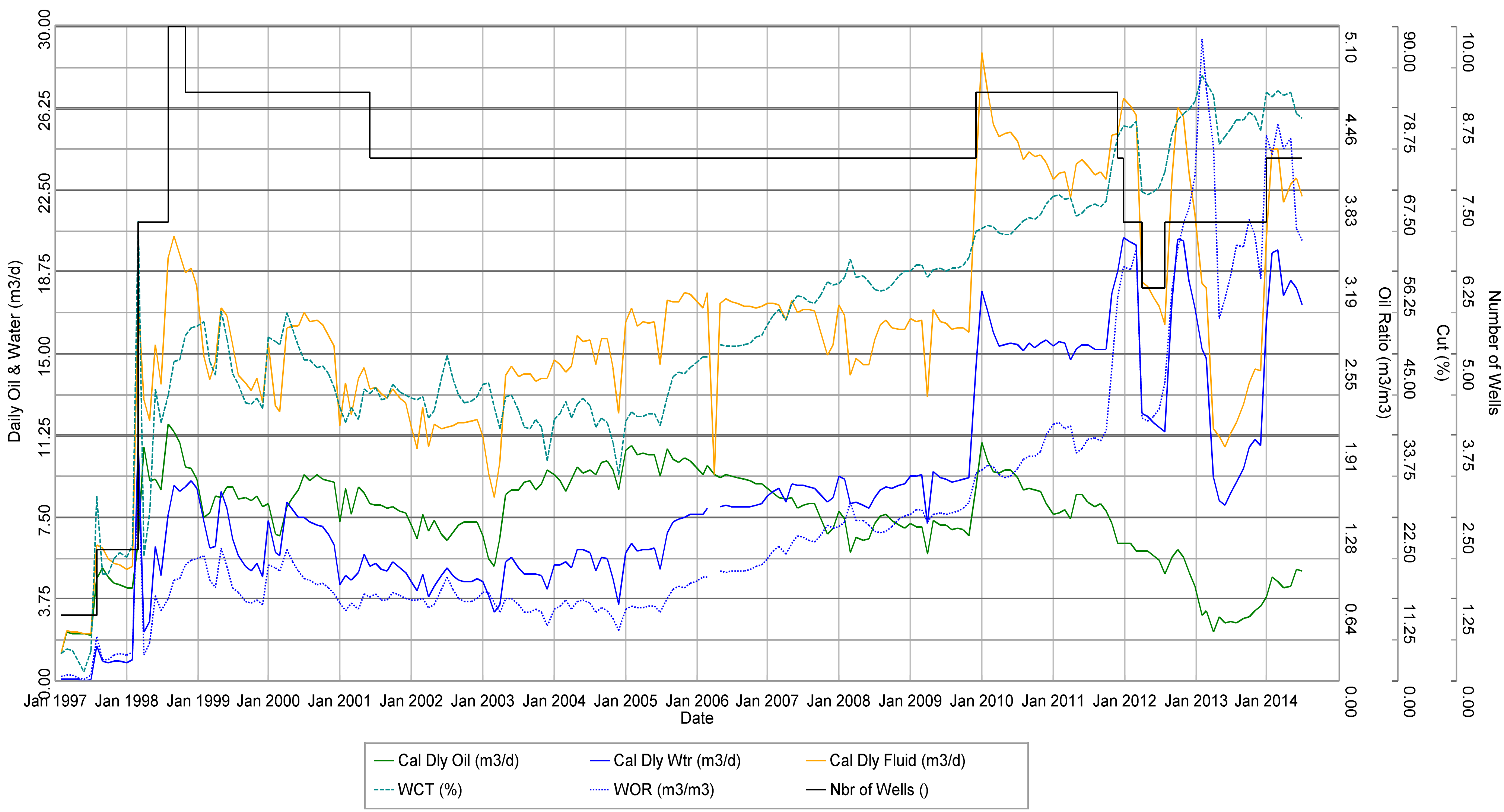
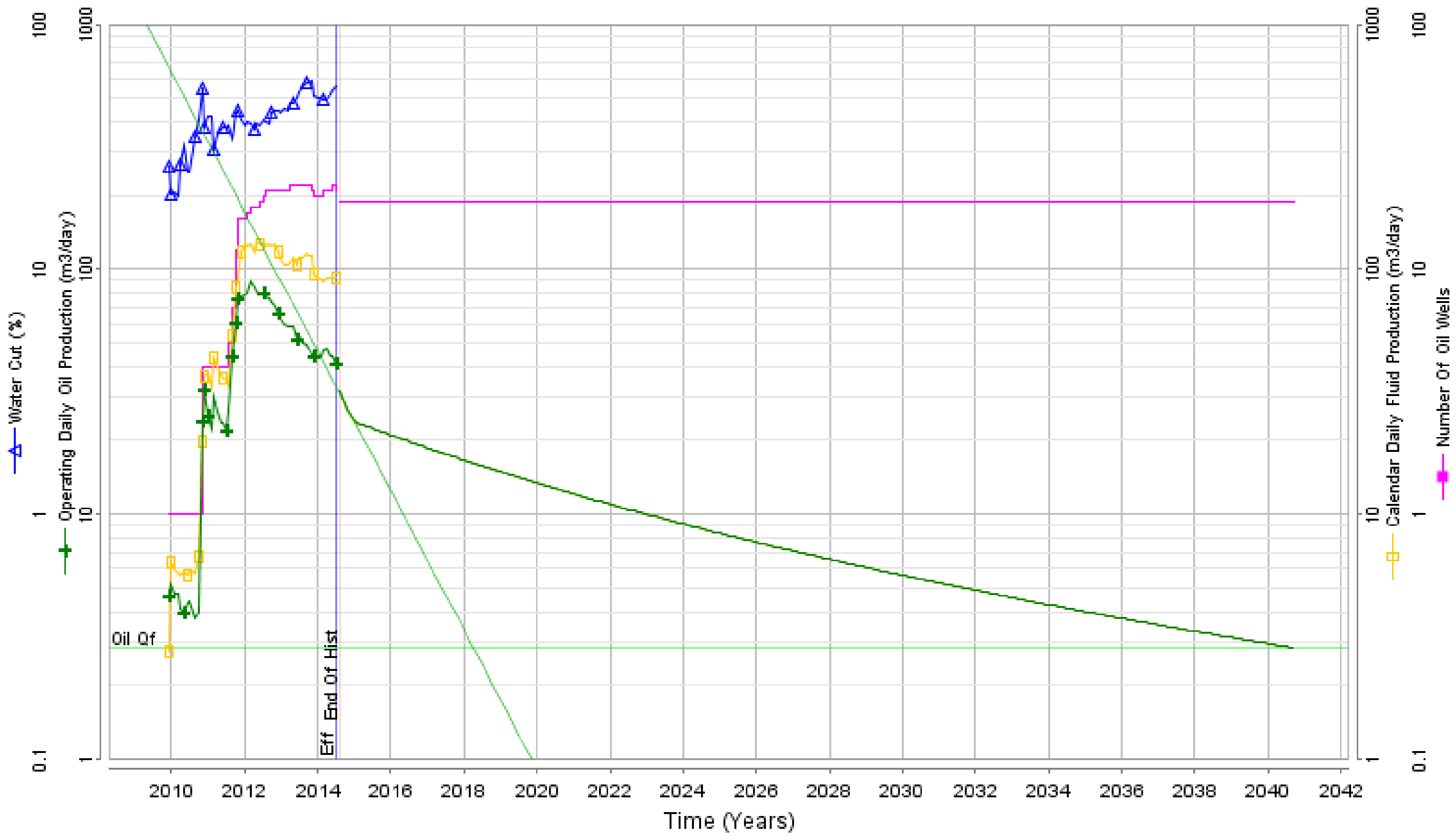


Figure No. 7

| | |
|---|---|
| Province: | Manitoba |
| Field: | multi zone (3) |
| Pool: | multi zone (2) |
| Unit: | multi zone (26) |
| Status: | Waiting On Srvc Rig |
| Operator: | TUNDRA OIL & GAS LIMITED |

# Primary Recovery

Undefined
BU3 Total Wells
Growth 1



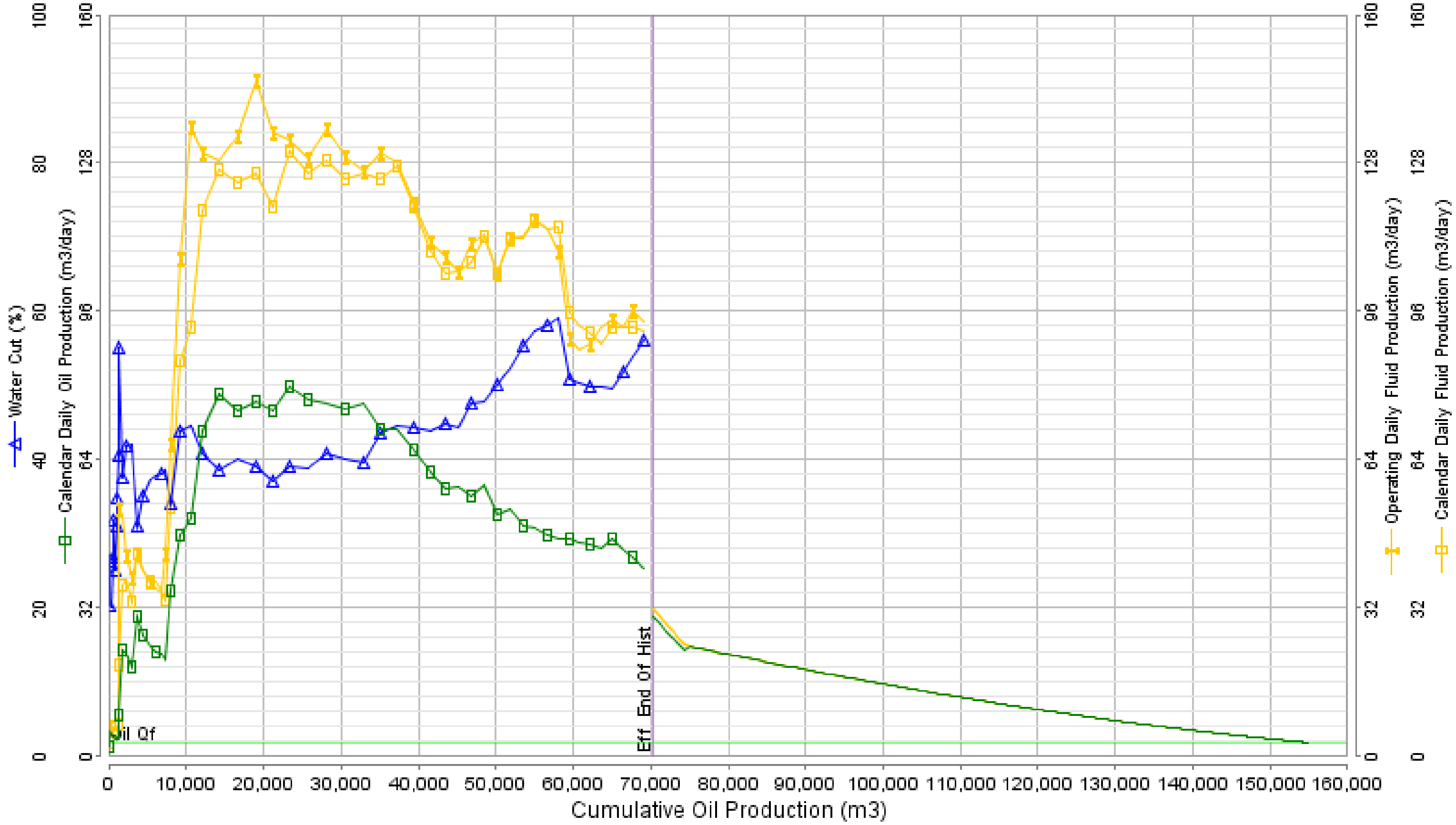

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cum Oil(m3): | 70,224 | Cum Gas(E3m3): | 0 | Cum Water(m3): | 57,866 | Cum Cond(m3): | 0 |
| Forecast Start: | 07/01/2014 | Calculation Type: | Decline | Est. Cum Prod (m3): | 70,225 | Decline Exponent: | 0.000 |
| Forecast End: | 08/06/2040 | OWIP (m3): | 0 | Remaining (m3): | 84,744 | Initial Decline (%/yr): | 50.0 |
| Initial Rate (m3): | 32.5 | Recovery Factor: | 0.000 | | | | |
| Final Rate (m3): | 2.9 | Ult. Recoverable (m3): | 154,969 | | | | |

Figure No. 8

Province: Manitoba
Field: multi zone (3)
Pool: multi zone (2)
Unit: multi zone (26)
Status: Waiting On Srvc Rig
Operator: TUNDRA OIL & GAS LIMITED

# Primary Recovery

Undefined
BU3 Total Wells
Growth 1



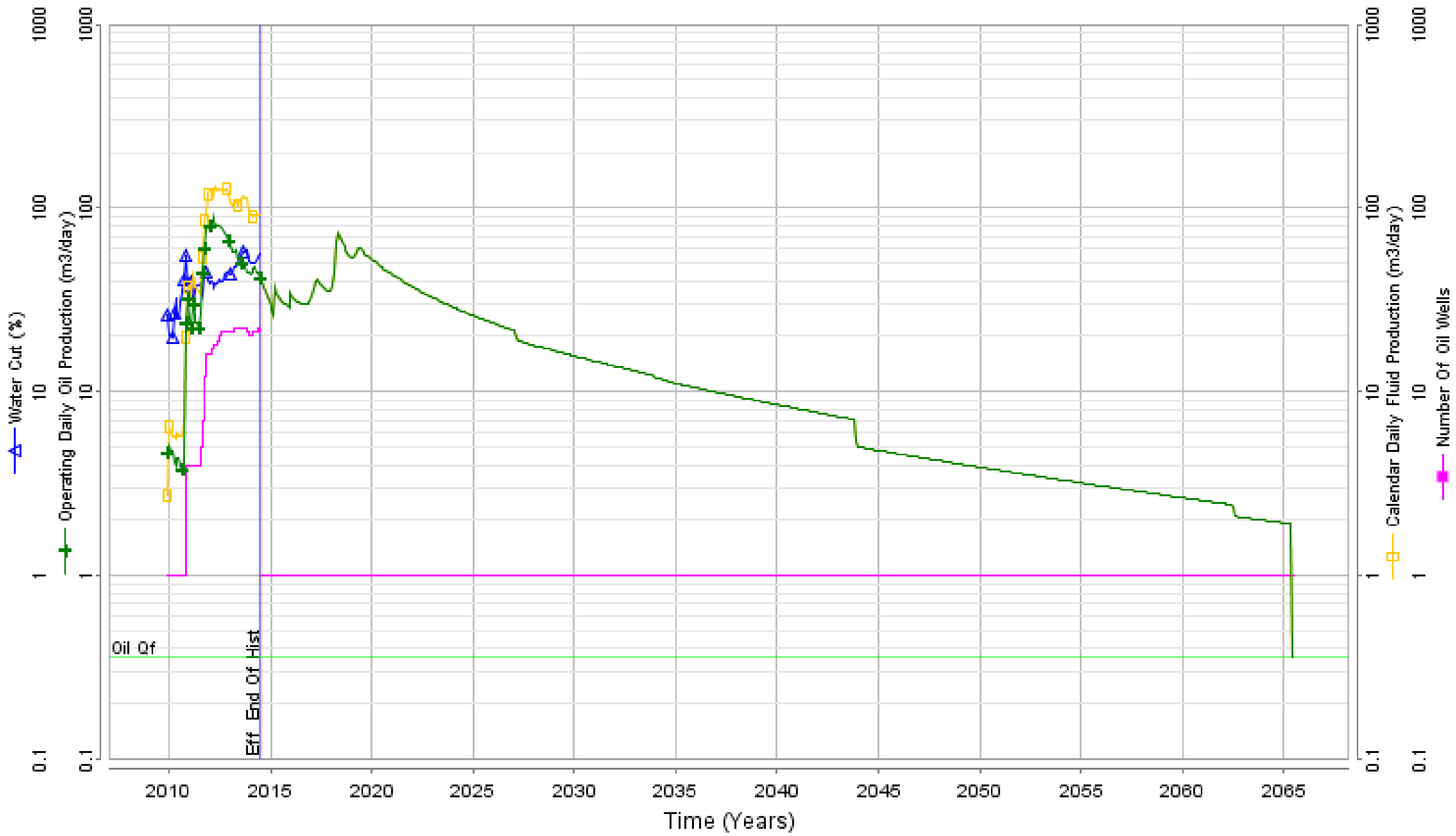

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cum Oil(m3): | 70,224 | Cum Gas(E3m3): | 0 | Cum Water(m3): | 57,866 | Cum Cond(m3): | 0 |
| Forecast Start: | 07/01/2014 | Calculation Type: | Decline | Est. Cum Prod (m3): | 70,225 | Decline Exponent: | 0.000 |
| Forecast End: | 08/06/2040 | OVIP (m3): | 0 | Remaining (m3): | 84,744 | Initial Decline (%/yr): | 50.0 |
| Initial Rate (m3): | 32.5 | Recovery Factor: | 0.000 | | | | |
| Final Rate (m3): | 2.9 | Ult. Recoverable (m3): | 154,969 | | | | |

Figure No. 9

Province: Manitoba
Field: multi zone (3)
Pool: multi zone (2)
Unit: multi zone (24)
Status: n/a
Operator: TUNDRA OIL & GAS LIMITED

## Primary + Secondary Recovery

Birdtail
BU3 WF FC Final
Growth 1



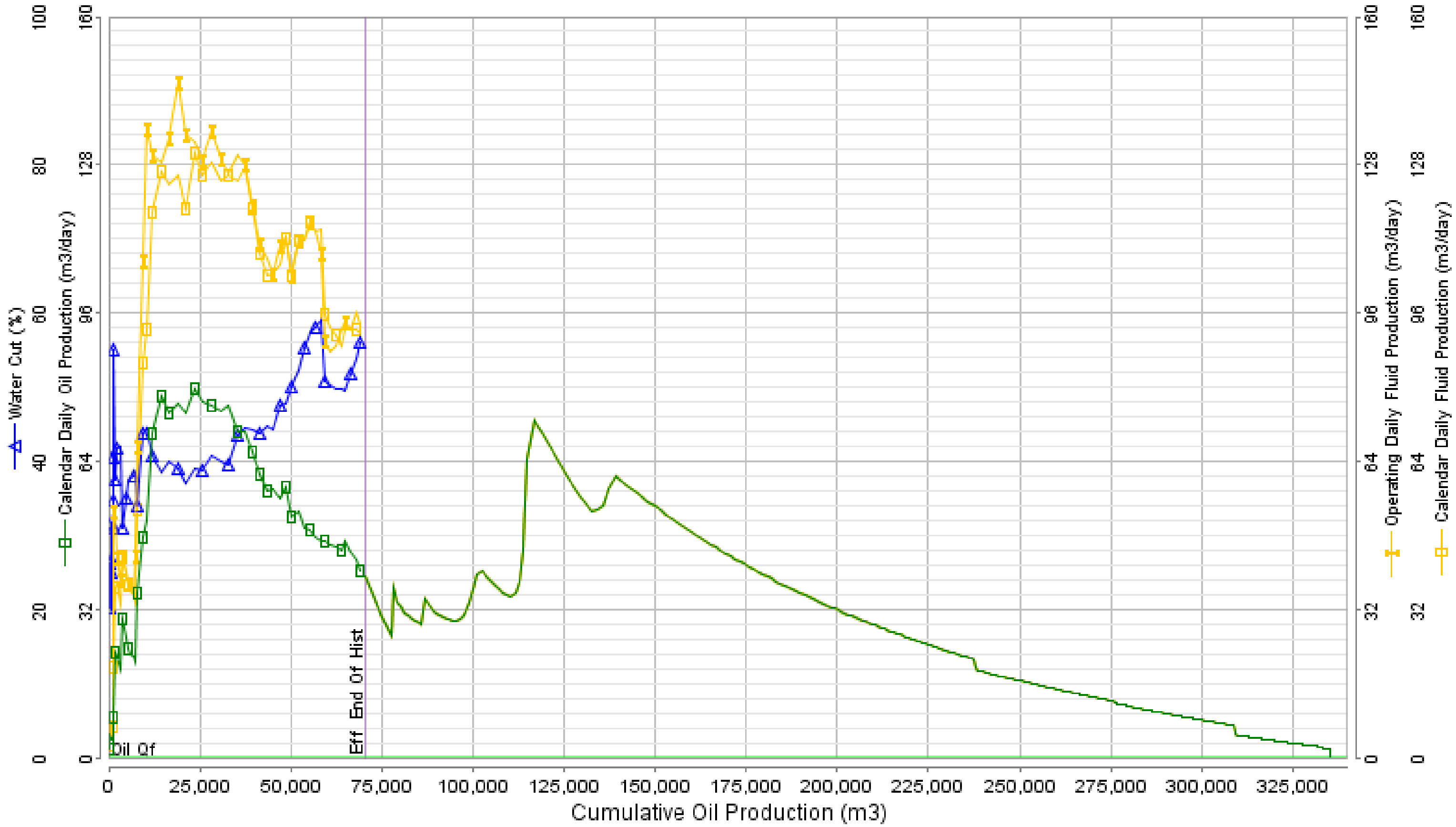

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cum Oil(m3): | 70,224 | Cum Gas(E3m3): | 0 | Cum Water(m3): | 57,866 | Cum Cond(m3): | 0 |
| Forecast Start: | 07/01/2014 | Calculation Type: | Undefined | Est. Cum Prod (m3): | 70,224 | Decline Exponent: | 0.000 |
| Forecast End: | 05/31/2065 | OVIP (m3): | 0 | Remaining (m3): | 265,076 | Initial Decline (%/yr): | 0.0 |
| Initial Rate (m3): | 39.3 | Recovery Factor: | 0.000 | | | | |
| Final Rate (m3): | 0.4 | Ult. Recoverable (m3): | 335,300 | | | | |

Figure No. 10

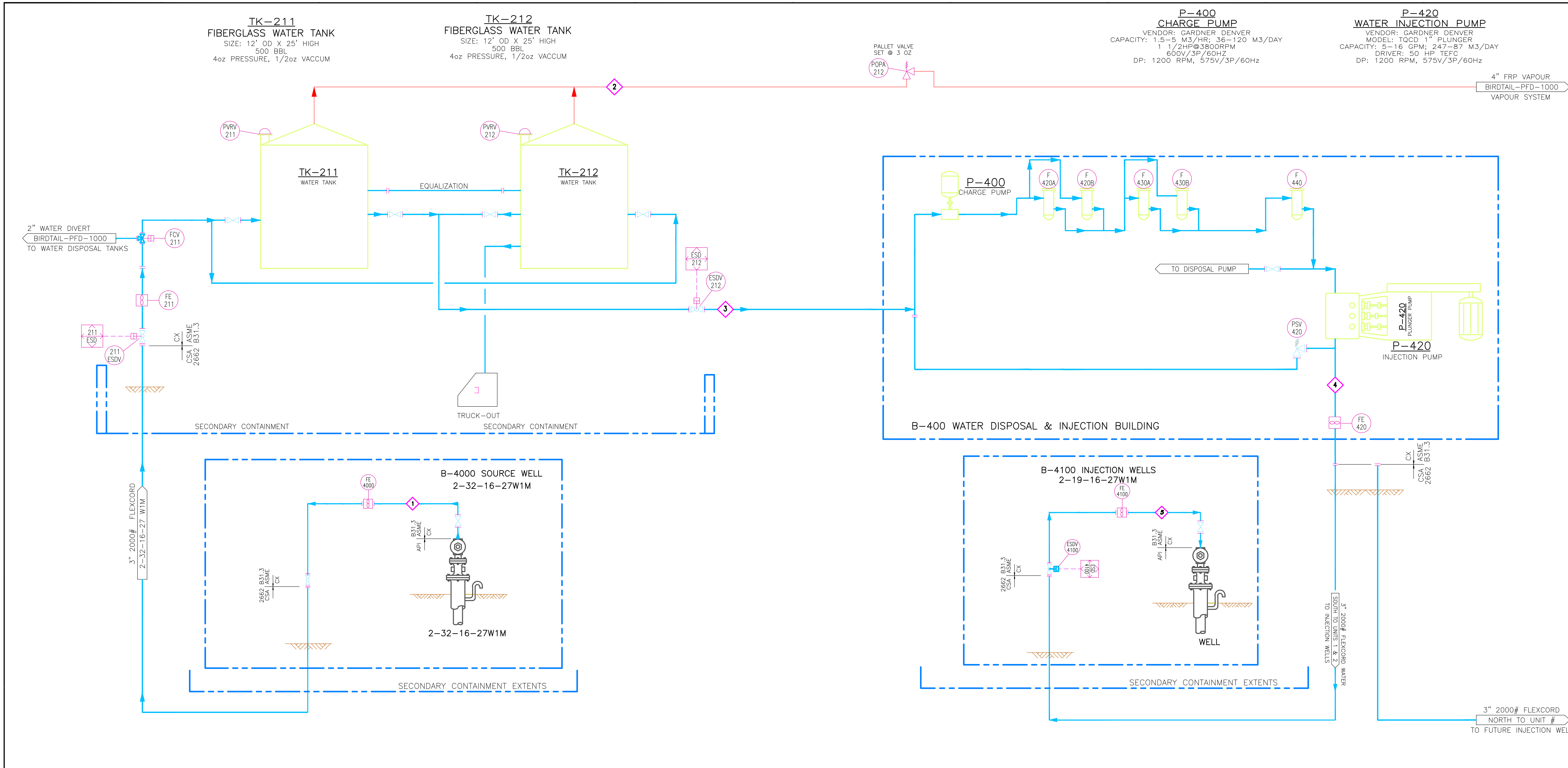
Province: Manitoba
Field: multi zone (3)
Pool: multi zone (2)
Unit: multi zone (24)
Status: n/a
Operator: TUNDRA OIL & GAS LIMITED

# Primary + Secondary Recovery

Birdtail
BU3 WF FC Final
Growth 1




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cum Oil(m3): | 70,224 | Cum Gas(E3m3): | 0 | Cum Water(m3): | 57,866 | Cum Cond(m3): | 0 |
| Forecast Start: | 07/01/2014 | Calculation Type: | Undefined | Est. Cum Prod (m3): | 70,224 | Decline Exponent: | 0.000 |
| Forecast End: | 05/31/2065 | OVIP (m3): | 0 | Remaining (m3): | 265,076 | Initial Decline (%/yr): | 0.0 |
| Initial Rate (m3): | 39.3 | Recovery Factor: | 0.000 | | | | |
| Final Rate (m3): | 0.4 | Ult. Recoverable (m3): | 335,300 | | | | |




| STREAM NUMBER | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COMPONENT | | OPER. | DESIGN | OPER. | DESIGN | OPER. | DESIGN | OPER. | DESIGN | OPER. | DESIGN |
| OIL | $m^3$/DAY | – | – | – | – | – | – | – | – | – | – |
| WATER | $m^3$/DAY | 25 | 100 | – | – | 10 | 100 | 750 | 1480 | 25 | 40 |
| PROD. EMULSION | $m^3$/DAY | – | – | – | – | – | – | – | – | – | – |
| PROD. GAS | $10^3 m^3$/DAY | – | – | 25 | 500 | – | – | – | – | – | – |
| PRESSURE | PSI | 500 | 740 | 2 oz | 4 oz | – | – | – | – | 750 | 1480 |
| TEMPERATURE | °C | 16 | 37 | – | – | 16 | 37 | 16 | 37 | 16 | 37 |
| LINE SIZE | in. | 3 | | 4 | | 4 | | 3 | | 3 | |

| REV | DESCRIPTION | BY | DATE | CHK | APP |
|---|---|---|---|---|---|
| B | REVISIONS | AP | 6-FEB-2013 | JC | |
| A | ISSUED FOR REVIEW | RM | 22-NOV-2012 | AP | JC |

REFERENCE DRAWING
–

NOTES:

Figure No. 11

TUNDRA OIL & GAS PARTNERSHIP

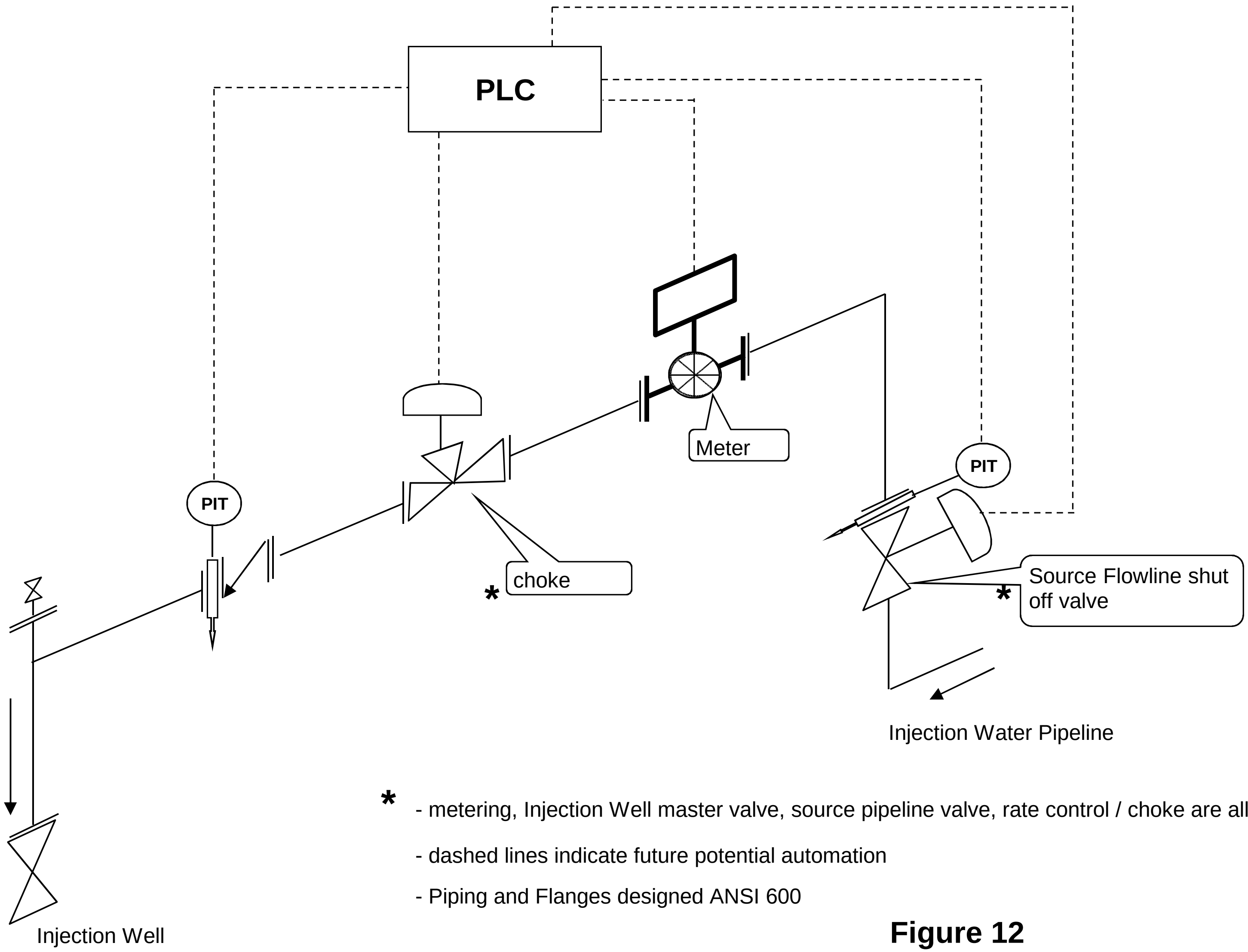
BIRDTAIL
8-30-16-27- W1M

WATER FLOOD
PROCESS FLOW DIAGRAM 3 OF 3

| DRAWN BY: | SCALE: | AFE: | DRAWING NUMBER: | REV NO: |
|---|---|---|---|---|
| RM | NTS | | 8-30-16-27-PFD-PFD-1010 | A |

## Birdtail Unit No. 3

### Proposed Injection Well Surface Piping P&ID




* - metering, Injection Well master valve, source pipeline valve, rate control / choke are all standard

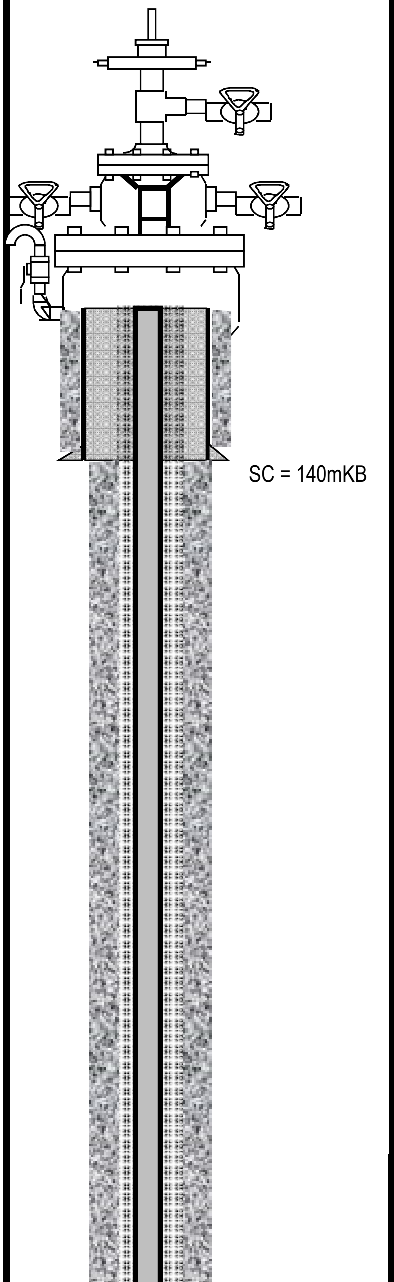
- dashed lines indicate future potential automation
- Piping and Flanges designed ANSI 600

**Figure 12**

Figure 13

# Tundra Oil And Gas Partnership

## TYPICAL OPEN HOLE WATER INJECTION WELL (WIW) DOWNHOLE DIAGRAM




| | | | | | | |
|---|---|---|---|---|---|---|
| **WELL NAME:** | **Tundra Birdtail Unit No. 3 HZNTL Open Hole WIW** | | | **WELL LICENCE:** | | |
| Prepared by | WRJ | (average depths) | | Date: | 2012 | |
| **Elevations :** | | | | | | |
| KB [m] | | | KB to THF [m] | | TD [m] | 2400.0 |
| GL [m] | | | CF (m) | | PBTD [m] | |
| **Current Perfs:** | **Open Hole** | | | 950.0 | to | 2400.0 |
| **Current Perfs:** | | | | | to | |
| **KOP:** | 700 m MD | | Total Interval | | to | |
| **Tubulars** | **Size [mm]** | **Wt - Kg/m** | **Grade** | **Landing Depth [mKB]** | | |
| Surface Casing | 244.5 | 48.06 | H-40 - ST&C | Surface | to | 140.0 |
| Intermed Csg (if run) | 177.8 | 34.23 & 29.76 | J-55 - LT&C | Surface | to | 950.0 |
| Open Hole Latera | none | none | none | 950.0 | to | 2400.0 |
| Tubing | 60.3 or 73.0 - TK-99 | 6.99 or 9.67 | J-55 | Surface | to | 940.0 |

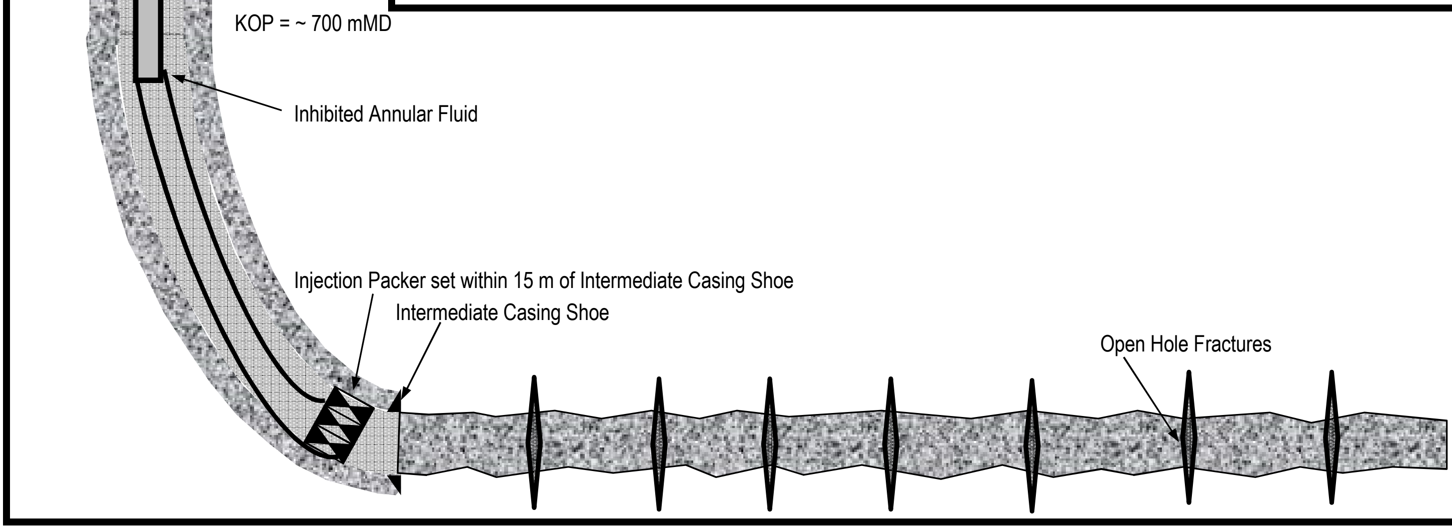
| **Date of Tubing Installation:** | | Length | Top @ |
|---|---|---|---|
| Item | Description / K.B.--Tbg. Flg. | 0.00 | m KB |
| | Corrosion Protected ENC Coated Packer (set within 15 m of Intermed Csg shoe) | | |
| | 60.3 mm or 73 mm TK-99 Internally Coated Tubing | | |
| | TK-99 Internally Coated Tubing Pup Jt | | |
| | Coated Split Dognut | | |
| | | | |
| | Annular space above injection packer filled with inhibited fresh water | | |
| | **Bottom of Tubing mKB** | | |

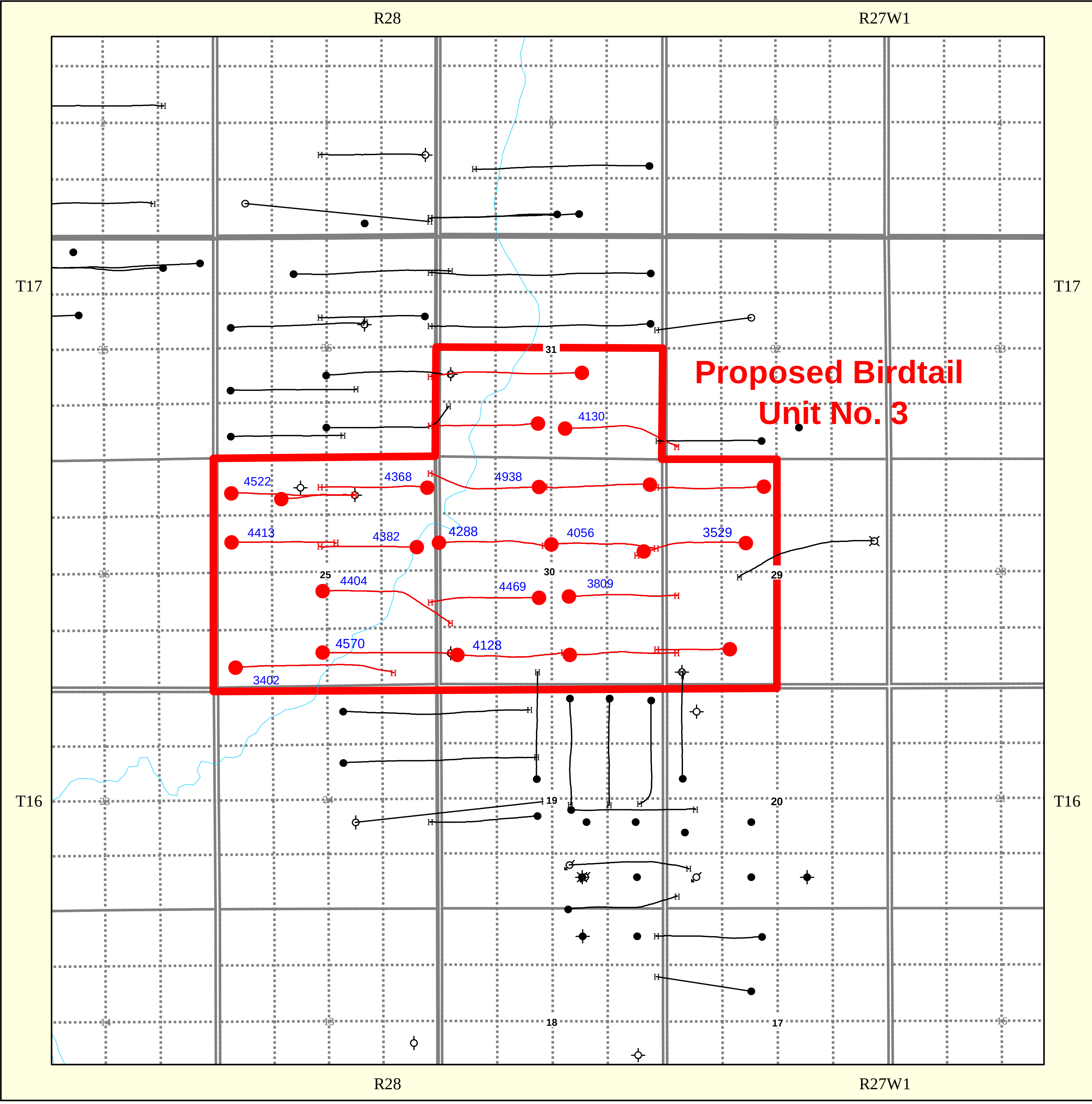
**Rod String :**

Date of Rod Installation:

**Bottomhole Pump:**

**Directions:**






## WELL LEGEND

Bottom Hole Locations:

- Location
- Service or Drain
- Dry & Abandoned
- Injection
- Suspended
- Oil
- Abandoned Oil

Surface Hole Locations:

- Horizontal

## WELL LISTS

- Birdtail Unit No. 3 Well List

# Tundra Oil and Gas

## Figure 14
## BTU3 Initial Reservoir Press

Created in AccuMap™
Product of IHS
Datum: NAD27
Vol. 24 No. 08, Aug 5 2014
(403) 770-4646



Author: Anh Nguyen
Date: September 26, 2014
File: Birdtail Unit No. 3 Initial Pr
Scale: 1 : 37044
Projection: Stereographic
Center: N50.39681 W101.18837

Grid Information:
DLS: IHS Enhanced Grid
NTS: Theoretical Grid
FPS: Theoretical Grid
US: IHS US Grid

DLS Version Information:
AB: ATS 2.6
BC: PRB 2.0
SK: STS 2.5
MB: MLI07

Scale 1:37044

0 Kilometers 1.6

0 Miles 1

**Table No. 1**

## Proposed BIRDTAIL UNIT NO. 3

**Attached to and made part of an Agreement Entitled**

**Birdtail Unit No. 3 - Unit Agreement**

| | Working Interest | | | Royalty Interest | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Tract No.** | **Land Description** | **Owner** | **Share %** | **Owner** | **Share %** | **Tract Participation** | **Crown** | **FH** | **Lessor Royalty %** |
| 1 | Lsd. 3-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.220913571% | Yes | | CSR |
| 2 | Lsd. 4-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.368086225% | Yes | | CSR |
| 3 | Lsd. 5-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.528368105% | Yes | | CSR |
| 4 | Lsd. 6-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.293234550% | Yes | | CSR |
| 5 | Lsd. 11-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.521193846% | Yes | | CSR |
| 6 | Lsd. 12-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.631715981% | Yes | | CSR |
| 7 | Lsd. 13-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.616211753% | Yes | | CSR |
| 8 | Lsd. 14-29-16-27W1 | Tundra Oil & Gas Partnership | 100% | Manitoba Mineral Resources | 100.000% | 1.559940150% | Yes | | CSR |
| 9 | Lsd. 1-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.247569254% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 10 | Lsd. 2-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.412262516% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 11 | Lsd. 3-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.434794447% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 12 | Lsd. 4-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.509516663% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 13 | Lsd. 5-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.520420169% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 14 | Lsd. 6-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.517606410% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 15 | Lsd. 7-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.496813623% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 16 | Lsd. 8-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | Computershare Trust Company of Canada | 50.000% | 2.333663511% | | Yes | 16.000000000 |
| | | | | 1251521 Alberta Ltd. | 50.000% | | | Yes | 16.000000000 |
| 17 | Lsd. 9-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.379155253% | | Yes | 15.000000000 |
| 18 | Lsd. 10-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.570719467% | | Yes | 15.000000000 |
| 19 | Lsd. 11-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.577980582% | | Yes | 15.000000000 |
| 20 | Lsd. 12-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.559372662% | | Yes | 15.000000000 |
| 21 | Lsd.13-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.469009426% | | Yes | 15.000000000 |
| 22 | Lsd.14-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.474286089% | | Yes | 15.000000000 |
| 23 | Lsd. 15-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.534156537% | | Yes | 15.000000000 |
| 24 | Lsd. 16-30-16-27W1 | Tundra Oil & Gas Partnership | 100% | 5991022 Manitoba Ltd. | 100.000% | 2.525790971% | | Yes | 15.000000000 |
| 25 | Lsd. 1-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 2.169556051% | | Yes | 15.000000000 |
| 26 | Lsd. 2-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 2.169911218% | | Yes | 15.000000000 |
| 27 | Lsd. 3-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 1.978876191% | | Yes | 15.000000000 |
| 28 | Lsd. 4-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 1.839912243% | | Yes | 15.000000000 |
| 29 | Lsd. 5-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 1.475461343% | | Yes | 15.000000000 |

| | Working Interest | | | Royalty Interest | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tract No. | Land Description | Owner | Share % | Owner | Share % | Tract Participation | Crown | FH | Lessor Royalty % |
| | | | | | | | | | |
| 30 | Lsd. 6-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 1.934421331% | | Yes | 15.000000000 |
| 31 | Lsd. 7-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 2.085958992% | | Yes | 15.000000000 |
| 32 | Lsd. 8-31-16-27W1 | Tundra Oil & Gas Partnership | 100% | Rural Municipality of Birtle | 100.000% | 2.131877561% | | Yes | 15.000000000 |
| 33 | Lsd. 1-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 6272313 Manitoba Ltd. | 100.000% | 2.184422215% | | Yes | 16.000000000 |
| 34 | Lsd. 2-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 1251521 Alberta Ltd. | 100.000% | 2.173306844% | | Yes | 16.000000000 |
| 35 | Lsd. 3-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 6535527 Manitoba Ltd. | 100.000% | 2.158905080% | | Yes | 16.000000000 |
| 36 | Lsd. 4-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 6535527 Manitoba Ltd. | 100.000% | 2.112349448% | | Yes | 16.000000000 |
| 37 | Lsd. 5-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 6535527 Manitoba Ltd. | 100.000% | 1.904581792% | | Yes | 16.000000000 |
| 38 | Lsd. 6-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 6535527 Manitoba Ltd. | 100.000% | 2.102111217% | | Yes | 16.000000000 |
| 39 | Lsd. 7-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 1251521 Alberta Ltd. | 100.000% | 2.138325534% | | Yes | 16.000000000 |
| 40 | Lsd. 8-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | 6272313 Manitoba Ltd. | 100.000% | 2.207024197% | | Yes | 16.000000000 |
| 41 | Lsd.9-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Armand J. Fouillard | 23.86875% | 2.220904017% | | Yes | 16.000000000 |
| | | | | Omer J. Fouillard | 23.86875% | | | Yes | 16.000000000 |
| | | | | Brian M. Campbell | 23.86875% | | | Yes | 16.000000000 |
| | | | | Clint L. Johnston | 23.86875% | | | Yes | 16.000000000 |
| | | | | Manitoba Mineral Resources | 4.525% | | Yes | | CSR |
| 42 | Lsd. 10-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Armand J. Fouillard | 25.00000% | 2.093019980% | | Yes | 16.000000000 |
| | | | | Omer J. Fouillard | 25.00000% | | | Yes | 16.000000000 |
| | | | | Brian M. Campbell | 25.00000% | | | Yes | 16.000000000 |
| | | | | Clint L. Johnston | 25.00000% | | | Yes | 16.000000000 |
| 43 | Lsd. 11-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Georgette S. Dupont | 100.000% | 1.899620713% | | Yes | 16.000000000 |
| 44 | Lsd. 12-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Georgette S. Dupont | 100.000% | 1.757781010% | | Yes | 16.000000000 |
| 45 | Lsd. 13-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Georgette S. Dupont | 100.000% | 1.733198788% | | Yes | 16.000000000 |
| 46 | Lsd. 14-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Georgette S. Dupont | 100.000% | 1.870708385% | | Yes | 16.000000000 |
| 47 | Lsd. 15-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Armand J. Fouillard | 25.00000% | 2.143370265% | | Yes | 16.000000000 |
| | | | | Omer J. Fouillard | 25.00000% | | | Yes | 16.000000000 |
| | | | | Brian M. Campbell | 25.00000% | | | Yes | 16.000000000 |
| | | | | Clint L. Johnston | 25.00000% | | | Yes | 16.000000000 |
| 48 | Lsd. 16-25-16-28W1 | Tundra Oil & Gas Partnership | 100% | Armand J. Fouillard | 22.87500% | 2.211613824% | | Yes | 16.000000000 |
| | | | | Omer J. Fouillard | 22.87500% | | | Yes | 16.000000000 |
| | | | | Brian M. Campbell | 22.87500% | | | Yes | 16.000000000 |
| | | | | Clint L. Johnston | 22.87500% | | | Yes | 16.000000000 |
| | | | | Manitoba Mineral Resources | 8.500% | | Yes | | CSR |
| | | | | | | **100.000000000%** | | | |

**Table No. 2**

## Birdtail Unit No. 3

**TRACT FACTORS BASED ON OIL-IN-PLACE (OOIP) MINUS CUM OIL PRODUCTION**

Determination of Working Interests in Proposed Unit

| TRACT NO. | LSD-SEC | TWP-RGE | UWI | *OOIP (m3)* | *Hz Cum Prodn June 2014 (m3)* | *Vertical Cum Prodn June 2014 (m3)* | *OOIP Minus Cum Oil Prodn (m3)* | *Tract Factor (%)* |
|---|---|---|---|---|---|---|---|---|
| 1 | 03-29 | 016-27W1 | 03-29-016-27W1 | 26,130 | 286.6 | 0.0 | 25,843 | 1.220913571 |
| 2 | 04-29 | 016-27W1 | 04-29-016-27W1 | 29,862 | 904.1 | 0.0 | 28,958 | 1.368086225 |
| 3 | 05-29 | 016-27W1 | 05-29-016-27W1 | 32,351 | 0.0 | 0.0 | 32,351 | 1.528368105 |
| 4 | 06-29 | 016-27W1 | 06-29-016-27W1 | 27,374 | 0.0 | 0.0 | 27,374 | 1.293234550 |
| 5 | 11-29 | 016-27W1 | 11-29-016-27W1 | 32,351 | 151.9 | 0.0 | 32,199 | 1.521193846 |
| 6 | 12-29 | 016-27W1 | 12-29-016-27W1 | 34,839 | 301.0 | 0.0 | 34,539 | 1.631715981 |
| 7 | 13-29 | 016-27W1 | 13-29-016-27W1 | 37,328 | 3,117.7 | 0.0 | 34,210 | 1.616211753 |
| 8 | 14-29 | 016-27W1 | 14-29-016-27W1 | 36,084 | 3,064.5 | 0.0 | 33,019 | 1.559940150 |
| 9 | 01-30 | 016-27W1 | 01-30-016-27W1 | 48,775 | 1,201.0 | 0.0 | 47,574 | 2.247569254 |
| 10 | 02-30 | 016-27W1 | 02-30-016-27W1 | 52,259 | 1,198.9 | 0.0 | 51,060 | 2.412262516 |
| 11 | 03-30 | 016-27W1 | 03-30-016-27W1 | 54,001 | 2,463.9 | 0.0 | 51,537 | 2.434794447 |
| 12 | 04-30 | 016-27W1 | 04-30-016-27W1 | 55,743 | 2,624.3 | 0.0 | 53,119 | 2.509516663 |
| 13 | 05-30 | 016-27W1 | 05-30-016-27W1 | 55,743 | 2,393.5 | 0.0 | 53,350 | 2.520420169 |
| 14 | 06-30 | 016-27W1 | 06-30-016-27W1 | 55,743 | 2,453.0 | 0.0 | 53,290 | 2.517606410 |
| 15 | 07-30 | 016-27W1 | 07-30-016-27W1 | 54,001 | 1,151.2 | 0.0 | 52,850 | 2.496813623 |
| 16 | 08-30 | 016-27W1 | 08-30-016-27W1 | 50,517 | 1,120.6 | 0.0 | 49,397 | 2.333663511 |
| 17 | 09-30 | 016-27W1 | 09-30-016-27W1 | 55,743 | 1,308.4 | 4,075.2 | 50,360 | 2.379155253 |
| 18 | 10-30 | 016-27W1 | 10-30-016-27W1 | 55,743 | 1,328.8 | 0.0 | 54,414 | 2.570719467 |
| 19 | 11-30 | 016-27W1 | 11-30-016-27W1 | 55,743 | 1,175.1 | 0.0 | 54,568 | 2.577980582 |
| 20 | 12-30 | 016-27W1 | 12-30-016-27W1 | 55,743 | 1,569.0 | 0.0 | 54,174 | 2.559372662 |
| 21 | 13-30 | 016-27W1 | 13-30-016-27W1 | 55,743 | 3,481.7 | 0.0 | 52,261 | 2.469009426 |
| 22 | 14-30 | 016-27W1 | 14-30-016-27W1 | 55,743 | 3,370.0 | 0.0 | 52,373 | 2.474286089 |
| 23 | 15-30 | 016-27W1 | 15-30-016-27W1 | 55,743 | 2,102.7 | 0.0 | 53,640 | 2.534156537 |
| 24 | 16-30 | 016-27W1 | 16-30-016-27W1 | 55,743 | 2,279.8 | 0.0 | 53,463 | 2.525790971 |
| 25 | 01-31 | 016-27W1 | 01-31-016-27W1 | 47,780 | 1,856.9 | 0.0 | 45,923 | 2.169556051 |
| 26 | 02-31 | 016-27W1 | 02-31-016-27W1 | 47,780 | 1,849.4 | 0.0 | 45,930 | 2.169911218 |
| 27 | 03-31 | 016-27W1 | 03-31-016-27W1 | 46,287 | 4,399.9 | 0.0 | 41,887 | 1.978876191 |
| 28 | 04-31 | 016-27W1 | 04-31-016-27W1 | 43,300 | 4,355.1 | 0.0 | 38,945 | 1.839912243 |
| 29 | 05-31 | 016-27W1 | 05-31-016-27W1 | 32,434 | 1,202.8 | 0.0 | 31,231 | 1.475461343 |
| 30 | 06-31 | 016-27W1 | 06-31-016-27W1 | 42,305 | 1,359.2 | 0.0 | 40,946 | 1.934421331 |

| TRACT NO. | LSD-SEC | TWP-RGE | UWI | *OOIP (m3)* | *Hz Cum Prodn June 2014 (m3)* | *Vertical Cum Prodn June 2014 (m3)* | *OOIP Minus Cum Oil Prodn (m3)* | *Tract Factor (%)* |
|---|---|---|---|---|---|---|---|---|
| 31 | 07-31 | 016-27W1 | 07-31-016-27W1 | 45,125 | 972.0 | 0.0 | 44,153 | 2.085958992 |
| 32 | 08-31 | 016-27W1 | 08-31-016-27W1 | 45,125 | 0.0 | 0.0 | 45,125 | 2.131877561 |
| 33 | 01-25 | 016-28W1 | 01-25-016-28W1 | 47,780 | 1,542.2 | 0.0 | 46,238 | 2.184422215 |
| 34 | 02-25 | 016-28W1 | 02-25-016-28W1 | 47,780 | 1,777.5 | 0.0 | 46,002 | 2.173306844 |
| 35 | 03-25 | 016-28W1 | 03-25-016-28W1 | 46,287 | 589.2 | 0.0 | 45,698 | 2.158905080 |
| 36 | 04-25 | 016-28W1 | 04-25-016-28W1 | 44,794 | 81.5 | 0.0 | 44,712 | 2.112349448 |
| 37 | 05-25 | 016-28W1 | 05-25-016-28W1 | 40,314 | 0.0 | 0.0 | 40,314 | 1.904581792 |
| 38 | 06-25 | 016-28W1 | 06-25-016-28W1 | 44,794 | 298.3 | 0.0 | 44,495 | 2.102111217 |
| 39 | 07-25 | 016-28W1 | 07-25-016-28W1 | 46,287 | 1,024.8 | 0.0 | 45,262 | 2.138325534 |
| 40 | 08-25 | 016-28W1 | 08-25-016-28W1 | 47,780 | 1,063.8 | 0.0 | 46,716 | 2.207024197 |
| 41 | 09-25 | 016-28W1 | 09-25-016-28W1 | 47,780 | 770.0 | 0.0 | 47,010 | 2.220904017 |
| 42 | 10-25 | 016-28W1 | 10-25-016-28W1 | 44,794 | 490.7 | 0.0 | 44,303 | 2.093019980 |
| 43 | 11-25 | 016-28W1 | 11-25-016-28W1 | 40,314 | 105.0 | 0.0 | 40,209 | 1.899620713 |
| 44 | 12-25 | 016-28W1 | 12-25-016-28W1 | 37,328 | 121.1 | 0.0 | 37,207 | 1.757781010 |
| 45 | 13-25 | 016-28W1 | 13-25-016-28W1 | 37,328 | 641.4 | 0.0 | 36,687 | 1.733198788 |
| 46 | 14-25 | 016-28W1 | 14-25-016-28W1 | 40,314 | 717.0 | 0.0 | 39,597 | 1.870708385 |
| 47 | 15-25 | 016-28W1 | 15-25-016-28W1 | 46,287 | 918.1 | 0.0 | 45,369 | 2.143370265 |
| 48 | 16-25 | 016-28W1 | 16-25-016-28W1 | 47,780 | 966.7 | 0.0 | 46,813 | 2.211613824 |
| | | | | **2,186,924** | **66,150.2** | **4,075.2** | **2,116,699** | **100.000000000** |

*Table No. 3 - Birdtail Unit No. 3 Well List*

| UWI | License Number | Type | Pool Name | Producing Zone | Mode | On Prod Date | Prod Date | Cal Dly Oil (m3/d) | Monthly Oil (m3) | Cum Prd Oil (m3) | Cal Dly Water (m3/d) | Monthly Water (m3) | Cum Prd Water (m3) | WCT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100/03-29-016-27W1/0 | 008026 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 9/1/2011 | Jun-2014 | 0.9 | 25.7 | 1190.7 | 1.4 | 42.1 | 1263.7 | 62.09 |
| 100/11-29-016-27W1/0 | 008102 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 9/1/2011 | Jun-2014 | 1.3 | 39.4 | 982.8 | 5.6 | 167.0 | 7202.8 | 80.91 |
| 100/14-29-016-27W1/0 | 007597 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 10/1/2010 | Jun-2014 | 3.7 | 111.1 | 6182.2 | 2.9 | 86.3 | 6098.7 | 43.72 |
| 100/02-30-016-27W1/0 | 007598 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 10/1/2010 | Jun-2014 | 1.2 | 36.4 | 2399.9 | 1.2 | 37.4 | 2195.0 | 50.68 |
| 102/04-30-016-27W1/0 | 008488 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 1/1/2012 | Jun-2014 | 2.5 | 75.7 | 5088.2 | 0.5 | 16.1 | 1142.6 | 17.54 |
| 100/06-30-016-27W1/0 | 008134 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 9/1/2011 | Jun-2014 | 2.9 | 86.2 | 4846.5 | 2.7 | 80.6 | 3209.9 | 48.32 |
| 100/07-30-016-27W1/0 | 008096 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 9/1/2011 | Jun-2014 | 1.4 | 43.2 | 2271.8 | 6.6 | 199.0 | 7319.0 | 82.16 |
| 100/09-30-016-27W1/0 | 007087 | Vertical | BAKKEN-THREE FORKS A | BAKKEN | Producing | 11/1/2009 | Jun-2014 | 1.0 | 29.9 | 4075.2 | 1.0 | 30.9 | 3453.4 | 50.82 |
| 100/11-30-016-27W1/0 | 008103 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 8/1/2011 | May-2014 | 0.0 | 0.2 | 2447.1 | 0.9 | 28.9 | 1432.5 | 99.31 |
| 100/14-30-016-27W1/0 | 008170 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 10/1/2011 | Jun-2014 | 5.2 | 154.8 | 6851.5 | 1.5 | 44.8 | 1223.7 | 22.44 |
| 100/16-30-016-27W1/0 | 008108 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 10/1/2011 | Jun-2014 | 3.3 | 100.0 | 4382.5 | 2.6 | 79.3 | 2191.0 | 44.23 |
| 100/02-31-016-27W1/0 | 007953 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 7/1/2011 | Jun-2014 | 2.3 | 68.2 | 3758.9 | 0.7 | 21.3 | 1010.5 | 23.80 |
| 100/03-31-016-27W1/0 | 007599 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 10/1/2010 | Jun-2014 | 3.5 | 105.6 | 8701.5 | 2.1 | 62.9 | 2349.9 | 37.33 |
| 100/07-31-016-27W1/0 | 008089 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 10/1/2011 | Jun-2014 | 2.2 | 64.8 | 3534.0 | 1.8 | 53.8 | 1716.3 | 45.36 |
| 100/03-25-016-28W1/2 | 008114 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 8/1/2011 | Jun-2014 | 2.5 | 73.9 | 3722.7 | 1.9 | 58.1 | 2818.3 | 44.02 |
| 100/04-25-016-28W1/0 | 009305 | Horizontal | BAKKEN-THREE FORKS A | THREEFK,BAKKEN | Producing | 3/1/2013 | Jun-2014 | 0.5 | 14.0 | 267.8 | 2.9 | 86.0 | 1586.7 | 86.00 |
| 100/06-25-016-28W1/0 | 008629 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN,THREEFK | Producing | 5/1/2012 | Jun-2014 | 2.2 | 65.8 | 2386.9 | 3.0 | 89.3 | 3283.8 | 57.58 |
| 100/09-25-016-28W1/0 | 008153 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 10/1/2011 | Jun-2014 | 1.1 | 32.4 | 2749.0 | 2.0 | 59.5 | 1856.0 | 64.74 |
| 102/09-25-016-28W1/0 | 008735 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 6/1/2012 | Jun-2014 | 1.0 | 29.9 | 915.9 | 1.3 | 38.7 | 1236.8 | 56.41 |
| 100/12-25-016-28W1/0 | 008674 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN,THREEFK | Producing | 7/1/2012 | Jun-2014 | 0.3 | 9.8 | 226.1 | 0.9 | 26.6 | 890.7 | 73.08 |
| 100/13-25-016-28W1/2 | 008481 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN,THREEFK | Producing | 2/1/2012 | Jun-2014 | 0.0 | 0.3 | 1398.8 | 8.0 | 241.4 | 3336.5 | 99.88 |
| 102/14-25-016-28W1/3 | 008481 | Horizontal | BAKKEN-THREE FORKS A | | Producing | N/A | | | | | | | | |
| 100/16-25-016-28W1/0 | 008145 | Horizontal | BAKKEN-THREE FORKS A | BAKKEN | Producing | 9/1/2011 | Jun-2014 | 1.4 | 42.6 | 1844.5 | 0.8 | 22.5 | 1073.3 | 34.56 |
| | | | | | | | | | | **70224.5** | | | **57891.1** | |

*Table No. 4: Middle Bakken OOIP Calculation*

OOIP = {A*h*phi (1-Sw)}/Boi

1m3 = 6.28981 bbl

**Total OOIP**
**13,755.337**

| LSD | Section | Twp | Rge | Avg.Por | h | Area | Sw est | 1-Sw | Area*h*phi*(1-Sw) | Boi | OOIP | OOIP | OOIP | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | m | m2 | % | | | | m3 | barrels | MSTB | |
| | | | | | | | | | | | | | | |
| 3 | 29 | 16 | 27 | 0.15 | 2.1 | 160000 | 0.48 | 0.52 | 26208 | 1.003 | 26,130 | 164,350 | **164.350** | |
| 4 | 29 | 16 | 27 | 0.15 | 2.4 | 160000 | 0.48 | 0.52 | 29952 | 1.003 | 29,862 | 187,829 | **187.829** | |
| 5 | 29 | 16 | 27 | 0.15 | 2.6 | 160000 | 0.48 | 0.52 | 32448 | 1.003 | 32,351 | 203,481 | **203.481** | |
| 6 | 29 | 16 | 27 | 0.15 | 2.2 | 160000 | 0.48 | 0.52 | 27456 | 1.003 | 27,374 | 172,176 | **172.176** | |
| 11 | 29 | 16 | 27 | 0.15 | 2.6 | 160000 | 0.48 | 0.52 | 32448 | 1.003 | 32,351 | 203,481 | **203.481** | |
| 12 | 29 | 16 | 27 | 0.15 | 2.8 | 160000 | 0.48 | 0.52 | 34944 | 1.003 | 34,839 | 219,134 | **219.134** | |
| 13 | 29 | 16 | 27 | 0.15 | 3 | 160000 | 0.48 | 0.52 | 37440 | 1.003 | 37,328 | 234,786 | **234.786** | |
| 14 | 29 | 16 | 27 | 0.15 | 2.9 | 160000 | 0.48 | 0.52 | 36192 | 1.003 | 36,084 | 226,960 | **226.960** | |
| 1 | 30 | 16 | 27 | 0.21 | 2.8 | 160000 | 0.48 | 0.52 | 48922 | 1.003 | 48,775 | 306,787 | **306.787** | |
| 2 | 30 | 16 | 27 | 0.21 | 3 | 160000 | 0.48 | 0.52 | 52416 | 1.003 | 52,259 | 328,701 | **328.701** | |
| 3 | 30 | 16 | 27 | 0.21 | 3.1 | 160000 | 0.48 | 0.52 | 54163 | 1.003 | 54,001 | 339,657 | **339.657** | |
| 4 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | **vert** |
| 5 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 6 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 7 | 30 | 16 | 27 | 0.21 | 3.1 | 160000 | 0.48 | 0.52 | 54163 | 1.003 | 54,001 | 339,657 | **339.657** | |
| 8 | 30 | 16 | 27 | 0.21 | 2.9 | 160000 | 0.48 | 0.52 | 50669 | 1.003 | 50,517 | 317,744 | **317.744** | |
| 9 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | **vert** |
| 10 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 11 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 12 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 13 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 14 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 15 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 16 | 30 | 16 | 27 | 0.21 | 3.2 | 160000 | 0.48 | 0.52 | 55910 | 1.003 | 55,743 | 350,614 | **350.614** | |
| 1 | 31 | 16 | 27 | 0.18 | 3.2 | 160000 | 0.48 | 0.52 | 47923 | 1.003 | 47,780 | 300,526 | **300.526** | |
| 2 | 31 | 16 | 27 | 0.18 | 3.2 | 160000 | 0.48 | 0.52 | 47923 | 1.003 | 47,780 | 300,526 | **300.526** | |
| 3 | 31 | 16 | 27 | 0.18 | 3.1 | 160000 | 0.48 | 0.52 | 46426 | 1.003 | 46,287 | 291,135 | **291.135** | |
| 4 | 31 | 16 | 27 | 0.18 | 2.9 | 160000 | 0.48 | 0.52 | 43430 | 1.003 | 43,300 | 272,352 | **272.352** | |
| 5 | 31 | 16 | 27 | 0.17 | 2.3 | 160000 | 0.48 | 0.52 | 32531 | 1.003 | 32,434 | 204,003 | **204.003** | **vert** |
| 6 | 31 | 16 | 27 | 0.17 | 3 | 160000 | 0.48 | 0.52 | 42432 | 1.003 | 42,305 | 266,091 | **266.091** | |
| 7 | 31 | 16 | 27 | 0.17 | 3.2 | 160000 | 0.48 | 0.52 | 45261 | 1.003 | 45,125 | 283,830 | **283.830** | |
| 8 | 31 | 16 | 27 | 0.17 | 3.2 | 160000 | 0.48 | 0.52 | 45261 | 1.003 | 45,125 | 283,830 | **283.830** | |
| 1 | 25 | 16 | 28 | 0.18 | 3.2 | 160000 | 0.48 | 0.52 | 47923 | 1.003 | 47,780 | 300,526 | **300.526** | |
| 2 | 25 | 16 | 28 | 0.18 | 3.2 | 160000 | 0.48 | 0.52 | 47923 | 1.003 | 47,780 | 300,526 | **300.526** | |
| 3 | 25 | 16 | 28 | 0.18 | 3.1 | 160000 | 0.48 | 0.52 | 46426 | 1.003 | 46,287 | 291,135 | **291.135** | |
| 4 | 25 | 16 | 28 | 0.18 | 3 | 160000 | 0.48 | 0.52 | 44928 | 1.003 | 44,794 | 281,743 | **281.743** | |
| 5 | 25 | 16 | 28 | 0.18 | 2.7 | 160000 | 0.48 | 0.52 | 40435 | 1.003 | 40,314 | 253,569 | **253.569** | |
| 6 | 25 | 16 | 28 | 0.18 | 3 | 160000 | 0.48 | 0.52 | 44928 | 1.003 | 44,794 | 281,743 | **281.743** | |
| 7 | 25 | 16 | 28 | 0.18 | 3.1 | 160000 | 0.48 | 0.52 | 46426 | 1.003 | 46,287 | 291,135 | **291.135** | |
| 8 | 25 | 16 | 28 | 0.18 | 3.2 | 160000 | 0.48 | 0.52 | 47923 | 1.003 | 47,780 | 300,526 | **300.526** | |
| 9 | 25 | 16 | 28 | 0.18 | 3.2 | 160000 | 0.48 | 0.52 | 47923 | 1.003 | 47,780 | 300,526 | **300.526** | |
| 10 | 25 | 16 | 28 | 0.18 | 3 | 160000 | 0.48 | 0.52 | 44928 | 1.003 | 44,794 | 281,743 | **281.743** | |
| 11 | 25 | 16 | 28 | 0.18 | 2.7 | 160000 | 0.48 | 0.52 | 40435 | 1.003 | 40,314 | 253,569 | **253.569** | |
| 12 | 25 | 16 | 28 | 0.18 | 2.5 | 160000 | 0.48 | 0.52 | 37440 | 1.003 | 37,328 | 234,786 | **234.786** | |
| 13 | 25 | 16 | 28 | 0.18 | 2.5 | 160000 | 0.48 | 0.52 | 37440 | 1.003 | 37,328 | 234,786 | **234.786** | |
| 14 | 25 | 16 | 28 | 0.18 | 2.7 | 160000 | 0.48 | 0.52 | 40435 | 1.003 | 40,314 | 253,569 | **253.569** | **vert** |
| 15 | 25 | 16 | 28 | 0.18 | 3.1 | 160000 | 0.48 | 0.52 | 46426 | 1.003 | 46,287 | 291,135 | **291.135** | **vert** |
| 16 | 25 | 16 | 28 | 0.18 | 3.2 | 160000 | 0.48 | 0.52 | 47923 | 1.003 | 47,780 | 300,526 | **300.526** | |
| | | | | | | | | | **Total OOIP** | | **2,186,924** | **13,755,337** | **13,755.337** | |

| | | | | | | | Recovery Factor | |
|---|---|---|---|---|---|---|---|---|
| UWI | OOIP [$10^3m^3$] | OOIP [Mbbls] | Cum Oil [$10^3m^3$] | Cum Oil [Mbbls] | EUR $10^3m^3$ | EUR Mbbls | Current | Ultimate RF |
| 00/03-29-016-27W1/0 | 56 | 352.2 | 1.1907 | 7.5 | 3.0 | 19.0 | 2.1% | 5.4% |
| 00/11-29-016-27W1/0 | 67 | 422.6 | 0.9828 | 6.2 | 3.3 | 20.9 | 1.5% | 5.0% |
| 00/14-29-016-27W1/0 | 73 | 461.7 | 6.1822 | 38.9 | 11.8 | 74.3 | 8.4% | 16.1% |
| 00/02-30-016-27W1/0 | 101 | 635.5 | 2.3999 | 15.1 | 4.2 | 26.4 | 2.4% | 4.2% |
| 02/04-30-016-27W1/0 | 110 | 690.3 | 5.0882 | 32.0 | 13.1 | 82.3 | 4.6% | 11.9% |
| 00/06-30-016-27W1/0 | 111 | 701.2 | 4.8465 | 30.5 | 10.3 | 64.6 | 4.3% | 9.2% |
| 00/07-30-016-27W1/0 | 105 | 657.4 | 2.2718 | 14.3 | 5.3 | 33.4 | 2.2% | 5.1% |
| 00/09-30-016-27W1/0 | 111 | 701.2 | 4.0752 | 25.6 | 6.3 | 39.4 | 3.7% | 5.6% |
| 00/11-30-016-27W1/0 | | | 2.4471 | 15.4 | 5.0 | 31.4 | 2.2% | 4.5% |
| 00/14-30-016-27W1/0 | 111 | 701.2 | 6.8515 | 43.1 | 18.4 | 115.7 | 6.1% | 16.5% |
| 00/16-30-016-27W1/0 | 111 | 701.2 | 4.3825 | 27.6 | 9.4 | 58.8 | 3.9% | 8.4% |
| 00/02-31-016-27W1/0 | 96 | 601.1 | 3.7589 | 23.6 | 7.5 | 47.4 | 3.9% | 7.9% |
| 00/03-31-016-27W1/0 | 90 | 563.5 | 8.7015 | 54.7 | 16.5 | 103.5 | 9.7% | 18.4% |
| 00/07-31-016-27W1/0 | 120 | 753.9 | 3.5340 | 22.2 | 7.6 | 47.8 | 2.9% | 6.3% |
| 00/03-25-016-28W1/2 | 96 | 601.1 | 3.7227 | 23.4 | 6.9 | 43.2 | 3.9% | 7.2% |
| 00/04-25-016-28W1/0 | 91 | 572.9 | 0.2678 | 1.7 | 0.9 | 5.8 | 0.3% | 1.0% |
| 00/06-25-016-28W1/0 | 94 | 591.7 | 2.3869 | 15.0 | 9.9 | 62.1 | 2.5% | 10.5% |
| 00/09-25-016-28W1/0 | 111 | 701.2 | 2.7490 | 17.3 | 4.1 | 25.9 | 2.5% | 3.7% |
| 02/09-25-016-28W1/0 | 93 | 582.3 | 0.9159 | 5.8 | 3.3 | 20.5 | 1.0% | 3.5% |
| 00/12-25-016-28W1/0 | 78 | 488.4 | 0.2261 | 1.4 | 0.4 | 2.4 | 0.3% | 0.5% |
| 00/13-25-016-28W1/2 | 78 | 488.4 | 1.3988 | 8.8 | 3.6 | 22.4 | 1.8% | 4.6% |
| 00/16-25-016-28W1/0 | 94 | 591.7 | 1.8445 | 11.6 | 4.4 | 27.8 | 2.0% | 4.7% |
| | **1,997** | **12560.5** | **70.225** | **441.7** | **155.0** | **975.2** | 3.2% | 7.1% |
| | | **1195.0** | **OOIP values for undrilled LSDs** | | | | 84.8 | 533.5 |
| | **2,187** | **13755.6** | | | | | | |

| | | | | |
|---|---|---|---|---|
| | Jun-14 | | | |
| Project | Cum Oil, mbbls | Current RF (Total) | | |
| Birdtail Unit No 3 | 441.7 | | **3.2%** | |
| | **Reserves, mbbls** | **Comments** | **RF, %** | |
| Pilot WF Inc. Recoverable, mbbls | 80 | | | 0.6% |
| Estimate WF Recoverable, mbbls | 975 | 100% of primary EUR | | 7.1% |
| WF EUR | 1,055 | | | 7.7% |
| **Total Recovery** | **2,110** | **WF response** | | **15.4%** |
| Estimate EUR under WF | **1,055** | | | |
| Incremental RF (Total), % | **7.7%** | | | |

# Tundra Oil & Gas Ltd.

**Tundra Birdtail (1-36) 03-31-016-27W1/00**

52134-2011-0219

## SUMMARY OF PVT DATA

### Reported Reservoir Conditions

| | | |
|---|---|---|
| Reservoir Pressure ............................... | 5 000 | kPa(a) |
| Reservoir Temperature ......................... | 20.0 | °C |

### Pressure-Volume Relations

| | | |
|---|---|---|
| Saturation Pressure ............................... | 372 | kPa(g) |
| Avg. Single-Phase Compressibility ......... | 6.28 | E-7 v/v/kPa ( 34 474 to 372 kPa(g) ) |
| Thermal Exp. @ 34 474 kPa(g) ............. | 1.00600 | V at 20.0 °C / V at 15.0 °C |

### Reservoir Fluid Viscosity

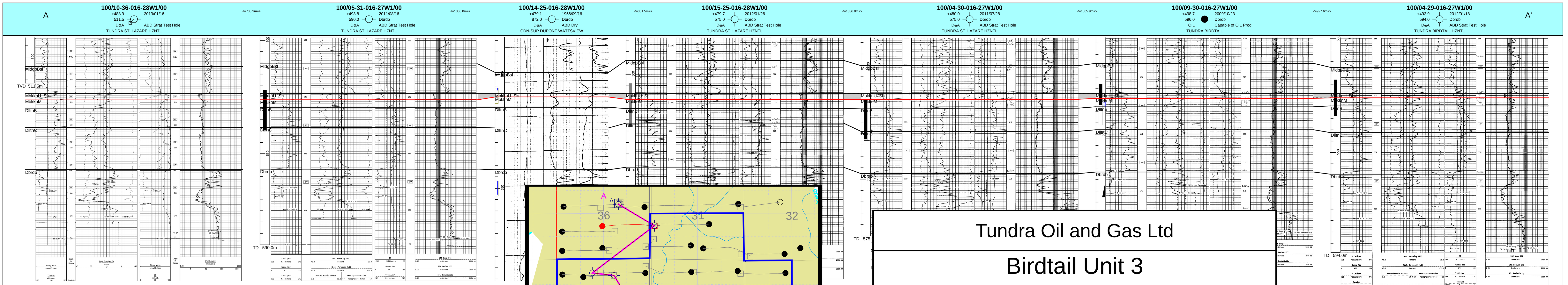
15.2 mPa·s at 372 kPa(g) and 20.0 °C

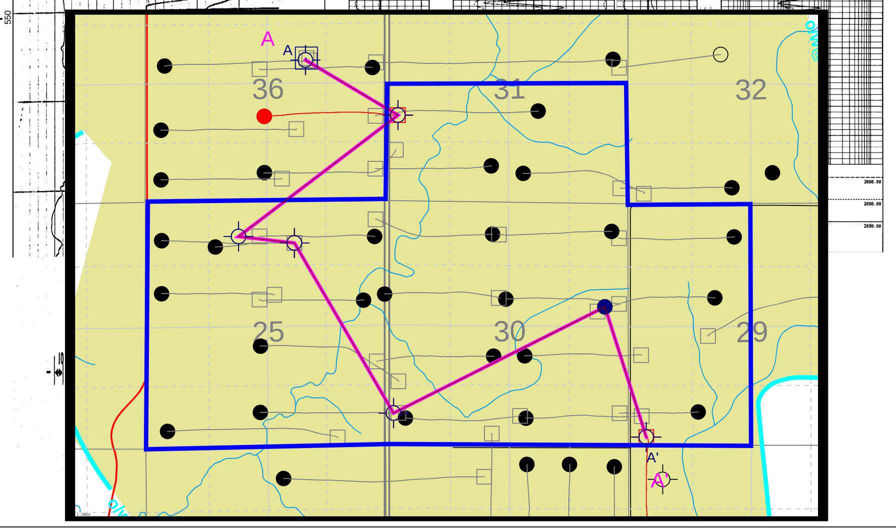
### Separator Test Results

| Separator Conditions | | Formation Volume Factor | Total Solution Gas/Oil Ratio | Tank Oil Gravity ( °API at 15.6 °C ) |
|---|---|---|---|---|
| kPa(g) | °C | (A) | (B) | |
| 0 | 15.0 | 1.003 | 0.4 | 30.4 |

(A) Cubic metres of saturated oil per cubic metre of stock tank oil at 15.0 °C.

(B) Total standard cubic metres of gas per cubic metre of stock tank oil at 15.0 °C.




Tundra Oil and Gas Ltd

Birdtail Unit 3

Stratigraphic Cross Section - MBkkn

Cross Section A - A'

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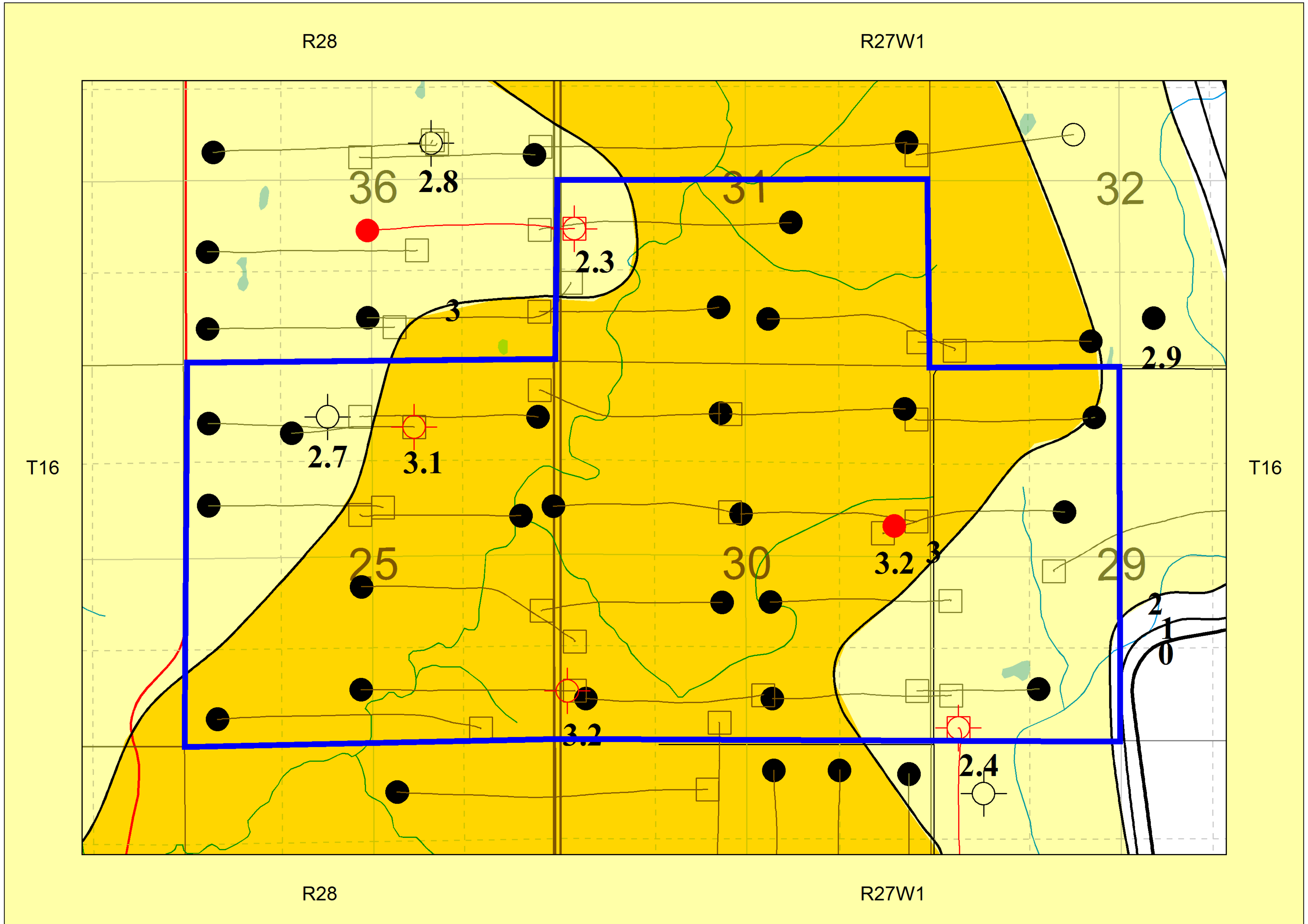
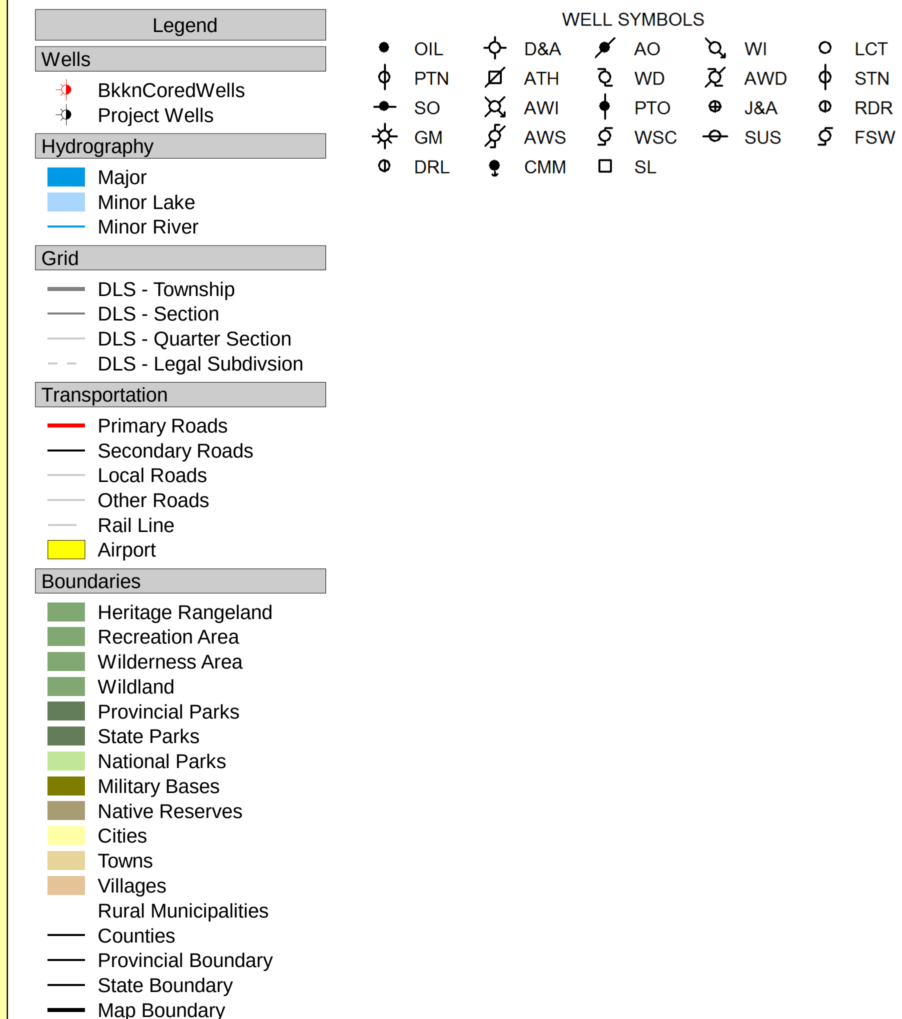
| | | |
|---|---|---|
| geoSCOUT www.geologic.com | Date : 2014/09/23 | By : K McNeil |
| | Datum : MbkknU_Sh | Scale = 1:600 |
| | Interval : Screen Display | |

Appendix No. 1




Tundra Oil and Gas Ltd

# Birdtail Unit 3
# Middle Bakken Net Hydrocarbon Pay Map
# (1m Contour Intervals)

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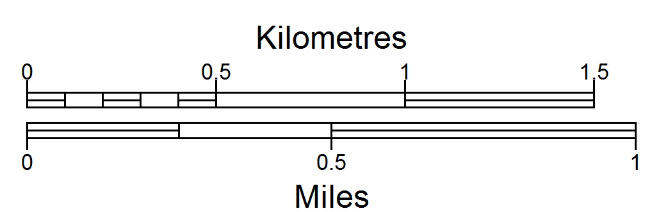
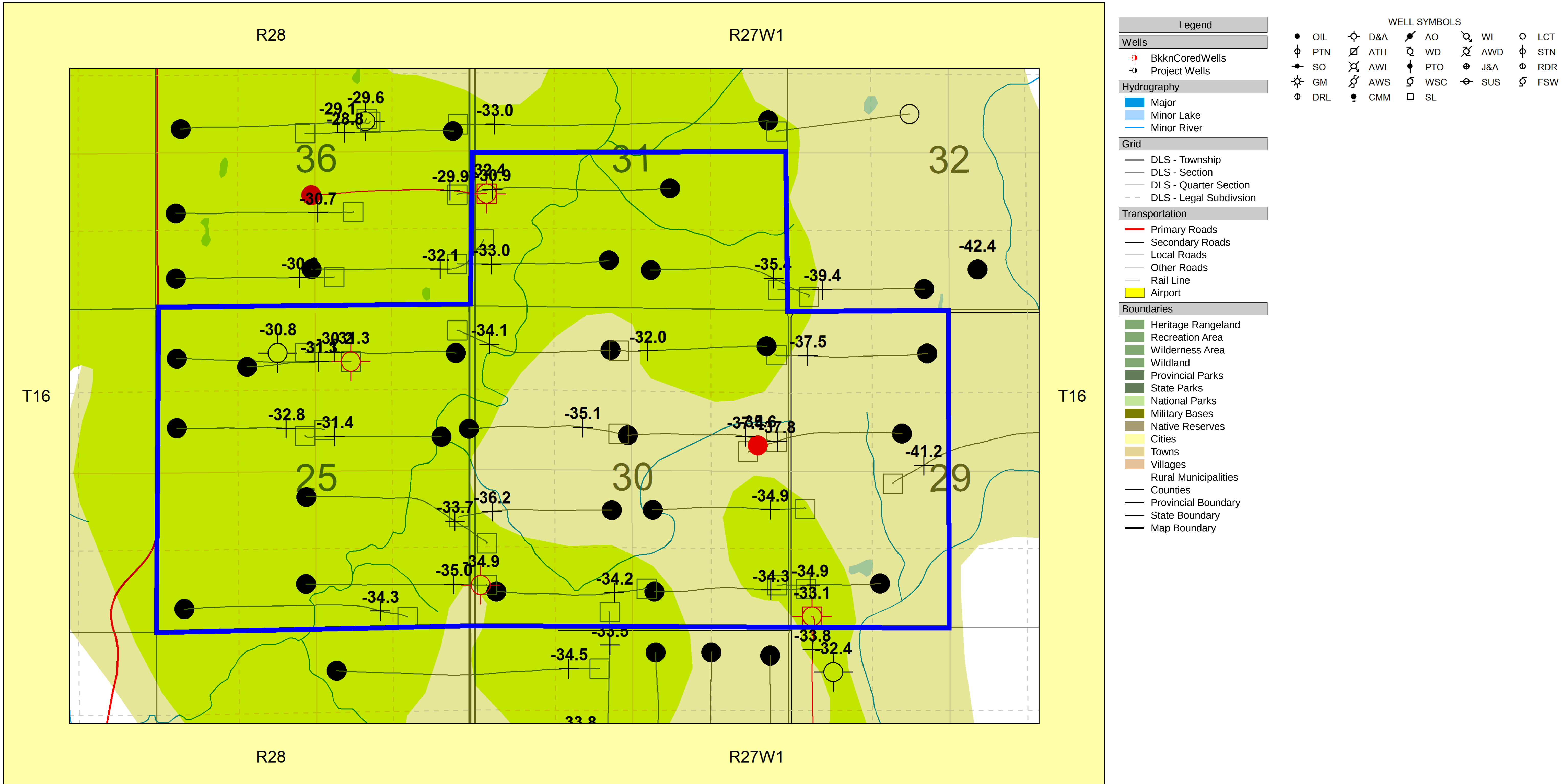
geoSCOUT www.geologic.com

| By : K McNeil | Date : 2014/09/23 |
|---|---|
| Scale = 1:20000 | Project : NorthBakken |




Datum: NAD 27 Spheroid: Clarke 1866
Projection: 6 degrees TM (Transverse Mercator)

Appendix No. 2




| Tundra Oil and Gas Ltd | |
|---|---|
| Birdtail Unit 3<br>Top Middle Bakken Subsea Structure Map<br>(5m Contour Intervals) | |
| Licensed to : Tundra Oil and Gas Ltd | |
| By : K McNeil | Date : 2014/09/23 |
| Scale = 1:20000 | Project : NorthBakken |

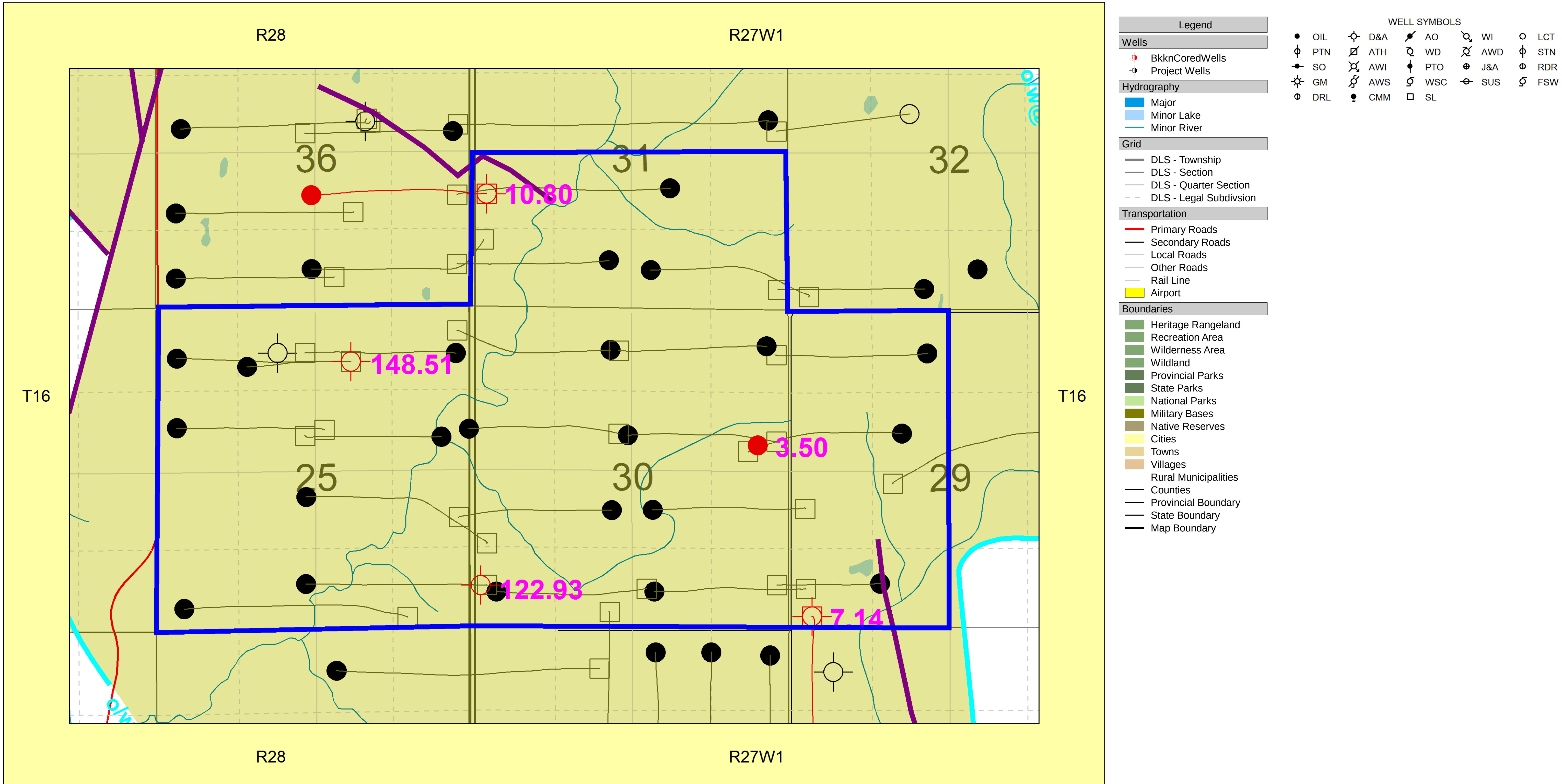
geoSCOUT www.geologic.com

Kilometres 0 0.5 1 1.5

0 0.5 1 Miles

Datum: NAD 27 Spheroid: Clarke 1866
Projection: 6 degrees TM (Transverse Mercator)

Appendix No. 3




# Tundra Oil and Gas Ltd

# Birdtail Unit 3
# Middle Bakken Kmax.h Values Map

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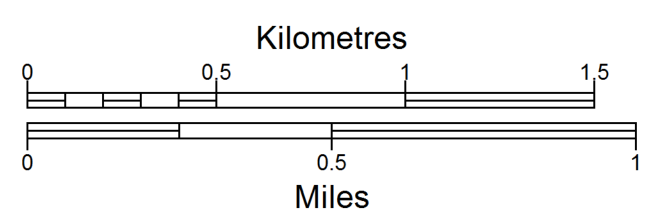
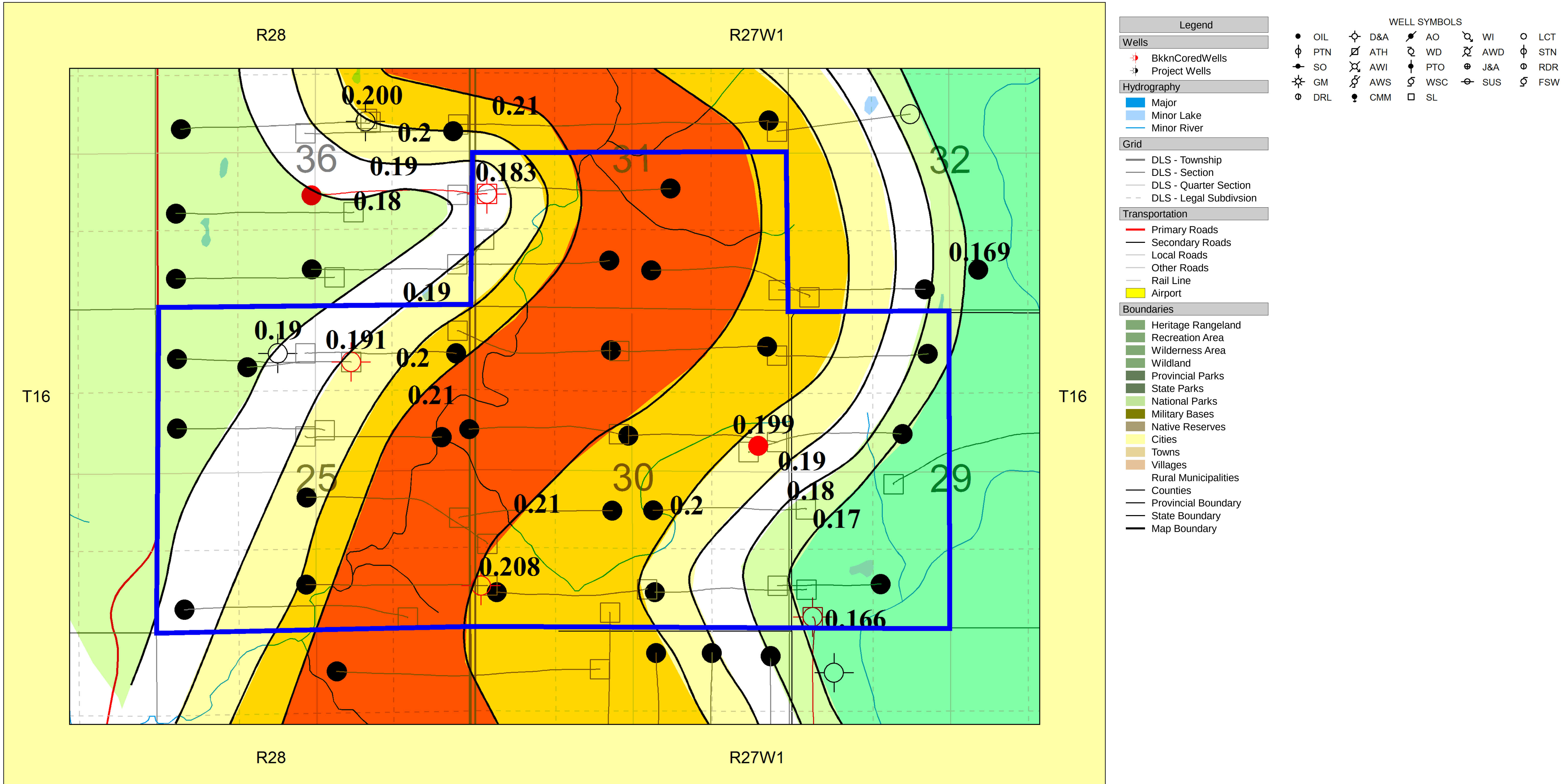
| | | |
|---|---|---|
| geoSCOUT www.geologic.com | By : K McNeil | Date : 2014/09/23 |
| | Scale = 1:20000 | Project : NorthBakken |




Datum: NAD 27 Spheroid: Clarke 1866
Projection: 6 degrees TM (Transverse Mercator)

Appendix No. 4




Tundra Oil and Gas Ltd

# Birdtail Unit 3
# Middle Bakken Average Porosity Map
# (0.01% Contour Intervals)

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geoSCOUT www.geologic.com

| | |
|---|---|
| By : K McNeil | Date : 2014/09/23 |
| Scale = 1:20000 | Project : NorthBakken |

Kilometres
0 0.5 1 1.5
0 0.5 1
Miles

Datum: NAD 27 Spheroid: Clarke 1866
Projection: 6 degrees TM (Transverse Mercator)

Appendix No. 5

## Appendix 6 – Corrosion Controls

*Injection Wells*

- Corrosion inhibitor in the annulus between tubing and casing.
- Surface freeze protection of annular fluids near surface.
- Corrosion-resistant valves on wellhead and flowline.
- Corrosion-resistant flowline equipment.
- Installation of cathodic protection to protect casing.
- Scale inhibitor protection as needed.
- Bacteria control chemical treatments when needed.
- Water injector packer will be coated for corrosion resistance.

*Producing Wells*

- Downhole corrosion inhibitor, either batch or daily injection, as needed.
- Scale inhibitor treatment daily injection as required for horizontal wells.
- Paraffin treatment daily injection if needed.
- Casing cathodic protection where required.

*Pipelines*

- The water source line will be Flexcord 2000# pipe.
- Injection lines will be a mix of Flexpipe 601 pipe and Centron 2000# pipe.
- Producing lines existing as per original flowline licenses.
-

*Facilities*

8-30-16-27W1 Water Plant

- Plant piping – internally coated, fiberglass or stainless steel.
- Filtration – stainless steel.
- Pumps – ceramic plungers, stainless steel disc valves.
- Tanks – fiberglass with stainless steel valves.