

**PROPOSED EBOR UNIT NO. 3**

**Application for Enhanced Oil Recovery Waterflood Project**

**Middle Bakken/Three Forks Formations**

**Bakken – Three Forks B Pool (01 62B)**

**Daly Sinclair Field, Manitoba**

September 9, 2016  
Tundra Oil and Gas Partnership

## **INTRODUCTION**

The Sinclair portion of the Daly Sinclair Oil Field is located in Ranges 28 and 29 W1 in Townships 7 and 8 (Figure 1). Since discovery in 2004, the main oilfield area was developed with vertical and horizontal wells at 40 acre spacing on Primary Production. Since early 2009, a significant portion of the main oilfield has been unitized and placed on Secondary Waterflood (WF) Enhanced Oil Recovery (EOR) Production, mainly from the Lyleton A & B members of the Three Forks Formation. Tundra Oil and Gas (Tundra) currently operates and continues to develop Sinclair Units 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14 and 17.

In the northern part of the Sinclair field, 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 to establish Ebor Unit No. 3 (Section 29, Section 30, Section 31, Section 32-008-29W1, Section 5, Section 6, Section 7, Section 8, Section 18-009-29W1) 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 01-62A Bakken-Torquay Pool of the Daly Sinclair Oilfield (Figure 3).

## **SUMMARY**

1. The proposed Ebor Unit No. 3 will include 35 horizontal wells and 20 vertical producing wells, within 144 Legal Sub Divisions (LSD) of the Middle Bakken/Three Forks producing reservoir. The project is located west of Sinclair Unit No. 6 and 13 (Figure 2).
2. Total Net Original Oil in Place (OOIP) in Ebor Unit No. 3 has been calculated to be **5,581** e<sup>3</sup>m<sup>3</sup> (35,105 Mbbbl) for an average of **38.75** net e<sup>3</sup>m<sup>3</sup> (243.8 Mbbbl) OOIP per 40 acre LSD based on a 0.5 md cutoff for the Middle Bakken, Upper & Lower Lyleton 'A' and Lyleton 'B'.
3. Cumulative production to the end of May 2016 from the 59 wells (55 producing, 4 abandoned) within the proposed Ebor Unit No. 3 project area was **225.0** e<sup>3</sup>m<sup>3</sup> (1,413 Mbbbl) of oil, and **601.1** e<sup>3</sup>m<sup>3</sup> (3,780 Mbbbl) of water, representing a **4.0%** Recovery Factor (RF) of the Net OOIP.
4. Estimated Ultimate Recovery (EUR) of Primary Proved Producing oil reserves in the proposed Ebor Unit No. 3 project area has been calculated to be **293.2** e<sup>3</sup>m<sup>3</sup> (**1,843** Mbbbl), with **68.2** e<sup>3</sup>m<sup>3</sup> (**429** Mbbbl) remaining as of the end of May 2016.
5. Ultimate oil recovery of the proposed Ebor Unit No. 3 OOIP, under the current Primary Production method, is forecasted to be **5.2%**.
6. Figure 4 shows the production from the Ebor Unit No. 3 peaked in February 2013 at 147.5 m<sup>3</sup> (OPD). As of May 2016, production was 34.9 m<sup>3</sup> OPD, 117.7 m<sup>3</sup> of water per day (WPD) and a 77.1% watercut.
7. In February 2013, production averaged 3.01 m<sup>3</sup> OPD per well in Ebor Unit No. 3. As of May 2016, average per well production has declined to 0.85 m<sup>3</sup> OPD. Decline analysis of the group primary production data forecasts total oil to continue declining at an annual rate of approximately **22.6%** in the project area.
8. Estimated Ultimate Recovery (EUR) of proved oil reserves under Secondary WF EOR for the proposed Ebor Unit No. 3 has been calculated to be **422.2** e<sup>3</sup>m<sup>3</sup> (**2,655** Mbbbl), with **197.2** e<sup>3</sup>m<sup>3</sup> (**1,240** Mbbbl) remaining. An incremental **129.0** e<sup>3</sup>m<sup>3</sup> (**811** Mbbbl) of proved oil reserves, or **2.3%**, are forecasted to be recovered under the proposed Unitization and Secondary EOR production vs the existing Primary Production method.
9. Total RF under Secondary WF in the proposed Ebor Unit No. 3 is estimated to be **7.5%**.
10. Based on the waterflood response in the adjacent main portion of the Sinclair field, the Three Forks and Middle Bakken Formations in the proposed project area are believed to be suitable reservoirs for WF EOR operations.
11. Existing horizontal wells, with multi-stage hydraulic fractures, will be converted to injection wells (Figure 5) within the proposed Ebor Unit No. 3, to complete waterflood patterns with effective 40 acre spacing similar to that of Sinclair Unit 19.

## **DISCUSSION**

The proposed Ebor Unit No. 3 project area is located within Townships 8-9, Range 29 W1 of the Daly Sinclair Oil Field. The proposed Ebor Unit No. 3 currently consists of 35 horizontal and 20 vertical producing wells, within an area covering 144 LSDs (Figure 2). This includes Section 29, Section 30, Section 31, Section 32-008-29W1, Section 5, Section 6, Section 7, Section 8, Section 18-009-29W1. A project area well list complete with recent production statistics is attached as Table 3.

Tundra believes that the waterflood response in the adjacent main portion of the Sinclair field demonstrates potential for incremental production and reserves from a WF EOR project in the subject Middle Bakken and/or Three Forks oil reservoirs.

## **Geology**

### **Stratigraphy:**

The stratigraphy of the reservoir section for the proposed unit is shown on the structural cross-section attached as Appendix 1. The section runs SE to NW through the proposed Unit area. The producing sequence in descending order consists of the Upper Bakken Shale, Middle Bakken Siltstone, Lyleton A Siltstone (broken into Upper and Lower members), the Red Shale Marker, Lyleton B Siltstone and the Torquay Silty Shale. The reservoir units are represented by the Middle Bakken, Lyleton A and Lyleton B Siltstones. The Upper Bakken Shale is a black, organic rich, platy shale which forms the top seal for the underlying Middle Bakken and Lyleton reservoirs. The reservoir units in the proposed unit are analogous to the Bakken / Lyleton producing reservoirs that have been approved adjacent to the proposed unit (Sinclair Unit 13, Sinclair Unit 6, Sinclair Unit 1, Sinclair Unit 10, Daly Unit 7 and Daly Unit 5) as noted on the Offsetting Units Map at Appendix 2.

### **Sedimentology:**

The Middle Bakken reservoir consists of fine to coarse grained grey siltstone to fine sandstone which may be subdivided on the basis of lithologic characteristics into upper and lower units. The upper portion is very often heavily bioturbated and is generally non-reservoir. These bioturbated beds often contain an impoverished fauna consisting of well-worn brachiopod, coral and occasional crinoid fragments suggesting deposition in a marginal marine environment. The lower part of the Middle Bakken is generally finely laminated with alternating light and dark laminations with occasional bioturbation. Reservoir quality is highly variable within the Unit area. Within the proposed unit, the Middle Bakken thickness ranges from about 0.3m in the North to 3.6m in the South (Appendix 4).

The Lyleton A reservoir within the proposed unit area consists of buff to tan medium to coarse siltstone (occasionally fine sandstone) made up of quartz, feldspar and detrital dolomite with minor mica and clay mostly in the form of clay clasts or chips. Clays do not generally occur as pore filling material, but rather as discrete grains within the siltstone. The Upper part is generally well bedded and shows evidence of parallel lamination with occasional wind ripples. The coarser siltstones are interbedded with finer grained grey-green siltstone similar in composition to the reservoir siltstone, but generally with lower permeability (i.e. < 0.1mD). These finer grained siltstones show evidence of haloturbation producing smeared siltstone



clasts floating in a fine grained grey-green siltstone matrix. The lower part of the Lyleton A generally shows a greater proportion of the grey-green fine-grained siltstone than the Upper and is generally a poorer reservoir. It also tends to exhibit greater amounts of haloturbation and pseudo-breccia of siltstone clasts in a finer grained siltstone matrix. Because of the fine grained matrix in this pseudo-breccia the connectivity between the clasts is much lower than the bedded siltstone and the Lower part of the Lyleton A is generally a poorer reservoir than the Upper part of the Lyleton A. Within the proposed unit area the Upper Lyleton A has a limited occurrence and has been thinned, where it exists, reaching a maximum thickness of 3.2m (Appendix 5). The Lower Lyleton A is more consistent within the proposed unit area ranging from 1.8m to 4.5m (Appendix 6).

The Red Shale Marker can form an aquitard between the overlying Middle Bakken / Lyleton A and the underlying Lyleton B reservoir. It consists of brick red dolomitic siltstone which is highly water soluble. The Red Shale Marker is 4.6m at its thickest and is fairly consistent throughout the proposed unit area, reaching 2.8m at its thinnest in the East (Appendix 7). The effectiveness of the Red Shale Marker unit as a barrier to fluid flow is greatly diminished by induced hydraulic fracturing. As such, the Red Shale Marker is most likely not an effective barrier to flow between the Middle Bakken and the Lyleton B over the proposed unit area.

The Lyleton B reservoir consists of buff to tan fine grained siltstone (occasionally very fine siltstone) made up of quartz, feldspar and detrital dolomite with minor mica and clay mostly in the form of clay clasts or chips. The Lyleton B is generally well bedded and shows evidence of parallel lamination with occasional wind ripples. The coarser siltstones are interbedded with dark grey-green or red very fine grained siltstone which is generally non-reservoir. The Lyleton B is between 4.4m-6.0m thick within the proposed unit (Appendix 8).

The Torquay (Three Forks) forms the base of the reservoir sequence and is a brick red or mint green dolomitic very fine siltstone similar to the Red Shale Marker and it forms a good basal seal to the Lyleton B reservoir (Appendix 9).

#### **Structure:**

Structure contour maps are provided for the top of each major unit (Appendices 10 through 16). The structure within the proposed unit area generally consists of an overall dip to the Southeast. Structural variations in the area are interpreted as being caused by dissolution of the underlying Prairie Evaporites, seen in the proposed unit area as the structural low in the SE. Structural variations caused by dissolution are common in the Sinclair Field but do not appear to represent continuous barriers to lateral fluid flow within the reservoir as they do not appear to interrupt the lateral continuity of the reservoir beds (see cross-section Appendix 1).

#### **Reservoir Continuity:**

Lateral continuity of the reservoir units is an essential requirement of a successful waterflood. As demonstrated by the cross section and the isopach maps, all reservoir formations, the Middle Bakken, Lyleton A, and Lyleton B, are continuous throughout the proposed unit area. Only the Upper Lyleton A pinches out but the Lower Lyleton A is continuous.

Vertical continuity between the Middle Bakken and underlying Lyleton A reservoir exists throughout the proposed unit as they are in direct contact. Vertical continuity between the Middle Bakken and Lyleton A to the underlying Lyleton B reservoir is broken by the Red Shale marker in this area. This break in vertical continuity is not expected to impede waterflood as fracked injectors and producers flow above and below the Red Shale Marker.

#### **Reservoir Quality:**

Permeability (k-h in mD\*m) and porosity (Phi-h in por\*m) maps for all four reservoir units are provided (Appendix 17 through 24). These maps are generated using core data and are generated as follows. First the core is divided into the reservoir units present. This data is then subject to a permeability cutoff. Intervals that meet or exceed the cutoff are multiplied by the interval thickness and then summed to get the total value for the Phi-h or k-h for that particular reservoir unit. The permeability cutoffs applied are as follows:

- Middle Bakken = 0.5 md
- Upper Lyleton A = 0.5 md
- Lower Lyleton A = 0.5 md
- Lyleton B = 0.5 md

As can be noted from the Phi-h and k-h maps the bulk of the reservoir in the proposed unit is contained in the Lower Lyleton A, with significant contributions from the Middle Bakken and Lyleton B formations and also in the Upper Lyleton A where it has not been eroded completely. It is important to note that the 0.5 md cutoff effectively ignores pore volume with permeability between 0.2 and 0.49 md that may contain moveable oil.

#### **Fluid Contacts:**

The oil/water contact for the Middle Bakken and Lyleton reservoir is estimated from production to be at about -525 m subsea. In tight reservoirs such as these the transition zone could be considerable and the top of the transition zone is estimated to be at about -490 m subsea based on production and simulation studies of the reservoir. The postulated oil/water contact at -525 m subsea is 70m below the lowest elevation the reservoir reaches within the unit area (Appendix 15).

#### **Gross OOIP Estimates**

Total volumetric OOIP for the Middle Bakken, Lyleton A and Lyleton B within the proposed unit has been calculated to be **5,581** e<sup>3</sup>m<sup>3</sup> (35,105 Mbbbl) using Tundra internally created maps. Maps used were generated from available core data combined with vertical log based isopach maps (Appendix 25).

Net pay for each cored well is calculated using the formation specific permeability cut-off discussed above. Representative intervals that had a measured permeability greater than the formation specific cut-off were considered pay. The weighted average porosity (phi) of all pay intervals for each formation was calculated for each cored well. The height of pay (h) was derived by summing the heights of each

representative sample that met the permeability cut off. From these two parameters, a phi\*h value was calculated for all four productive horizons in all wells with core over each respective formation.

The phi\*h values for all cored wells were contoured using IHS's Petra software program using a 150m grid node spacing. Phi\*h values for each LSD were calculated off the associated grid by determining the average values over each LSD.

Tabulated parameters for each LSD from the calculations can be found in **Table 4**.

OOIP values were calculated using the following volumetric equation:

$$OOIP = \frac{Area * Net Pay * Porosity * (1 - Water Saturation)}{Initial Formation Volume Factor of Oil}$$

or

$$OOIP(m3) = \frac{A * h * \phi * (1 - Sw)}{Bo} * \frac{10,000m2}{ha}$$

or

$$OOIP(Mbbl) = \frac{A * h * \phi * (1 - Sw)}{Bo} * 3.28084 \frac{ft}{m} * 7,758.367 \frac{bbl}{acre * ft} * \frac{1Mbbl}{1,000bbl}$$

where

OOIP	= Original Oil in Place by LSD (Mbbl, or m3)
A	= Area (40acres, or 16.187 hectares, per LSD)
h * $\phi$	= Net Pay * Porosity, or Phi * h (ft, or m)
Bo	= Formation Volume Factor of Oil (stb/rb, or sm3/rm3)
Sw	= Water Saturation (decimal)

The initial oil formation volume factor was adopted from PVT information taken from the 100/02-17-009-29W1 and 100/13-19-009-28W1 Bakken wells and is thought to be representative of the fluid characteristics in the reservoir.

### **Historical Production**

A historical group production history plot for the proposed Ebor Unit No. 3 is shown as **Figure 4**. Oil production commenced from the proposed Unit area in October 1987 and peaked during February 2013 at 147.5 m<sup>3</sup> (OPD). As of May 2016, production was 34.9 m<sup>3</sup> OPD, 117.7 m<sup>3</sup> of water per day (WPD) and a 77.1% watercut.

From peak production in February 2013 to date, oil production is declining at an annual rate of approximately **22.6%** under the current Primary Production method. The remainder of the field's production and decline rates indicate the need for pressure restoration and maintenance. Waterflooding is deemed to be the most efficient means of secondary recovery to introduce energy back into the system and provide areal sweep between wells.

## **UNITIZATION**

Unitization and implementation of a Waterflood EOR project is forecasted to increase overall recovery of OOIP from the proposed project area.

### **Unit Name**

Tundra proposes that the official name of the new Unit shall be Ebor Unit No. 3.

### **Unit Operator**

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

### **Unitized Zone**

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

### **Unit Wells**

The 35 horizontal wells and 20 vertical wells to be included in the proposed Ebor Unit No. 3 are outlined in **Table 3**.

### **Unit Lands**

Ebor Unit No. 3 will consist of 144 LSDs as follows:

- Section 29 of Township 8, Range 29, W1M
- Section 30 of Township 8, Range 29, W1M
- Section 31 of Township 8, Range 29, W1M
- Section 32 of Township 8, Range 29, W1M
- Section 5 of Township 9, Range 29, W1M
- Section 6 of Township 9, Range 29, W1M
- Section 7 of Township 9, Range 29, W1M
- Section 8 of Township 9, Range 29, W1M
- Section 18 of Township 9, Range 29, W1M

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

### **Tract Factors**

The proposed Ebor Unit No. 3 will consist of 144 Tracts based on the 40 acre LSDs containing the existing 35 horizontal and 20 vertical wells.

The Tract Factor contribution for each of the LSD's within the proposed Ebor 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

Tract Factor calculations for all individual LSDs based on the above methodology are outlined within **Table 2**.

### **Working Interest Owners**

**Table 1** outlines the working interest (WI) for each recommended Tract within the proposed Ebor Unit No. 3. 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 Ebor Unit No. 3.

## **WATERFLOOD EOR DEVELOPMENT**

### **Technical Studies**

The waterflood performance predictions for the proposed Ebor Unit No. 3 Bakken project are based on internal engineering assessments. Project area specific reservoir and geological parameters were utilized and then compared to the Sinclair Unit No. 1 waterflood. Sensitivities were then applied to account for reservoir quality, initial well production, and proposed waterflood spacing in Ebor Unit No. 3.

### **Pre-Production of New Horizontal Injection Wells**

Primary production from the original vertical/horizontal producing wells in the proposed Ebor Unit No. 3 has declined significantly from peak rate indicating a need for secondary pressure support. It is anticipated that 17 existing producing horizontal wells and 2 future infill wells will be converted to horizontal injection wells upon approval as shown in **Figure 5**. This will result in effective 40 acre waterflood patterns within Ebor Unit No. 3. Since these proposed horizontal injection wells have already been on production for a period of time there will not be a need for an additional pre-production period within this unit. It has been observed that placing new horizontal wells immediately on water injection in areas without significant reservoir pressure depletion has been problematic in similar low permeability formations, and has a negative impact on the ultimate total recovery factor of OOIP. Consequently, Tundra believes an initial period of producing new wells prior to being placed on permanent water injection is essential and all Unit mineral owners will benefit.

Tundra monitors reservoir pressure, fluid production and decline rates in each pattern to determine when the well will be converted to water injection.

### **Reserves Recovery Profiles and Production Forecasts**

The primary waterflood performance predictions for the proposed Ebor 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 using Sinclair Unit No. 1 as an analogy with sensitivities applied to account for a waterflood pattern design of a horizontal injector with offsetting horizontal producers.

#### **Primary Production Forecast**

Cumulative production in the Ebor Unit No. 3 project area, to the end of May 2016 from 59 wells, was **225.0** e<sup>3</sup>m<sup>3</sup> of oil and **601.1** e<sup>3</sup>m<sup>3</sup> of water for a recovery factor of **4.0%** of the calculated Net OOIP.

Ultimate Primary Proved Producing oil reserves recovery for Ebor Unit No. 3 has been estimated to be **293.2** e<sup>3</sup>m<sup>3</sup>, or a **5.2%** Recovery Factor (RF) of OOIP. Remaining Producing Primary Reserves has been estimated to be **68.2** e<sup>3</sup>m<sup>3</sup> to the end of May 2016.

The expected production decline and forecasted cumulative oil recovery under continued Primary Production are shown in **Figures 7 and 8**.

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

Tundra will plan an injection conversion schedule to allow for the most expeditious development of the waterflood within the proposed Ebor Unit No. 3, while maximizing reservoir knowledge.

### Criteria for Conversion to Water Injection Well

Nineteen (19) water injection wells are required for this proposed unit as shown in **Figure 5**.

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

- Measured reservoir pressures at start of and/or through primary production
- Fluid production rates and any changes in decline rate
- Any observed production interference effects with adjacent vertical and horizontal wells
- Pattern mass balance and/or oil recovery factor estimates
- Reservoir pressure relative to bubble point pressure

The above schedule allows for the proposed Ebor Unit No. 3 project to be developed equitably, efficiently, and moves to 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 Sinclair Unit No. 1 waterflood (**Figure 6**). Sensitivities were then applied to account for reservoir quality, initial well production and the proposed waterflood spacing in Ebor Unit No. 3.

Secondary Waterflood plots of the expected oil production forecast over time and the expected oil production vs. cumulative oil are plotted in **Figures 9 and 10**, respectively. Total Secondary EUR for the proposed Ebor Unit No. 3 is estimated to be **422.2 e<sup>3</sup>m<sup>3</sup>** with **197.2 e<sup>3</sup>m<sup>3</sup>** remaining representing a total secondary recovery factor of **7.5%** for the proposed Unit area. An incremental **129.0 e<sup>3</sup>m<sup>3</sup>** of oil, or a **2.3%** recovery factor, are forecasted to be recovered under the proposed Unitization and Secondary EOR production scheme vs. the existing Primary Production method.

### Estimated Fracture Pressure

Completion data from the existing producing wells within the project area indicate an actual fracture pressure gradient range of 18.0 to 22.0 kPa/m true vertical depth (TVD).

## **WATERFLOOD OPERATING STRATEGY**

### **Water Source**

The injection water for the proposed Ebor Unit No. 3 will be supplied from the existing Sinclair 3-4-8-29W1 Battery source and injection water system. All existing injection water is obtained from the Lodgepole formation in the 102/16-32-7-29W1 licensed water source well. Lodgepole water from the 102/16-32 source well is pumped to the main Sinclair Units Water Plant at 3-4-8-29W1, filtered, and pumped up to injection system pressure. A diagram of the Sinclair water injection system and new pipeline connection to the proposed Ebor Unit No. 3 project area injection wells is shown as **Figure 11**.

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

Since all producing Middle Bakken/Three Forks wells in the Daly Sinclair areas, whether vertical or horizontal, have been hydraulically fractured, produced waters from these wells are inherently a mixture of Three Forks and Bakken native sources. This mixture of produced waters has been extensively tested for compatibility with 102/16-32 source Lodgepole water, by a highly qualified third party, prior to implementation by Tundra in Sinclair Unit 1. 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 Sinclair injection water facility. Review and monitoring of the source water scale inhibition system is also part of an existing routine maintenance program.

### **Injection Wells**

The water injection wells for the proposed Ebor Unit No. 3 will be current producing wells configured downhole for injection as shown in **Figure 12**. The horizontal injection wells will have been stimulated by multiple hydraulic fracture treatments to obtain suitable injection. Tundra has extensive experience with horizontal fracturing in the area, and all jobs are rigorously programmed and monitored during execution. This helps ensure optimum placement of each fracture stage to prevent, or minimize, the potential for out-of-zone fracture growth and thereby limit the potential for future out-of-zone injection.

The water injection wells will be placed on injection after approval to inject. Wellhead injection pressures will be maintained below the least value of either:

- the area specific known and calculated fracture gradient, or
- 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 water injection wells are surface equipped with injection volume metering and rate/pressure control. 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 Ebor Unit No. 3 horizontal water injection well rate is forecasted to average **10 - 40 m<sup>3</sup> WPD**, based on expected reservoir permeability and pressure.

### **Reservoir Pressure**

No representative initial pressure surveys are available for the proposed Ebor Unit No. 3 project area in the Bakken producing zone. The extremely long shut-in and build-up times required to obtain a possible representative reservoir pressures were economically prohibitive at the time of drilling these locations.

### **Reservoir Pressure Management during Waterflood**

Tundra expects it will take 2-4 years to re-pressurize the reservoir due to cumulative primary production voidage and pressure depletion. Initial monthly 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**

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

- Regular production well rate and WCT testing
- Daily water injection rate and pressure monitoring vs target
- Water injection rate/pressure/time vs. cumulative injection plot
- Reservoir pressure surveys as required to establish pressure trends
- Pattern VRR
- Potential use of chemical tracers to track water injector/producer responses
- Use of some or all of: 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 Ebor 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 Ebor Unit No. 3.

### **On Going Reservoir Pressure Surveys**

Any pressures taken during the operation of the proposed unit will be reported within the Annual Progress Reports for Ebor Unit No. 3 as per Section 73 of the Drilling and Production Regulation.

### **Economic Limits**

Under the current Primary recovery method, existing wells within the proposed Ebor 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 Ebor Unit No. 3 waterflood operation will utilize the existing Tundra operated source well supply and water plant (WP) facilities located at 3-4-8-29 W1M Battery. Injection wells will be connected to the existing high pressure water pipeline system supplying other Tundra-operated Waterflood Units.

A complete description of all planned system design and operational practices to prevent corrosion related failures is shown in **Figure 13**.

### **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 Ebor Unit No. 3. Copies of the notices and proof of service, to all surface and mineral rights owners will be forwarded to the Petroleum Branch when available to complete the Ebor Unit No. 3 Application.

Ebor Unit No. 3 Unitization, and execution of the formal Ebor Unit No. 3 Agreement by affected Mineral Owners, is expected during Q4 2016. Copies of same will be forwarded to the Petroleum Branch, when available, to complete the Ebor Unit No. 3 Application.

Should the Petroleum Branch have further questions or require more information, please contact Paul Khangura at 403.910.1660 or by email at [paul.khangura@tundraoilandgas.com](mailto:paul.khangura@tundraoilandgas.com).

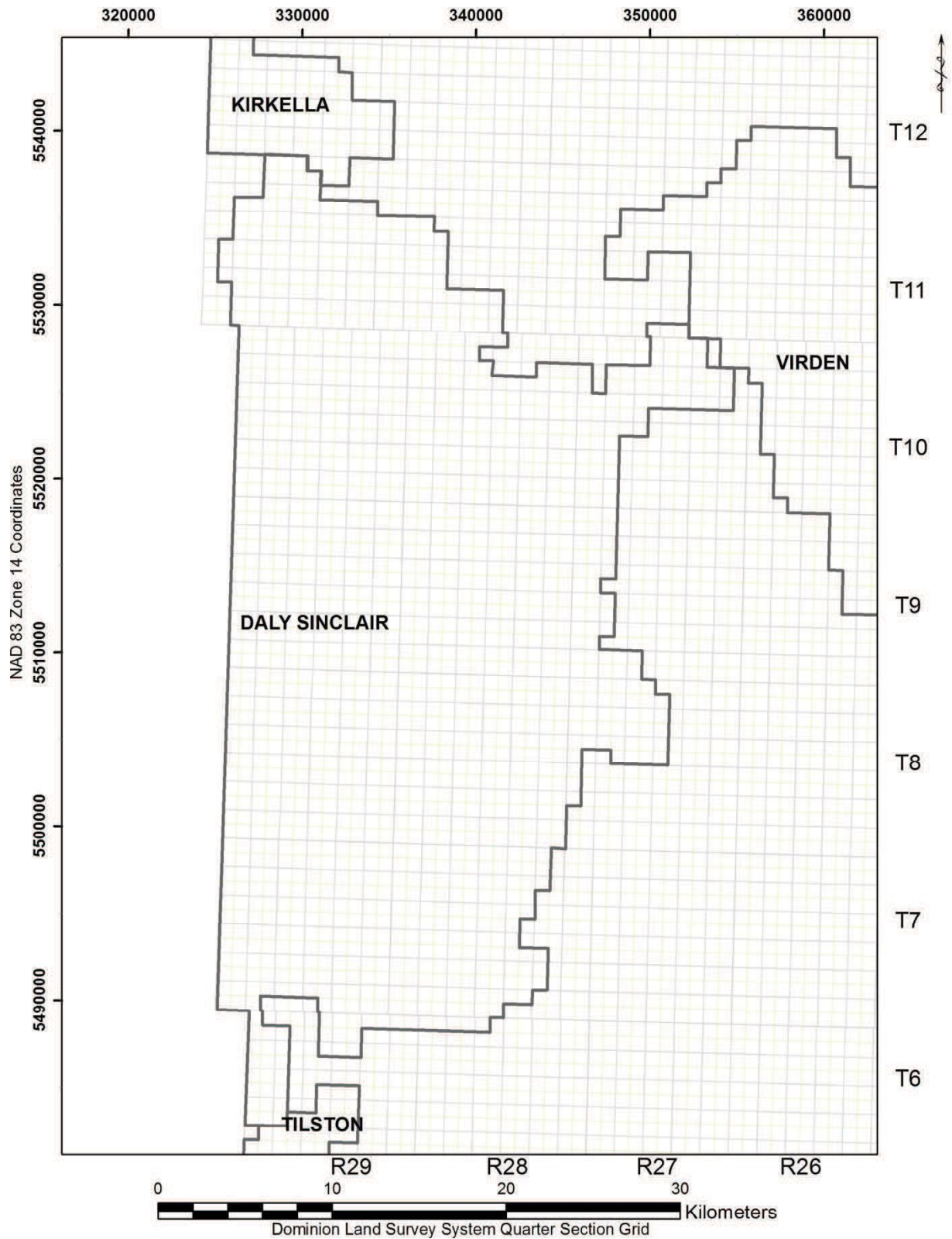
### **TUNDRA OIL & GAS PARTNERSHIP**

Original Signed by Paul Khangura, September 9, 2016, in Calgary, AB

**Proposed Ebor Unit No. 3**  
**Application for Enhanced Oil Recovery Waterflood Project**

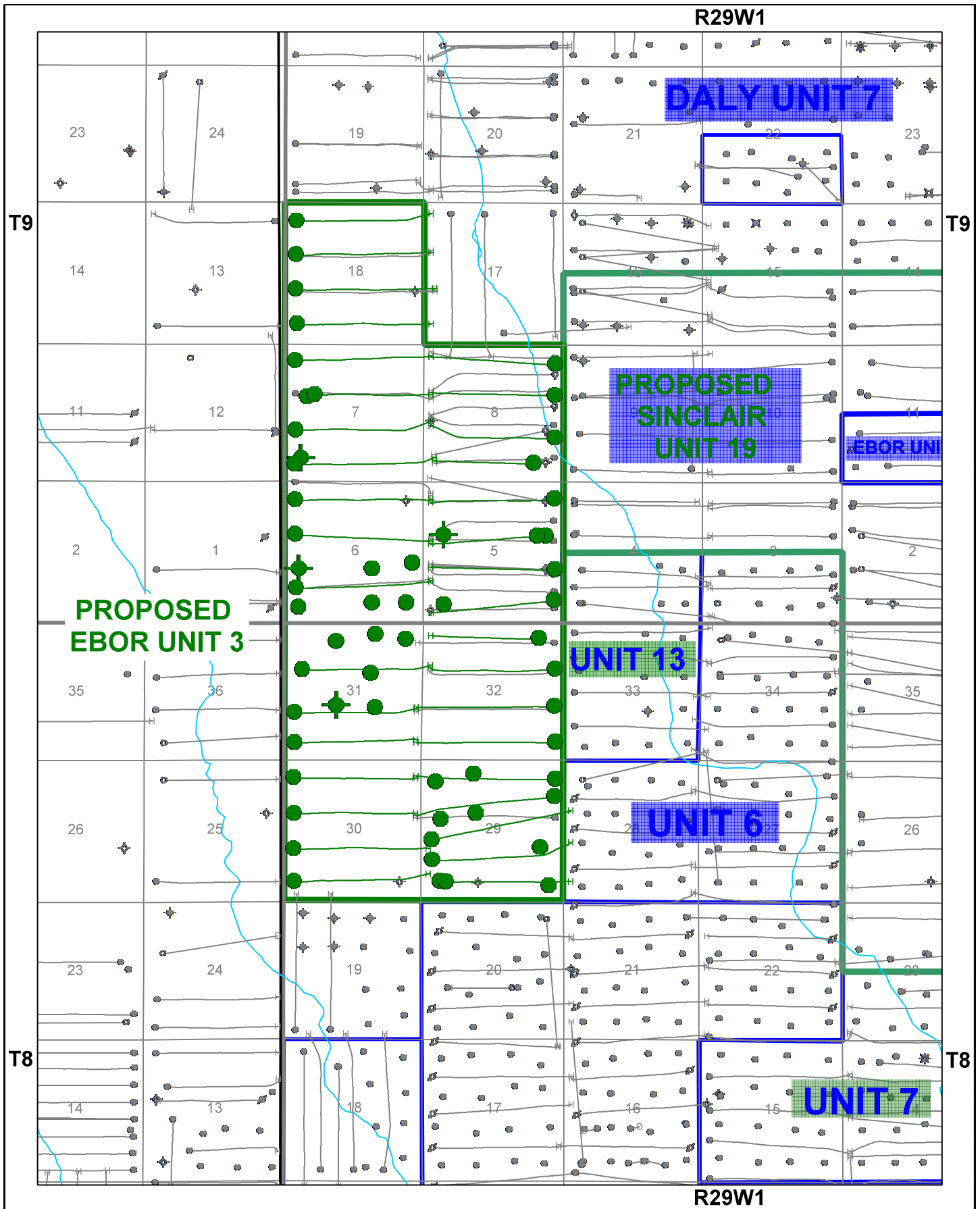
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**Figure 2 - Daly Sinclair Field (01)**

Figure No. 2





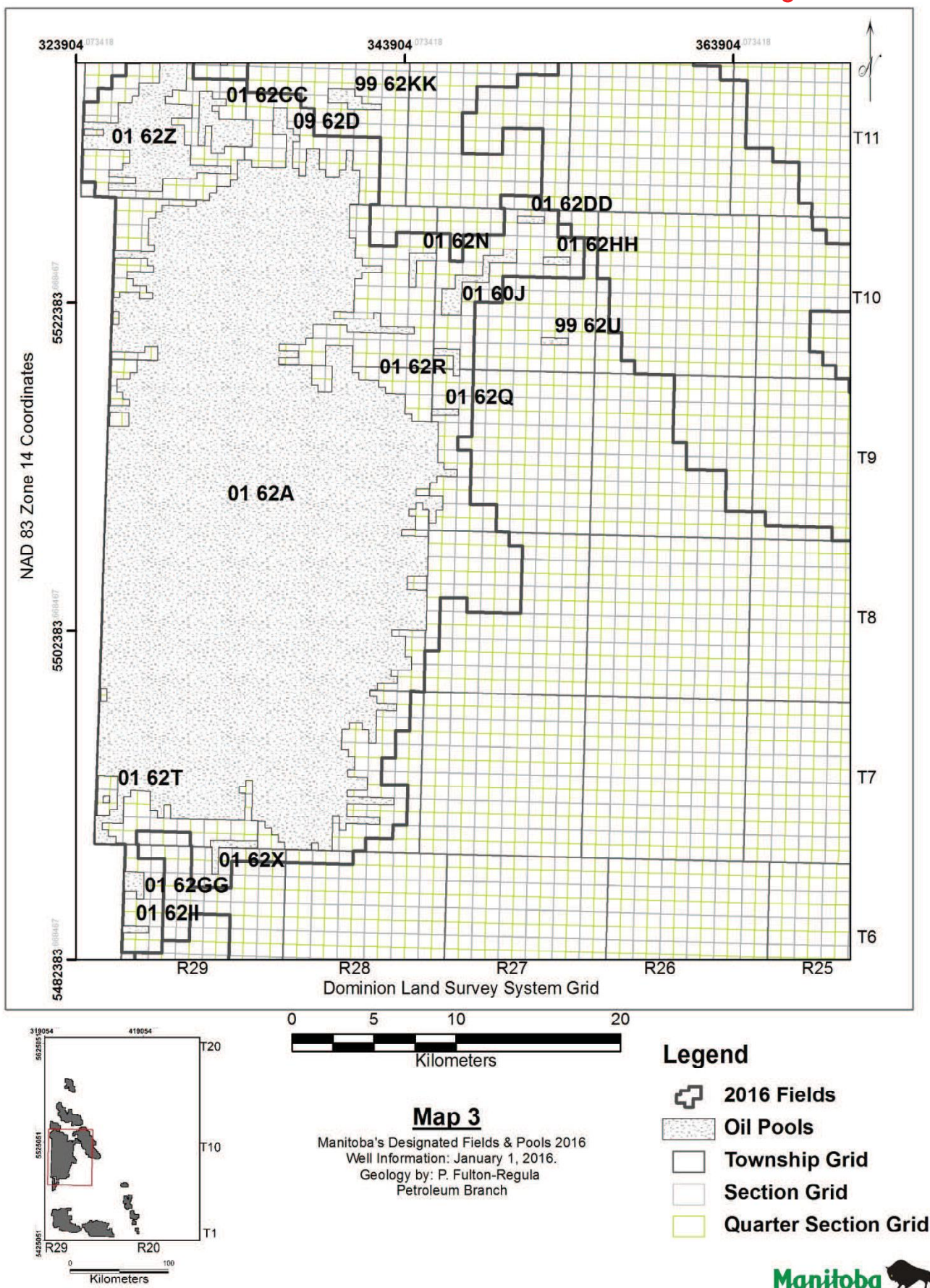


Figure 21 - Map 3 Bakken &amp; Bakken Torquay Formation Pools (60 &amp; 62)

# Well Information as of 6/16/2016 - Group Well Report

Figure No. 4

## Production Graph

<b>Group:</b>	ebor unit no. 3 well list.lwell	<b>On Prod:</b>	1987-10 to 2016-04	<b>Cum Oil:</b>	223585.6 m3
<b># of Wells:</b>	59	<b>Prod Form:</b>	BAKKEN; TORQUAY; THREEFK; LODGEPOLE; BAKKENU...	<b>Cum Gas:</b>	8.2 E3m3
<b>Fluid:</b>	Oil	<b>Field:</b>	DALY (1)	<b>Cum Wtr:</b>	597439.8 m3
<b>Mode:</b>	Producing; Abandoned; Abandoned Zone; Comingled	<b>Pool Code:</b>	62A; 0I	<b>Cum Inj Oil:</b>	0.0 m3
		<b>Unit Code:</b>		<b>Cum Inj Gas:</b>	0.0 E3m3
				<b>Cum Inj Wtr:</b>	0.0 m3

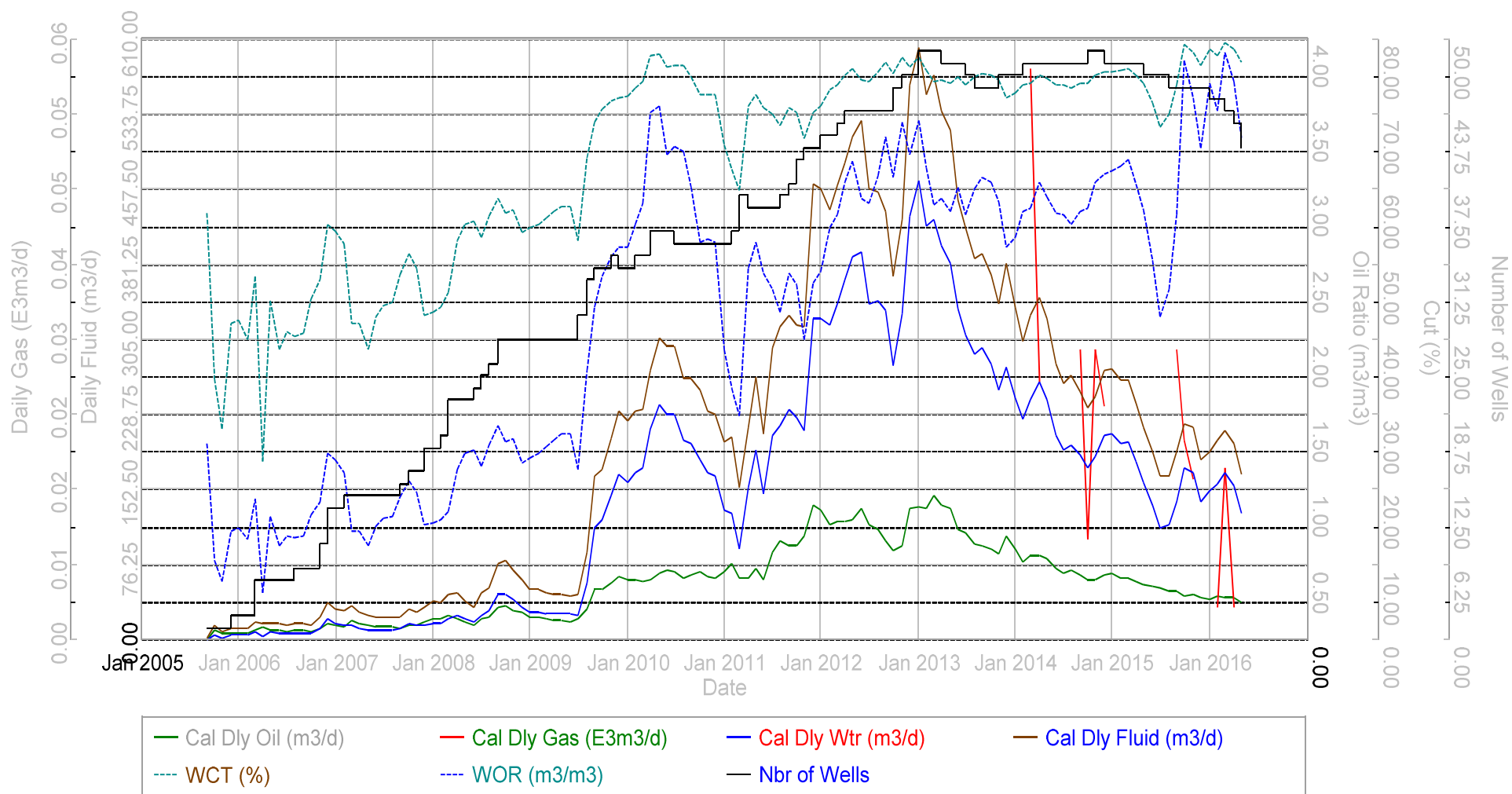
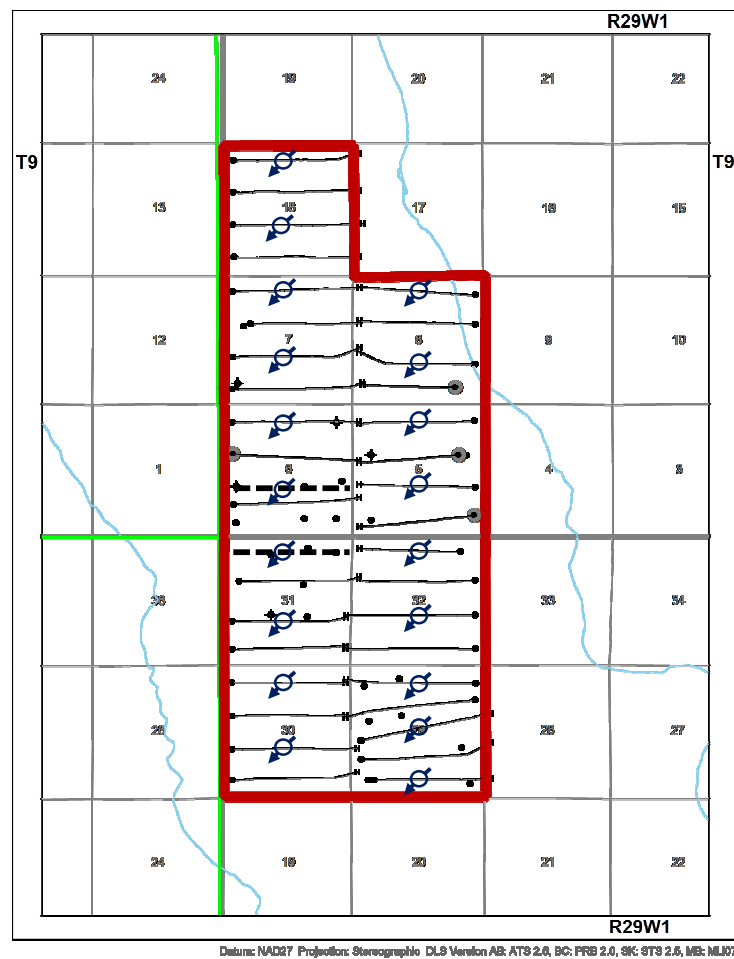


Figure No. 5

**Proposed EBOR UNIT 3  
Development**

2 – Infill produce first  
injectors to be drilled

17 – Existing producers to be  
converted to injectors





# Well Information as of 8/17/2016 - Group Well Report

Figure No. 6

## Production Graph

<b>Group:</b>	sinclair unit no. 1 well list wo co2 wells.lwell	<b>On Prod:</b>	2004-07 to 2016-06	<b>Cum Oil:</b>	1487887.0 m3
<b># of Wells:</b>	190	<b>Prod Form:</b>	BAKKEN; TORQUAY; THREEFK; BAKKENU; BAKKENM	<b>Cum Gas:</b>	206.9 E3m3
<b>Fluid:</b>	Oil; Water Injection	<b>Field:</b>	DALY (1)	<b>Cum Wtr:</b>	308708.4 m3
<b>Mode:</b>	Producing; Injection; Abandoned	<b>Pool Code:</b>	62A	<b>Cum Inj Oil:</b>	0.0 m3
		<b>Unit Code:</b>	162A01	<b>Cum Inj Gas:</b>	0.0 E3m3
				<b>Cum Inj Wtr:</b>	1696904.1 m3

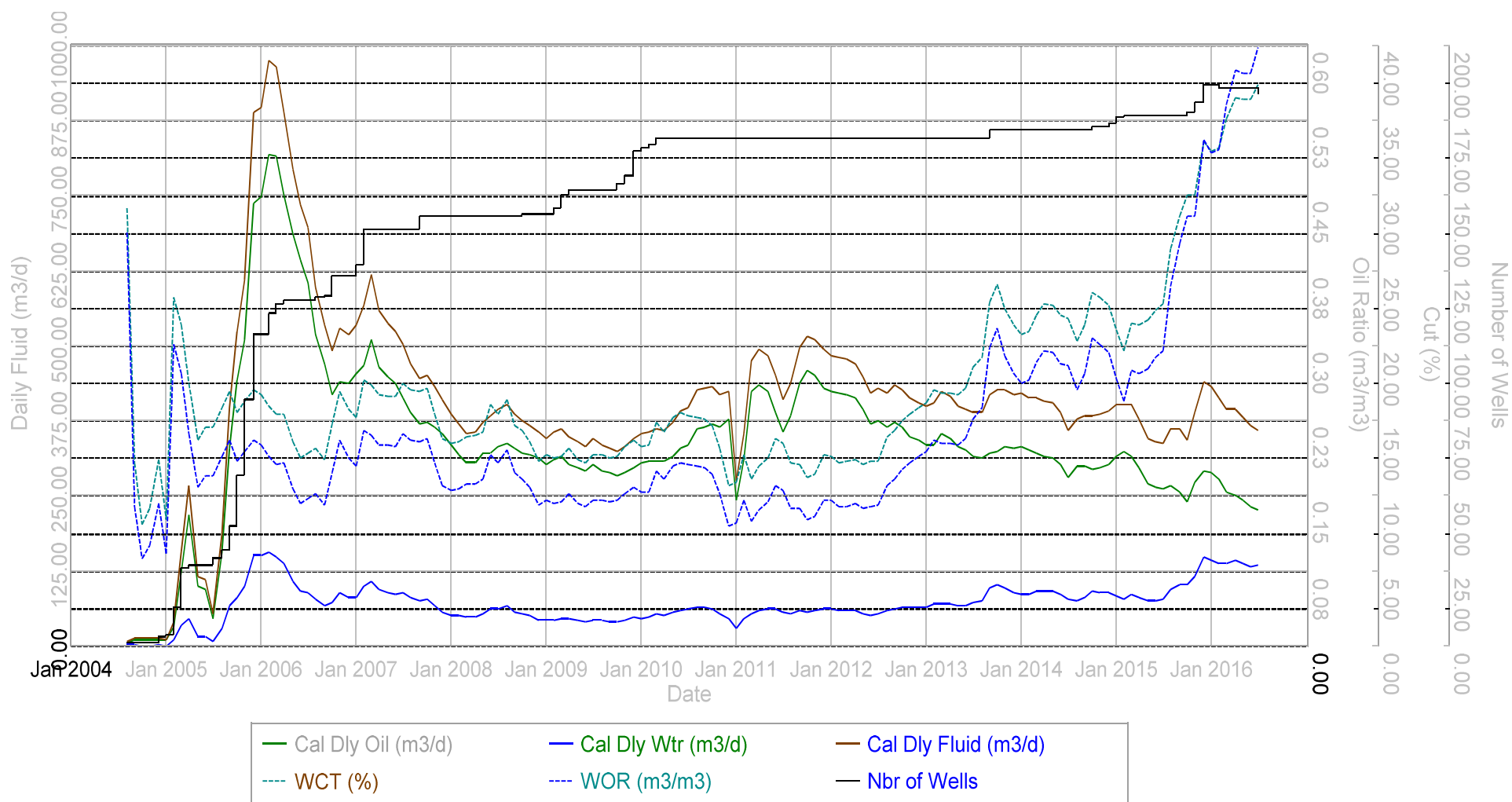


Figure No. 7

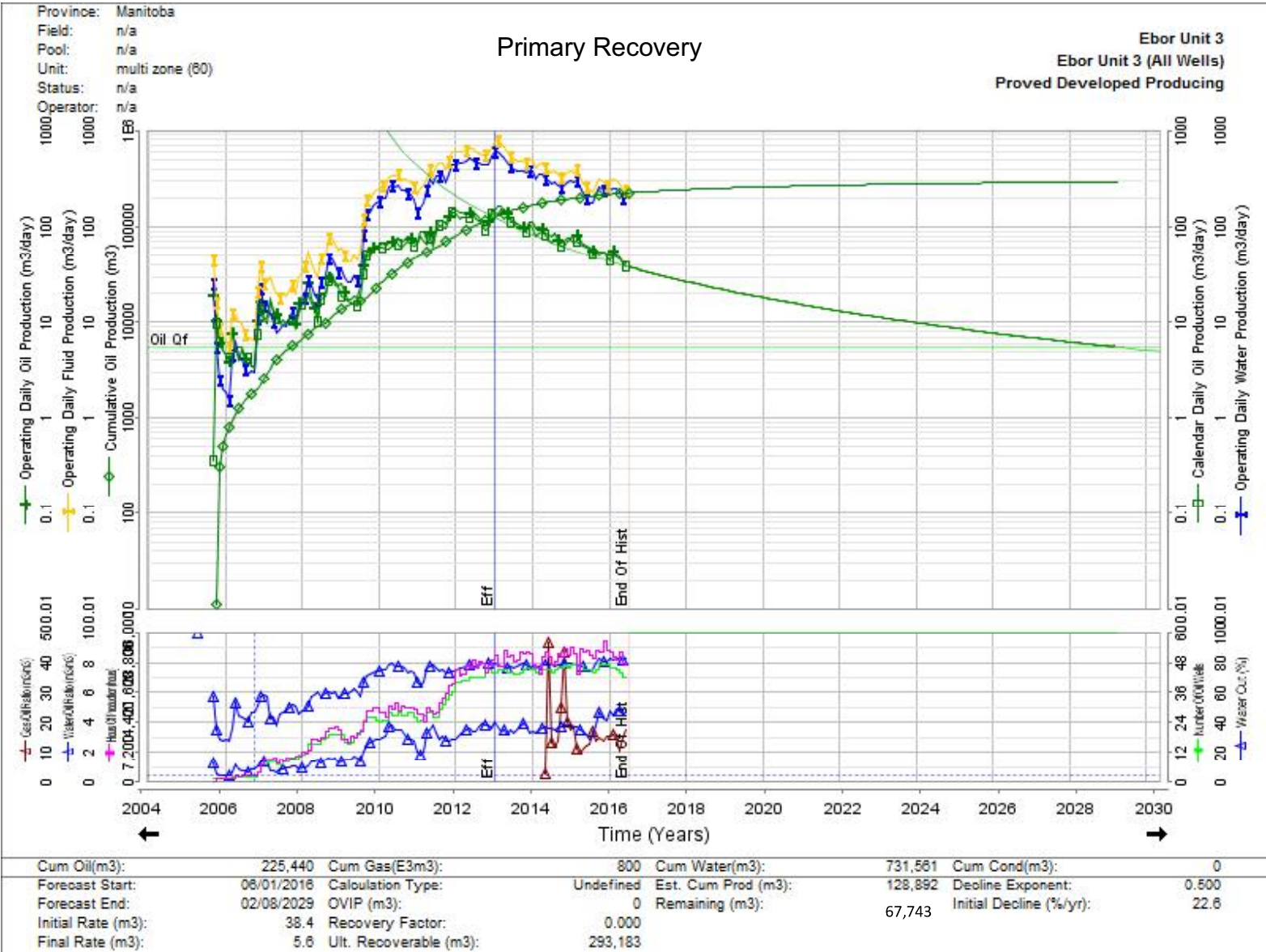


Figure No. 8

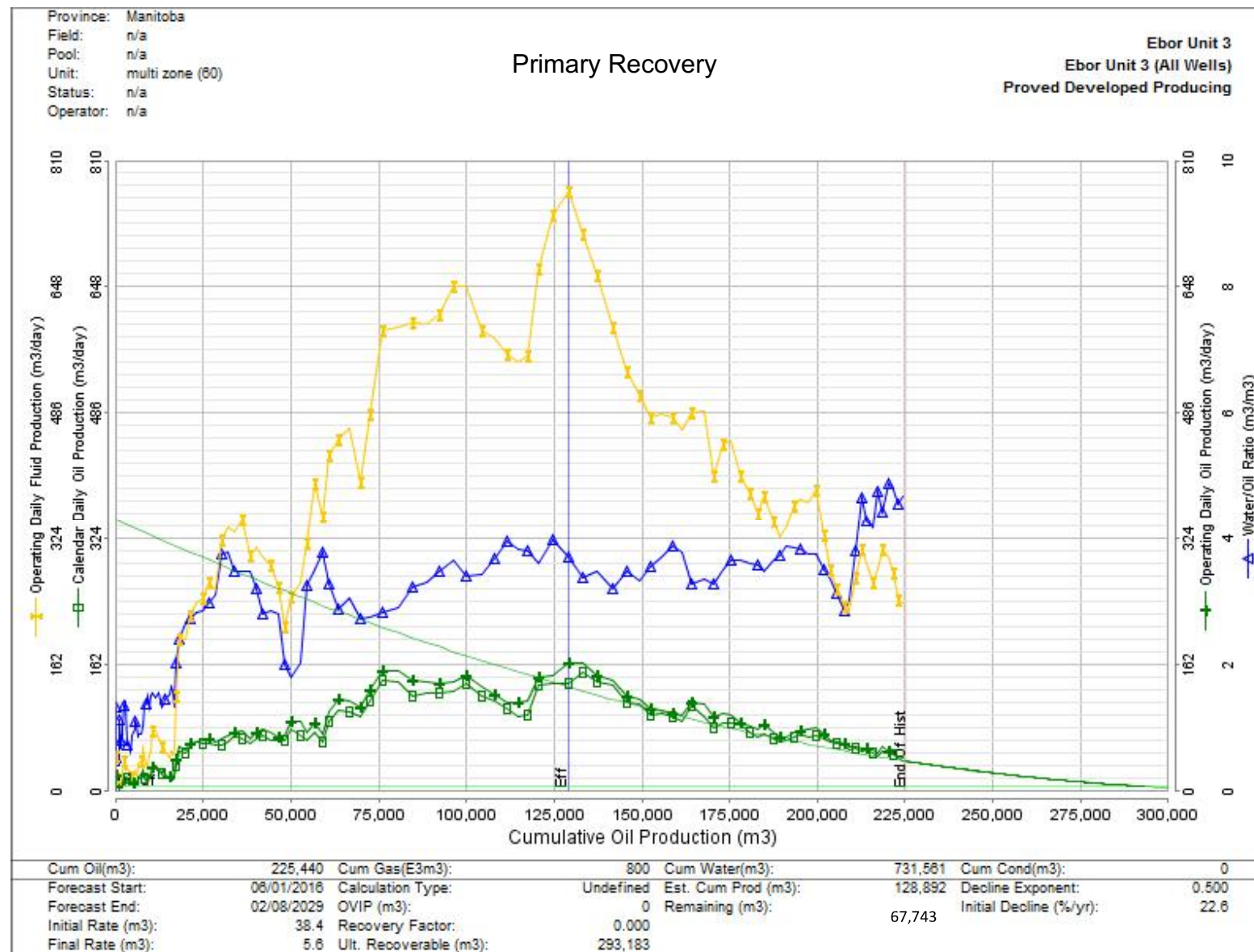


Figure No. 9

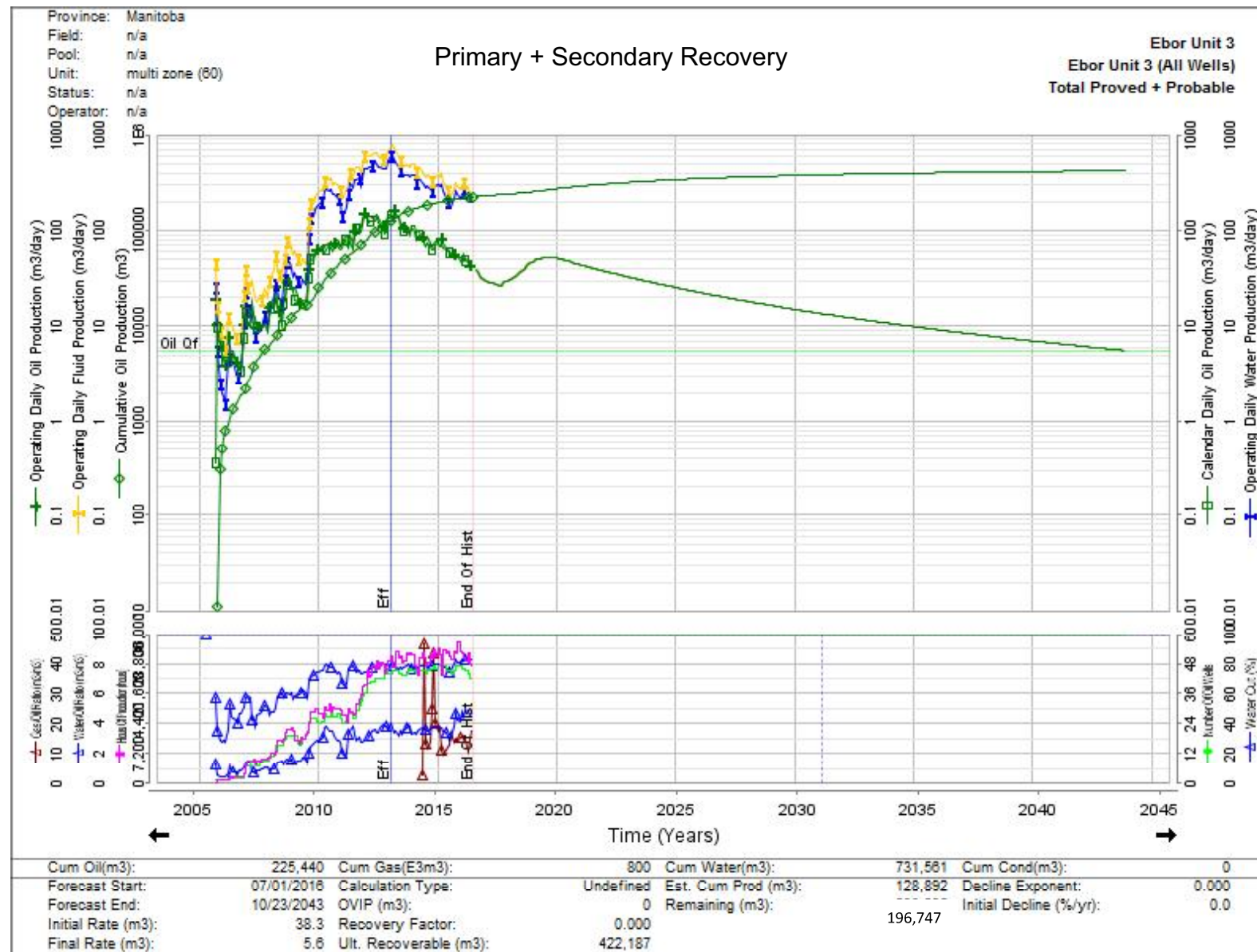




Figure No. 10

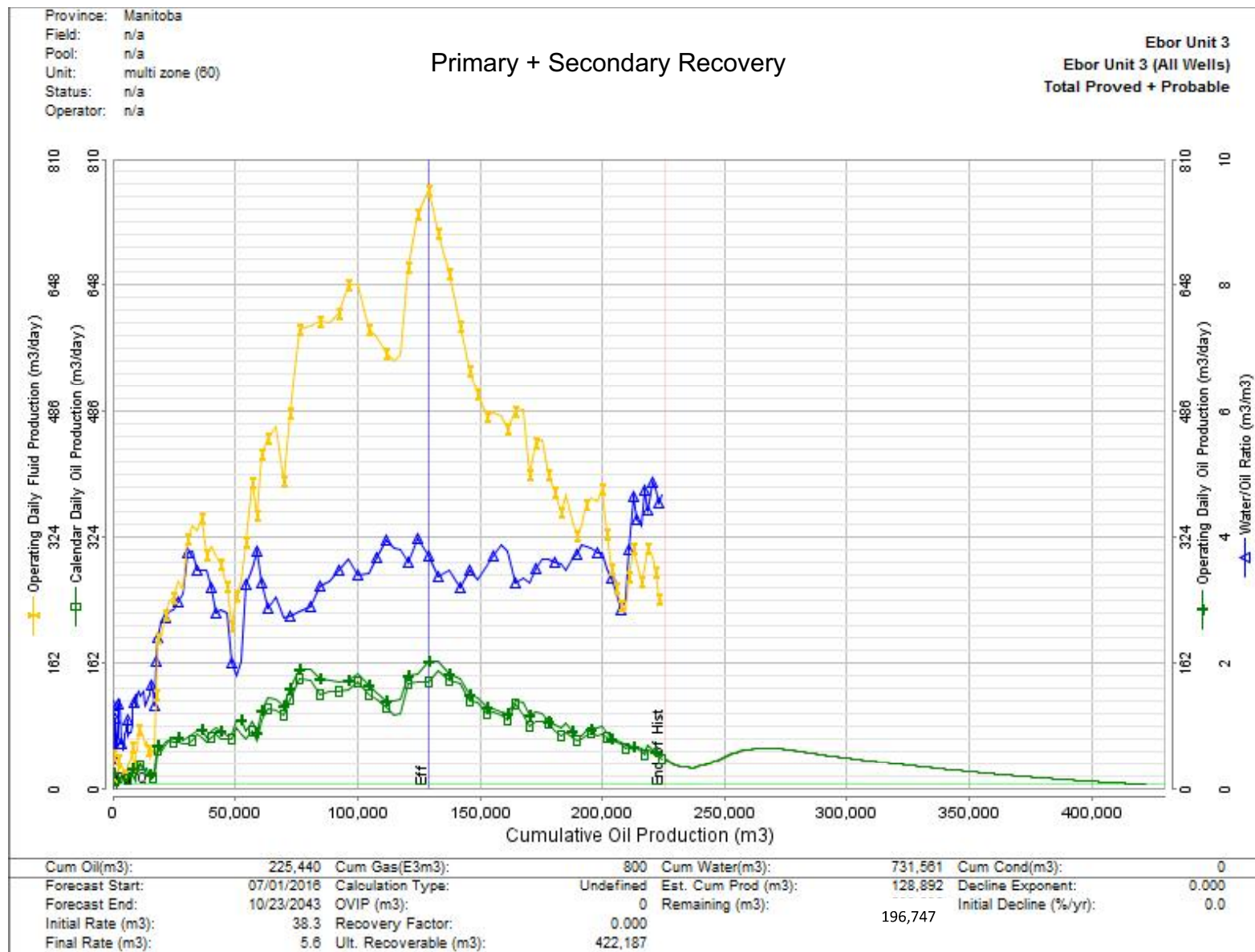
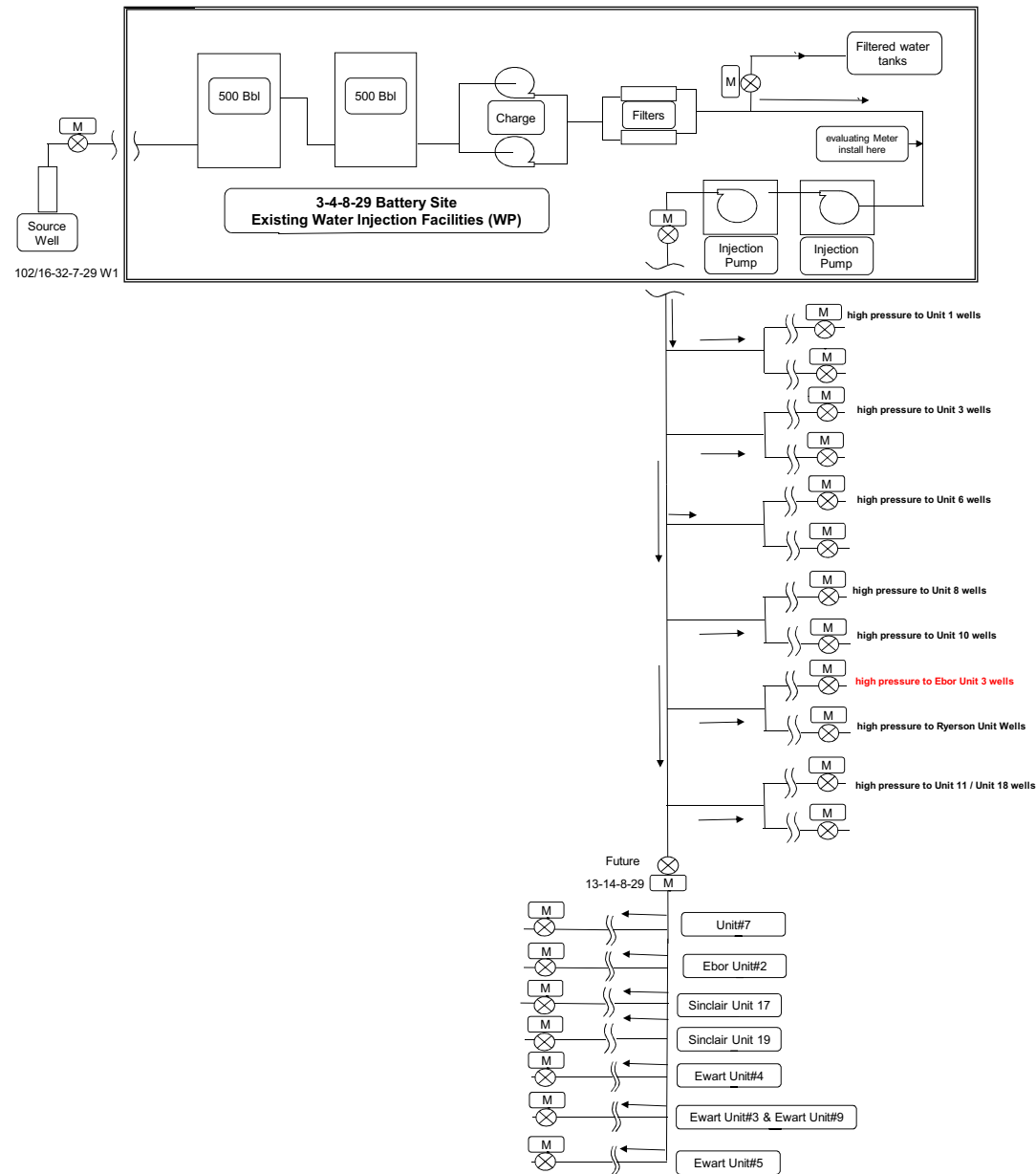
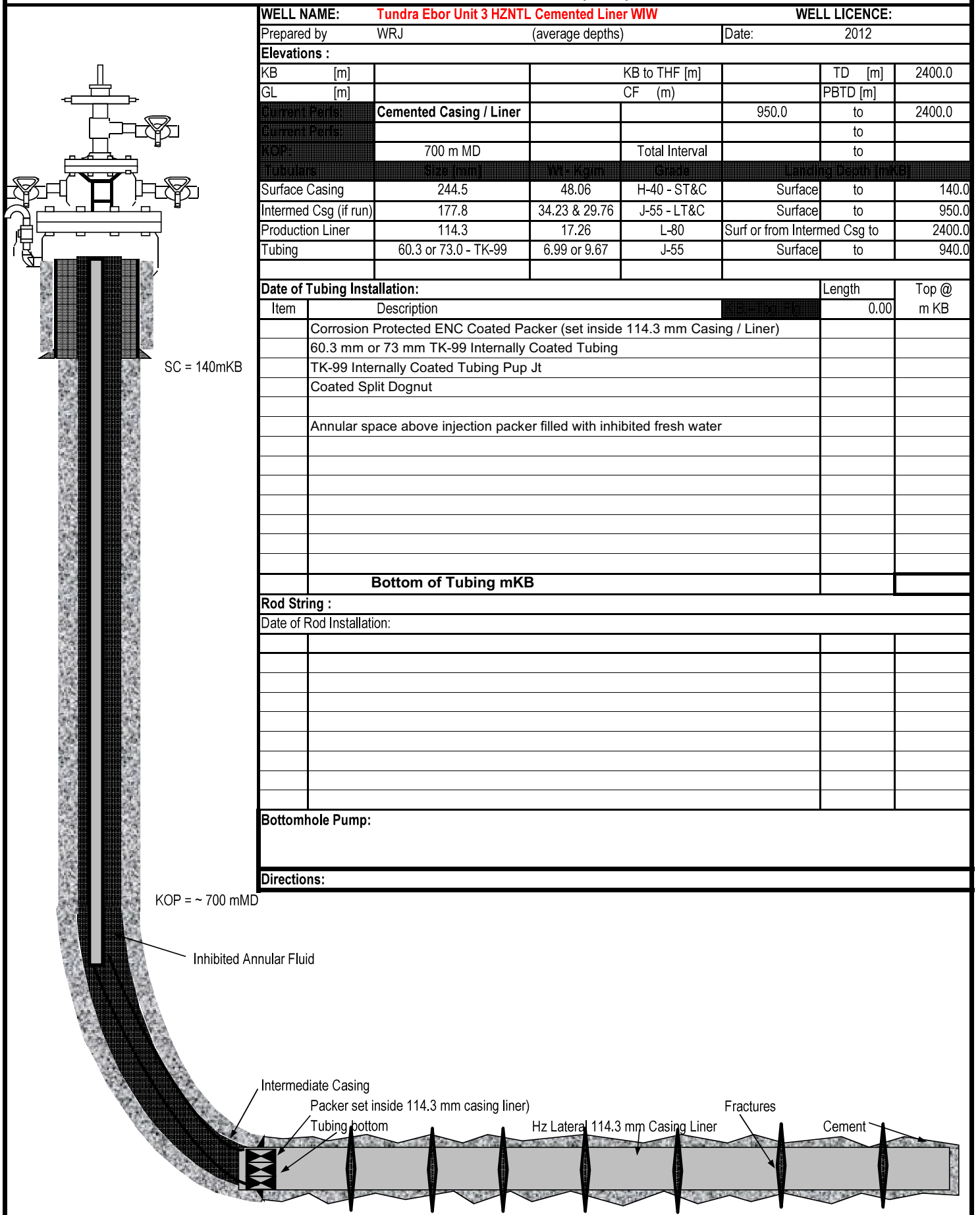


FIGURE 11

# Sinclair Water Injection System



## TYPICAL CEMENTED LINER WATER INJECTION WELL (WIW) DOWNHOLE DIAGRAM

[illegible]

# **Ebor Unit No. 3**

## **EOR Waterflood Project**

### **Planned Corrosion Control Program \*\***

#### **Source Well**

- Continuous downhole corrosion inhibition
- Continuous surface corrosion inhibitor injection
- Downhole scale inhibitor injection
- Corrosion resistant valves and internally coated surface piping

#### **Pipelines**

- Source well to 3-4-8-29 Water Plant – Fiberglass
- New High Pressure Pipeline to Unit 9 injection wells – 2000 psi high pressure Fiberglass

#### **Facilities**

- 3-4-8-29 Water Plant and New Injection Pump Station
  - Plant piping – 600 ANSI schedule 80 pipe, Fiberglass or Internally coated
  - Filtration – Stainless steel bodies and PVC piping
  - Pumping – Ceramic plungers, stainless steel disc valves
  - Tanks – Fiberglass shell, corrosion resistant valves

#### **Injection Wellhead / Surface Piping**

- Corrosion resistant valves and stainless steel and/or internally coated steel surface piping

#### **Injection Well**

- Casing cathodic protection where required
- Wetted surfaces coated downhole packer
- Corrosion inhibited water in the annulus between tubing / casing
- Internally coated tubing surface to packer
- Surface freeze protection of annular fluid
- Corrosion resistant master valve
- Corrosion resistant pipeline valve

#### **Producing Wells**

- Casing cathodic protection where required
- Downhole batch corrosion inhibition as required
- Downhole scale inhibitor injection as required

**Figure 13**

\*\* subject to final design and engineering



**Proposed Ebor Unit No. 3**  
**Application for Enhanced Oil Recovery Waterflood Project**

**List of Tables**

Table 1	Tract Participation
Table 2	Tract Factor Calculation
Table 3	Current Well List and Status
Table 4	Original Oil in Place and Recovery Factors

**TABLE NO. 2: TRACT FACTOR CALCULATIONS FOR EBOR BAKKEN UNIT NO. 3**  
**TRACT FACTORS BASED ON OIL-IN-PLACE (OOIP) - CUMULATIVE PRODUCTION TO APRIL 2016**

LSD-SEC	Tract	OOIP (m3)	HZ Wells Alloc Prod (m3)	Vert Wells Cum Prod (m3)	Sum H2 + Vert Alloc Cum Prodn	OOIP - Cum	OOIP Tract Factor (%)	Tract
01-29	01-29-008-29W1M	44,739	1,144.2	2,316.4	3,460.6	41,278	0.7706202%	01-29-008-29W1M
02-29	02-29-008-29W1M	36,510	1,215.4		1,215.4	35,294	0.6589065%	02-29-008-29W1M
03-29	03-29-008-29W1M	32,403	1,332.1		1,332.1	31,071	0.5800604%	03-29-008-29W1M
04-29	04-29-008-29W1M	37,529	831.5	7,221.3	8,052.8	29,476	0.5502856%	04-29-008-29W1M
05-29	05-29-008-29W1M	31,631	2,229.5		2,229.5	29,401	0.5488821%	05-29-008-29W1M
06-29	06-29-008-29W1M	32,739	1,741.5		1,741.5	30,997	0.5786814%	06-29-008-29W1M
07-29	07-29-008-29W1M	38,157	1,149.6		1,149.6	37,007	0.6908836%	07-29-008-29W1M
08-29	08-29-008-29W1M	44,787	982.5	1,334.4	2,316.9	42,470	0.7928626%	08-29-008-29W1M
09-29	09-29-008-29W1M	38,426	2,103.9		2,103.9	36,322	0.6780838%	09-29-008-29W1M
10-29	10-29-008-29W1M	35,519	2,244.9		2,244.9	33,274	0.6211945%	10-29-008-29W1M
11-29	11-29-008-29W1M	32,392	1,728.9	377.4	2,106.3	30,286	0.5653989%	11-29-008-29W1M
12-29	12-29-008-29W1M	33,254	1,045.5	1,375.0	2,420.5	30,833	0.5756215%	12-29-008-29W1M
13-29	13-29-008-29W1M	35,011	907.4	706.7	1,614.1	33,396	0.6234727%	13-29-008-29W1M
14-29	14-29-008-29W1M	31,200	999.4	500.8	1,500.2	29,699	0.5544545%	14-29-008-29W1M
15-29	15-29-008-29W1M	33,720	1,182.9		1,182.9	32,537	0.6074230%	15-29-008-29W1M
16-29	16-29-008-29W1M	35,728	1,264.9		1,264.9	34,463	0.6433779%	16-29-008-29W1M
01-30	01-30-008-29W1M	26,643	703.4		703.4	25,940	0.4842641%	01-30-008-29W1M
02-30	02-30-008-29W1M	24,230	735.9		735.9	23,494	0.4386019%	02-30-008-29W1M
03-30	03-30-008-29W1M	20,985	719.0		719.0	20,266	0.3783379%	03-30-008-29W1M
04-30	04-30-008-29W1M	18,120	682.2		682.2	17,438	0.3255392%	04-30-008-29W1M
05-30	05-30-008-29W1M	22,247	1,265.1		1,265.1	20,982	0.3917098%	05-30-008-29W1M
06-30	06-30-008-29W1M	24,432	1,323.7		1,323.7	23,108	0.4313967%	06-30-008-29W1M
07-30	07-30-008-29W1M	26,587	1,352.3		1,352.3	25,235	0.4711099%	07-30-008-29W1M
08-30	08-30-008-29W1M	28,233	1,253.4		1,253.4	26,980	0.5036772%	08-30-008-29W1M
09-30	09-30-008-29W1M	32,088	551.4		551.4	31,537	0.5887583%	09-30-008-29W1M
10-30	10-30-008-29W1M	30,343	954.3		954.3	29,388	0.5486475%	10-30-008-29W1M

LSD-SEC	Tract	OoIP (m3)	HZ Wells Alloc Prod (m3)	Vert Wells Cum Prodn (m3)	Sum HZ + Vert Alloc Cum Prodn	OoIP - Cum	OoIP Tract Factor (%)	Tract
11-30	11-30-008-29W1M	28,634	930.8		930.8	27,703	0.5171788%	11-30-008-29W1M
12-30	12-30-008-29W1M	26,537	890.2		890.2	25,646	0.4787884%	12-30-008-29W1M
13-30	13-30-008-29W1M	31,057	1,289.2		1,289.2	29,767	0.5557212%	13-30-008-29W1M
14-30	14-30-008-29W1M	33,125	1,327.8		1,327.8	31,797	0.5936160%	14-30-008-29W1M
15-30	15-30-008-29W1M	34,316	1,373.6		1,373.6	32,942	0.6149917%	15-30-008-29W1M
16-30	16-30-008-29W1M	35,995	832.5		832.5	35,162	0.6564377%	16-30-008-29W1M
01-31	01-31-008-29W1M	37,189	252.3		252.3	36,936	0.6895587%	01-31-008-29W1M
02-31	02-31-008-29W1M	37,038	454.4		454.4	36,583	0.6829667%	02-31-008-29W1M
03-31	03-31-008-29W1M	38,103	439.2		439.2	37,664	0.7031366%	03-31-008-29W1M
04-31	04-31-008-29W1M	36,998	420.4		420.4	36,578	0.6828592%	04-31-008-29W1M
05-31	05-31-008-29W1M	42,284	730.2		730.2	41,554	0.7757657%	05-31-008-29W1M
06-31	06-31-008-29W1M	44,494	764.6	93.0	857.6	43,637	0.8146429%	06-31-008-29W1M
07-31	07-31-008-29W1M	40,141	783.2	267.1	1,050.3	39,091	0.7297791%	07-31-008-29W1M
08-31	08-31-008-29W1M	38,523	481.9		481.9	38,041	0.7101750%	08-31-008-29W1M
09-31	09-31-008-29W1M	49,906	794.2		794.2	49,112	0.9168627%	09-31-008-29W1M
10-31	10-31-008-29W1M	60,480	844.8	939.6	1,784.4	58,696	1.0957853%	10-31-008-29W1M
11-31	11-31-008-29W1M	57,108	834.5		834.5	56,274	1.0505648%	11-31-008-29W1M
12-31	12-31-008-29W1M	52,329	612.5		612.5	51,717	0.9654881%	12-31-008-29W1M
13-31	13-31-008-29W1M	65,660	0.0		0.0	65,660	1.2257982%	13-31-008-29W1M
14-31	14-31-008-29W1M	75,584	0.0	1,859.8	1,859.8	73,724	1.3763471%	14-31-008-29W1M
15-31	15-31-008-29W1M	75,017	0.0	3,406.7	3,406.7	71,610	1.3368722%	15-31-008-29W1M
16-31	16-31-008-29W1M	59,092	0.0	2,797.8	2,797.8	56,295	1.0509541%	16-31-008-29W1M
01-32	01-32-008-29W1M	34,311	2,312.8		2,312.8	31,998	0.5973703%	01-32-008-29W1M
02-32	02-32-008-29W1M	34,435	2,412.6		2,412.6	32,022	0.5978220%	02-32-008-29W1M
03-32	03-32-008-29W1M	33,666	2,414.5		2,414.5	31,251	0.5834203%	03-32-008-29W1M
04-32	04-32-008-29W1M	35,682	2,040.1		2,040.1	33,641	0.6280453%	04-32-008-29W1M
05-32	05-32-008-29W1M	37,089	2,764.5		2,764.5	34,324	0.6407907%	05-32-008-29W1M
06-32	06-32-008-29W1M	35,855	2,879.5		2,879.5	32,975	0.6156096%	06-32-008-29W1M
07-32	07-32-008-29W1M	34,144	2,882.3		2,882.3	31,262	0.5836218%	07-32-008-29W1M
08-32	08-32-008-29W1M	32,580	2,719.5		2,719.5	29,860	0.5574540%	08-32-008-29W1M

LSD-SEC	Tract	OoIP (m3)	HZ Wells Alloc Prod (m3)	Vert Wells Cum Prod (m3)	Sum HZ + Vert Alloc Cum Prodn	OoIP - Cum	OoIP Tract Factor (%)	Tract
09-32	09-32-008-29W1M	29,282	1,953.1	1,953.1	1,953.1	27,329	0.5102029%	09-32-008-29W1M
10-32	10-32-008-29W1M	33,610	2,043.9	2,043.9	2,043.9	31,566	0.5893013%	10-32-008-29W1M
11-32	11-32-008-29W1M	36,578	2,041.8	2,041.8	2,041.8	34,536	0.6447533%	11-32-008-29W1M
12-32	12-32-008-29W1M	40,122	1,183.2	1,183.2	1,183.2	38,939	0.7269432%	12-32-008-29W1M
13-32	13-32-008-29W1M	42,642	560.9	560.9	560.9	42,081	0.7856050%	13-32-008-29W1M
14-32	14-32-008-29W1M	38,081	972.5	972.5	972.5	37,108	0.6927647%	14-32-008-29W1M
15-32	15-32-008-29W1M	34,368	972.2	972.2	972.2	33,396	0.6234650%	15-32-008-29W1M
16-32	16-32-008-29W1M	29,708	490.5	490.5	490.5	29,218	0.5454640%	16-32-008-29W1M
01-05	01-05-009-29W1M	31,177	1,207.2	1,207.2	1,207.2	29,970	0.5595083%	01-05-009-29W1M
02-05	02-05-009-29W1M	35,249	1,299.3	1,299.3	1,299.3	33,950	0.6338022%	02-05-009-29W1M
03-05	03-05-009-29W1M	39,526	1,302.0	1,302.0	1,302.0	38,224	0.7135935%	03-05-009-29W1M
04-05	04-05-009-29W1M	50,129	728.1	1,111.2	1,839.3	48,289	0.9015056%	04-05-009-29W1M
05-05	05-05-009-29W1M	42,927	1,125.1	1,125.1	1,125.1	41,801	0.7803850%	05-05-009-29W1M
06-05	06-05-009-29W1M	37,869	1,905.3	1,905.3	1,905.3	35,964	0.6714035%	06-05-009-29W1M
07-05	07-05-009-29W1M	37,982	1,883.5	1,883.5	1,883.5	36,099	0.6739169%	07-05-009-29W1M
08-05	08-05-009-29W1M	36,799	1,815.1	1,815.1	1,815.1	34,984	0.6531124%	08-05-009-29W1M
09-05	09-05-009-29W1M	43,733	1,129.8	887.7	2,017.5	41,715	0.7787726%	09-05-009-29W1M
10-05	10-05-009-29W1M	40,626	1,129.8	1,129.8	1,129.8	39,496	0.7373481%	10-05-009-29W1M
11-05	11-05-009-29W1M	36,847	1,129.8	1,129.8	1,129.8	35,717	0.6667963%	11-05-009-29W1M
12-05	12-05-009-29W1M	33,982	1,129.8	55.5	1,185.3	32,797	0.61222749%	12-05-009-29W1M
13-05	13-05-009-29W1M	33,694	606.5		606.5	33,088	0.6177084%	13-05-009-29W1M
14-05	14-05-009-29W1M	36,992	1,038.6		1,038.6	35,953	0.6711991%	14-05-009-29W1M
15-05	15-05-009-29W1M	41,411	1,040.1		1,040.1	40,371	0.7536850%	15-05-009-29W1M
16-05	16-05-009-29W1M	43,629	992.7		992.7	42,637	0.7959758%	16-05-009-29W1M
01-06	01-06-009-29W1M	63,768	528.0	2,348.8	2,876.8	60,891	1.1367707%	01-06-009-29W1M
02-06	02-06-009-29W1M	71,123	744.7	1,526.2	2,270.9	68,852	1.2853875%	02-06-009-29W1M
03-06	03-06-009-29W1M	68,371	860.2		860.2	67,511	1.2603448%	03-06-009-29W1M
04-06	04-06-009-29W1M	65,005	897.5	3,451.7	4,349.2	60,656	1.1323754%	04-06-009-29W1M
05-06	05-06-009-29W1M	46,990	545.3	102.3	647.6	46,343	0.8651638%	05-06-009-29W1M
06-06	06-06-009-29W1M	50,517	709.8		709.8	49,807	0.9298342%	06-06-009-29W1M
07-06	07-06-009-29W1M	57,588	824.0	1,271.6	2,095.6	55,493	1.0359848%	07-06-009-29W1M

LSD-SEC	Tract	OoIP (m3)	HZ Wells Alloc Prod (m3)	Vert Wells Cum Prodn (m3)	Sum Hz + Vert Alloc Cum Prodn	OoIP - Cum	OoIP Tract Factor (%)	Tract
08-06	08-06-009-29W1M	57,644	946.1	3,397.3	4,343.4	53,301	0.9950597%	08-06-009-29W1M
09-06	09-06-009-29W1M	37,322	1,754.1		1,754.1	35,568	0.6640159%	09-06-009-29W1M
10-06	10-06-009-29W1M	37,670	1,773.0		1,773.0	35,897	0.6701631%	10-06-009-29W1M
11-06	11-06-009-29W1M	36,826	1,774.4		1,774.4	35,052	0.6543763%	11-06-009-29W1M
12-06	12-06-009-29W1M	33,960	1,700.9		1,700.9	32,259	0.6022340%	12-06-009-29W1M
13-06	13-06-009-29W1M	32,694	1,089.5		1,089.5	31,605	0.5900215%	13-06-009-29W1M
14-06	14-06-009-29W1M	34,441	1,144.5		1,144.5	33,297	0.6216145%	14-06-009-29W1M
15-06	15-06-009-29W1M	33,917	1,152.9		1,152.9	32,764	0.6116625%	15-06-009-29W1M
16-06	16-06-009-29W1M	31,745	1,047.4		1,047.4	30,698	0.5730884%	16-06-009-29W1M
01-07	01-07-009-29W1M	33,826	803.6		803.6	33,022	0.6164913%	01-07-009-29W1M
02-07	02-07-009-29W1M	34,282	966.7		966.7	33,316	0.6219653%	02-07-009-29W1M
03-07	03-07-009-29W1M	34,039	958.4		958.4	33,081	0.6175798%	03-07-009-29W1M
04-07	04-07-009-29W1M	30,643	918.0	266.1	1,184.1	29,459	0.5499676%	04-07-009-29W1M
05-07	05-07-009-29W1M	38,540	1,279.4		1,279.4	37,261	0.6956133%	05-07-009-29W1M
06-07	06-07-009-29W1M	38,597	1,370.1		1,370.1	37,227	0.6949892%	06-07-009-29W1M
07-07	07-07-009-29W1M	36,893	1,383.9		1,383.9	35,509	0.6629137%	07-07-009-29W1M
08-07	08-07-009-29W1M	36,308	1,268.8		1,268.8	35,039	0.6541391%	08-07-009-29W1M
09-07	09-07-009-29W1M	36,826	1,895.4		1,895.4	34,931	0.6521179%	09-07-009-29W1M
10-07	10-07-009-29W1M	38,818	2,275.0		2,275.0	36,543	0.6822208%	10-07-009-29W1M
11-07	11-07-009-29W1M	43,888	2,255.9		2,255.9	41,633	0.7772314%	11-07-009-29W1M
12-07	12-07-009-29W1M	47,930	847.8	386.1	1,233.9	46,696	0.8717589%	12-07-009-29W1M
13-07	13-07-009-29W1M	44,941	2,436.7		2,436.7	42,504	0.7935042%	13-07-009-29W1M
14-07	14-07-009-29W1M	42,745	2,550.5		2,550.5	40,195	0.7503911%	14-07-009-29W1M
15-07	15-07-009-29W1M	39,467	2,574.4		2,574.4	36,893	0.6887416%	15-07-009-29W1M
16-07	16-07-009-29W1M	37,947	2,416.7		2,416.7	35,530	0.6633098%	16-07-009-29W1M
01-08	01-08-009-29W1M	42,666	381.5		381.5	42,284	0.7893997%	01-08-009-29W1M
02-08	02-08-009-29W1M	41,101	1,104.4		1,104.4	39,997	0.7466972%	02-08-009-29W1M
03-08	03-08-009-29W1M	37,488	1,101.9		1,101.9	36,386	0.6792784%	03-08-009-29W1M
04-08	04-08-009-29W1M	34,888	585.0		585.0	34,303	0.6404009%	04-08-009-29W1M
05-08	05-08-009-29W1M	36,537	1,006.6		1,006.6	35,530	0.6633087%	05-08-009-29W1M
06-08	06-08-009-29W1M	37,968	1,584.3		1,584.3	36,383	0.6792371%	06-08-009-29W1M

LSD-SEC	Tract	OoIP (m3)	HZ Wells Alloc Prod (m3)	Vert Wells Cum Prod (m3)	Sum HZ + Vert Alloc Cum Prodn	OoIP - Cum	OoIP Tract Factor (%)	Tract
07-08	07-08-009-29W1M	40,020	1,583.1		1,583.1	38,437	0.7175764%	07-08-009-29W1M
08-08	08-08-009-29W1M	41,513	1,512.0		1,512.0	40,001	0.7467747%	08-08-009-29W1M
09-08	09-08-009-29W1M	38,818	3,195.3		3,195.3	35,623	0.6650397%	09-08-009-29W1M
10-08	10-08-009-29W1M	37,877	3,344.0		3,344.0	34,533	0.6446925%	10-08-009-29W1M
11-08	11-08-009-29W1M	37,112	3,341.7		3,341.7	33,771	0.6304596%	11-08-009-29W1M
12-08	12-08-009-29W1M	36,540	1,827.7		1,827.7	34,712	0.6480380%	12-08-009-29W1M
13-08	13-08-009-29W1M	37,407	939.0		939.0	36,467	0.6808051%	13-08-009-29W1M
14-08	14-08-009-29W1M	36,569	1,532.8		1,532.8	35,036	0.6540787%	14-08-009-29W1M
15-08	15-08-009-29W1M	35,160	1,533.3		1,533.3	33,627	0.6277711%	15-08-009-29W1M
16-08	16-08-009-29W1M	36,445	1,467.1		1,467.1	34,978	0.6529895%	16-08-009-29W1M
01-18	01-18-009-29W1M	42,052	2,064.9		2,064.9	39,987	0.7465147%	01-18-009-29W1M
02-18	02-18-009-29W1M	39,154	2,149.5		2,149.5	37,004	0.6908274%	02-18-009-29W1M
03-18	03-18-009-29W1M	39,221	2,128.9		2,128.9	37,092	0.6924586%	03-18-009-29W1M
04-18	04-18-009-29W1M	39,489	1,931.0		1,931.0	37,558	0.7011697%	04-18-009-29W1M
05-18	05-18-009-29W1M	34,971	1,307.6		1,307.6	33,663	0.6284524%	05-18-009-29W1M
06-18	06-18-009-29W1M	35,855	1,366.2		1,366.2	34,489	0.6438628%	06-18-009-29W1M
07-18	07-18-009-29W1M	39,508	1,373.7		1,373.7	38,135	0.7119295%	07-18-009-29W1M
08-18	08-18-009-29W1M	58,865	1,265.1		1,265.1	57,600	1.0753229%	08-18-009-29W1M
09-18	09-18-009-29W1M	39,847	1,008.0		1,008.0	38,839	0.7250776%	09-18-009-29W1M
10-18	10-18-009-29W1M	32,985	1,070.4		1,070.4	31,915	0.5958092%	10-18-009-29W1M
11-18	11-18-009-29W1M	32,279	1,061.5		1,061.5	31,218	0.5827971%	11-18-009-29W1M
12-18	12-18-009-29W1M	30,704	1,010.5		1,010.5	29,693	0.5543359%	12-18-009-29W1M
13-18	13-18-009-29W1M	30,514	821.3		821.3	29,693	0.5543350%	13-18-009-29W1M
14-18	14-18-009-29W1M	29,265	877.3		877.3	28,388	0.5299615%	14-18-009-29W1M
15-18	15-18-009-29W1M	30,017	889.1		889.1	29,128	0.5437807%	15-18-009-29W1M
16-18	16-18-009-29W1M	31,098	800.2		800.2	30,298	0.5656226%	16-18-009-29W1M

5,581,190 186,666.6 38,000.5 224,667.1 5,356,523 100.0000000%



TABLE NO. 3: WELL LIST AND STATUS

UWI	License Number	Rig Release Date	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)	Monthly Gas (E3m3)	Cal Dly Gas (E3m3/d)	Monthly Gas (E3m3)	Cum Prd Gas (E3m3)	WCT (%)
100/01-29-008-29W1/0	006221	1/20/2007	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	1/28/2007	Oct-2014	0.1	3.0	2316.4	0.1	2.3	1072.9	0.0	0.0	0.0	43.40	
100/04-29-008-29W1/0	005424	3/8/2005	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	8/26/2005	May-2016	0.5	16.0	7221.3	0.1	2.9	2352.3	0.0	0.0	0.0	15.34	
102/04-29-008-29W1/0	008555	2/12/2012	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	3/5/2012	May-2016	1.8	55.3	4176.7	1.8	56.8	8626.5	0.0	0.0	0.0	50.67	
100/05-29-008-29W1/0	006972	7/14/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	7/28/2009	May-2016	0.9	26.8	6741.6	1.4	43.9	12413.3	0.0	0.0	0.0	62.09	
102/05-29-008-29W1/0	008710	7/26/2012	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	10/1/2012	May-2016	1.0	29.5	3948.4	1.6	50.6	8588.2	0.0	0.0	0.0	63.17	
100/08-29-008-29W1/0	006224	8/9/2007	Vertical	BAKKEN-TORQUAY	BAKKEN-THREE FORKS A	Producing	8/23/2007	May-2016	1.6	134.4	1344.4	0.4	11.3	1690.7	0.0	0.0	0.0	87.60	
100/09-29-008-29W1/0	008756	10/5/2012	Horizontal	BAKKEN-THREE FORKS A	BAKKEN,THREEFFK	Producing	12/19/2012	May-2016	1.1	34.4	3526.8	3.7	116.2	11353.8	0.0	0.0	0.0	77.16	
100/11-29-008-29W1/0	005935	10/11/2006	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	11/5/2006	May-2016	0.0	0.4	377.4	0.1	2.3	1623.7	0.0	0.0	0.0	85.19	
100/12-29-008-29W1/0	005936	10/13/2006	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	11/5/2006	May-2016	0.2	5.5	1375.0	0.2	6.6	2381.0	0.0	0.0	0.0	54.55	
100/13-29-008-29W1/0	005937	10/16/2006	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	11/2/2006	May-2010	0.0	0.0	706.7	3.0	91.9	2858.8	0.0	0.0	0.0	100.00	
100/14-29-008-29W1/0	005782	1/27/2006	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	2/21/2006	Feb-2011	0.2	4.5	500.8	0.6	17.4	1427.9	0.0	0.0	0.0	79.45	
100/16-29-008-29W1/0	008556	2/5/2012	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	2/24/2012	May-2016	1.2	38.2	3710.6	3.9	120.6	19582.0	0.0	0.0	0.0	75.94	
100/04-30-008-29W1/0	009973	8/12/2014	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	9/21/2014	May-2016	2.4	73.4	2840.4	4.9	151.2	6654.8	0.0	0.0	0.0	67.32	
100/05-30-008-29W1/0	006951	6/19/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	7/6/2009	May-2016	0.9	28.4	5194.5	1.3	40.7	8249.0	0.0	0.0	0.0	58.90	
100/12-30-008-29W1/0	007054	9/27/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	10/11/2009	May-2016	0.4	13.7	3326.7	5.0	155.8	17332.8	0.0	0.0	0.0	91.92	
100/13-30-008-29W1/0	007121	12/2/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	1/4/2010	May-2016	0.4	11.3	4823.2	1.9	57.5	26723.5	0.0	0.0	0.0	83.58	
100/04-31-008-29W1/0	006968	6/28/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	7/18/2009	May-2016	0.1	1.8	1566.4	0.7	23.2	17091.0	0.0	0.0	0.0	92.80	
100/05-31-008-29W1/0	008725	7/19/2012	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	10/11/2012	May-2016	0.9	28.2	2760.0	5.0	155.4	15039.8	0.0	0.0	0.0	84.64	
100/07-31-008-29W1/0	006632	3/11/2008	Vertical	TORQUAY	BAKKEN-THREE FORKS A	Producing	5/30/2008	Feb-2013	0.1	3.6	267.1	0.8	23.7	1644.9	0.0	0.0	0.0	86.81	
100/10-31-008-29W1/0	006511	12/12/2007	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	1/12/2008	Jun-2009	0.8	25.0	939.6	0.5	15.5	768.0	0.0	0.0	0.0	38.27	
100/12-31-008-29W1/0	008581	3/4/2012	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	9/17/2012	May-2016	0.7	21.9	3085.9	1.8	55.9	12922.1	0.0	0.0	0.0	71.85	
100/14-31-008-29W1/0	006476	11/10/2007	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	11/15/2007	May-2016	0.4	12.6	1859.8	0.3	9.5	1716.1	0.0	0.0	0.0	42.99	
100/15-31-008-29W1/0	006451	10/23/2007	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	11/6/2007	May-2016	0.6	19.3	2797.8	0.1	4.2	1304.8	0.0	0.0	0.0	26.12	
100/01-32-008-29W1/0	006899	7/6/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	7/16/2009	May-2016	1.4	43.0	9180.0	1.7	52.7	11817.0	0.0	0.0	0.0	55.07	
100/08-32-008-29W1/0	006891	7/12/2012	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	9/17/2012	May-2016	4.2	131.5	11245.8	4.7	145.9	15722.0	0.0	0.0	0.0	52.60	
100/09-32-008-29W1/0	008582	3/12/2012	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	9/22/2012	May-2016	2.0	62.4	7222.0	3.0	93.8	13606.9	0.0	0.0	0.0	60.05	
100/16-32-008-29W1/0	006715	7/17/2008	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	8/10/2008	Sep-2012	0.0	0.9	2996.1	0.5	14.7	5997.9	0.0	0.0	0.0	94.23	
100/01-05-009-29W1/0	006990	7/23/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	8/9/2009	May-2016	1.6	48.3	4536.7	11.0	340.5	30349.4	0.0	0.0	0.0	87.58	
100/04-05-009-29W1/0	006624	3/8/2008	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	6/4/2008	May-2016	0.2	4.9	1111.2	0.4	13.7	2242.3	0.0	0.0	0.0	73.66	
100/08-05-009-29W1/0	007671	11/9/2010	Horizontal	BAKKENU	BAKKEN-THREE FORKS A	Producing	2/24/2011	May-2016	0.8	26.0	6729.0	0.9	26.7	11650.6	0.0	0.0	0.0	50.66	
100/09-05-009-29W1/0	006029	9/13/2006	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	10/20/2006	Feb-2016	0.0	0.9	887.7	0.0	1.3	987.2	0.0	0.0	0.0	59.09	
102/09-05-009-29W1/0	006923	3/16/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	6/26/2009	May-2016	0.5	16.4	4519.2	5.9	183.5	24823.1	0.0	0.0	0.0	91.80	
100/16-05-009-29W1/0	007672	11/23/2010	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	8/3/2011	May-2016	0.0	0.8	3677.9	0.1	3.7	9022.5	0.0	0.0	0.0	82.22	
100/01-06-009-29W1/0	005607	10/12/2005	Vertical	BAKKEN-TORQUAY	BAKKEN-THREE FORKS A	Producing	10/19/2006	Apr-2016	0.3	9.6	2348.8	0.3	8.7	1408.9	0.0	0.0	0.0	47.54	
100/02-06-009-29W1/0	005756	1/19/2006	Vertical	BAKKEN-TORQUAY	BAKKEN-THREE FORKS A	Producing	2/21/2006	Aug-2012	0.0	0.6	1526.2	0.0	0.5	1313.1	0.0	0.0	0.0	45.45	
100/04-06-009-29W1/2	006288	3/17/2007	Vertical	THREEFFK,BAKKEN	BAKKEN-THREE FORKS A	Producing	9/14/2007	Nov-2015	0.6	16.8	3451.7	0.3	10.4	2533.4	0.0	0.0	0.0	38.24	
102/04-06-009-29W1/0	008617	3/8/2012	Horizontal	BAKKENNM	BAKKEN-THREE FORKS A	Producing	12/8/2012	May-2016	1.4	43.0	6055.7	3.5	108.2	13486.8	0.0	0.0	0.0	71.56	
100/07-06-009-29W1/2	005817	6/21/2006	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Producing	7/13/2006	Jun-2015	0.0	0.3	1271.6	0.0	0.3	731.4	0.0	0.0	0.0	50.00	
100/08-06-009-29W1/0	005768	1/23/2006	Vertical	BAKKEN	BAKKEN-THREE FORKS A	Comingled	2/14/2006	Mar-2015	0.0	0.2	3397.3	2.2	69.1	2077.6	0.0	0.0	0.0	99.71	
100/12-06-009-29W1/0	006930	6/11/2009	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	6/25/2009	May-2016	0.5	16.2	7002.4	0.4	12.4	13091.1	0.0	0.0	0.0	43.36	
100/13-06-009-29W1/0	007673	12/2/2010	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	1/28/2011	May-2016	0.0	0.5	4434.3	0.4	11.7	21010.6	0.0	0.0	0.0	95.90	
102/04-07-009-29W1/0	007764	8/20/2011	Horizontal	BAKKEN	BAKKEN-THREE FORKS A	Producing	12/19/2011	Jan-2016	1.1	3646.7	3646.7	0.2	7.2	13782.2	0.0	0.0	0.0	86.75	
100/05-07-009-29W1/0	007967	3/24/2011	Horizontal	THREEFFK,BAKKEN	BAKKEN-THREE FORKS A	Producing	10/16/2011	May-2016	0.7	22.3	5302.2	1.6	49.8	19929.0	0.0	0.0	0.0	69.07	
100/12-07-009-29W1/0	006553	1/25/2008	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	2/5/2008	May-2016	0.0	0.4	386.1	0.0	1.3	998.9	0.0	0.0	0.0	76.47	
102/12-07-009-29W1/0	007923	7/22/2011	Horizontal	BAKKEN-THREE FORKS A	BAKKEN,THREEFFK	Producing	9/8/2011	May-2016	8.0	7274.1	7274.1	1.1	12.1	16766.6	0.0	0.0	0.0	81.04	
100/13-07-009-29W1/0	007765	12/18/2010	Horizontal	BAKKEN-THREE FORKS A	BAKKEN	Producing	2/26/2011	May-2016	0.7	20.8	9978.3	0.4	12.1	9322.0	0.0	0.0	0.0	36.78	
102/01-08-009-29W1/0	006668	6/11/2008	Horizontal	BAKKEN-THREE FORKS A	BAKKEN	Producing	7/10/2008	May-2016	0.3	8.8	3172.7	1.0	31.3	6634.7	0.0	0.0	0.0	78.05	
100/08-08-009-29W1/0	007886	3/11/2011	Horizontal	BAKKEN-THREE FORKS A	BAKKEN	Producing	7/20/2011	May-2016	0.8	25.3	5686.0	10.5	324.2	40666.5	0.0	0.0	0.0	92.76	
100/09-08-009-29W1/0	007887	3/11/2011	Horizontal	BAKKEN-THREE FORKS A	BAKKEN	Producing	9/3/2011	May-2016	1.1	33.1	11708.8	1.1	32.8	18780.4	0.0	0.0	0.0	49.77	
100/16-08-009-29W1/0	007697	12/10/2010	Horizontal	BAKKEN-THREE FORKS A	BAKKENNM	Producing	2/20/2011	Mar-2016	0.6	18.2	5472.3	20.9	648.3	47673.4	0.0	0.0	0.0	97.27	
100/04-18-009-29W1/0	007238	2/27/2010	Horizontal	BAKKEN-THREE FORKS A	BAKKEN	Producing	3/3/2010	May-2016	0.4	13.9	8274.2	1.2	37.0	12136.9	0.0	0.0	0.0	72.69	
100/05-18-009-29W1/2	009003	8/29/2013	Horizontal	BAKKEN-THREE FORKS A	BAKKENNM	Producing	10/8/2013	May-2016	2.2	68.2	5312.6	2.9	88.8	8315.4	0.0	0.0	0.0	56.56	
100/12-18-009-29W1/0	007257	3/9/2010	Horizontal	BAKKEN-THREE FORKS A	BAKKEN	Producing	3/17/2010	May-2016	0.8	26.0	450.5	25.6	793.2	23436.4	0.0	0.0	0.0	96.83	
100/13-18-009-29W1/0	008964	12/11/2013	Horizontal	BAKKEN-THREE FORKS A	BAKKENNM	Producing	1/31/2014	May-2016	1.1	33.5	3387.9	5.9	183.6	13519.9	0.0	0.0	0.0	84.57	

<i>UWI</i>	<i>License Number</i>	<i>Rig Release Date</i>	<i>Type</i>	<i>Pool Name</i>	<i>Producing Zone</i>	<i>Mode</i>	<i>On Prod Date</i>	<i>Prod Date</i>	<i>Cal Dly Oil (m3/d)</i>	<i>Monthly Oil (m3)</i>	<i>Cum Prd Oil (m3)</i>	<i>Cal Dly Water (m3/d)</i>	<i>Monthly Water (m3)</i>	<i>Cum Prd Water (m3)</i>	<i>Cal Dly Gas (E3m3/d)</i>	<i>Monthly Gas (E3m3)</i>	<i>Cum Prd Gas (E3m3)</i>	<i>WCT (%)</i>
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These locations are abandoned and/or did not produce and will not be included in the Unit Well list.

100/06-31-008-29W1/0	006569	1/28/2008	Vertical	BAKKEN-THREE FORKS B	BAKKEN	Abandoned	2/1/2008	Oct-2009	0.0	0.5	93.0	0.0	0.0	1230.4				0.00
100/12-05-009-29W1/2	003858	3/16/1986	Vertical	BAKKEN-THREE FORKS B	BAKKEN	Abandoned	10/1/1987	Mar-1988	0.1	3.0	55.5	0.1	3.0	105.0				50.00
100/05-06-009-29W1/2	006656	7/9/2008	Vertical	BAKKEN-THREE FORKS B	BAKKEN	Abandoned Zone	8/1/2008	Jun-2013	0.0	0.3	102.3	0.0	0.6	249.0				66.67
100/04-07-009-29W1/0	006576	1/31/2008	Vertical	BAKKEN-THREE FORKS B	BAKKEN	Abandoned Zone	2/1/2008	May-2013	0.0	1.2	266.1	0.3	7.8	815.9				86.67

22467.1 1413114 BBL 601089.0 3780736



**Table No. 4: OOIP Calculation**

UWI	MBKKN OOIP 0.5 md (m3)	Lyleton UA OOIP 0.5 md (m3)	Lyleton LA OOIP 0.5 md (m3)	Lyleton B OOIP 0.5 md (m3)	Total OOIP 0.5 md (m3)
01-29-008-29W1M	12,345	7,550	14,926	9,918	44,739
02-29-008-29W1M	9,765	2,433	14,679	9,633	36,510
03-29-008-29W1M	7,275	2,192	13,250	9,686	32,403
04-29-008-29W1M	4,096	8,189	15,220	10,024	37,529
05-29-008-29W1M	7,145	-	15,034	9,452	31,631
06-29-008-29W1M	8,086	-	15,215	9,437	32,739
07-29-008-29W1M	12,725	68	15,725	9,638	38,157
08-29-008-29W1M	17,244	2,157	15,551	9,835	44,787
09-29-008-29W1M	12,371	440	15,632	9,983	38,426
10-29-008-29W1M	9,465	21	16,552	9,482	35,519
11-29-008-29W1M	6,140	-	17,369	8,883	32,392
12-29-008-29W1M	8,673	-	16,066	8,515	33,254
13-29-008-29W1M	10,040	-	17,121	7,849	35,011
14-29-008-29W1M	4,840	-	16,878	9,482	31,200
15-29-008-29W1M	7,714	-	16,234	9,771	33,720
16-29-008-29W1M	10,347	-	15,005	10,376	35,728
01-30-008-29W1M	5,859	614	10,573	9,598	26,643
02-30-008-29W1M	5,514	-	9,673	9,043	24,230
03-30-008-29W1M	5,677	5	7,134	8,169	20,985
04-30-008-29W1M	6,747	218	3,855	7,299	18,120
05-30-008-29W1M	7,414	-	7,763	7,070	22,247
06-30-008-29W1M	6,765	-	9,800	7,867	24,432
07-30-008-29W1M	6,897	-	11,019	8,671	26,587
08-30-008-29W1M	6,959	-	12,131	9,143	28,233
09-30-008-29W1M	9,686	-	14,310	8,092	32,088
10-30-008-29W1M	9,302	-	13,302	7,738	30,343
11-30-008-29W1M	8,911	-	12,566	7,156	28,634
12-30-008-29W1M	9,328	-	10,646	6,563	26,537
13-30-008-29W1M	10,722	-	14,516	5,819	31,057
14-30-008-29W1M	10,965	-	15,994	6,166	33,125
15-30-008-29W1M	11,749	-	15,989	6,577	34,316
16-30-008-29W1M	12,654	-	16,336	7,005	35,995
01-31-008-29W1M	12,659	-	18,433	6,097	37,189
02-31-008-29W1M	12,690	-	18,959	5,388	37,038
03-31-008-29W1M	11,301	-	21,829	4,973	38,103
04-31-008-29W1M	11,015	-	21,082	4,902	36,998
05-31-008-29W1M	10,592	356	27,052	4,285	42,284
06-31-008-29W1M	10,410	218	29,731	4,135	44,494
07-31-008-29W1M	13,458	464	21,697	4,522	40,141
08-31-008-29W1M	11,504	663	20,902	5,453	38,523
09-31-008-29W1M	7,786	10,369	26,595	5,156	49,906
10-31-008-29W1M	7,245	18,473	31,041	3,722	60,480
11-31-008-29W1M	11,719	10,099	31,672	3,619	57,108
12-31-008-29W1M	12,134	6,681	29,529	3,986	52,329
13-31-008-29W1M	12,307	18,272	30,716	4,364	65,660
14-31-008-29W1M	15,923	25,327	30,325	4,010	75,584
15-31-008-29W1M	6,825	36,481	27,104	4,606	75,017
16-31-008-29W1M	4,647	20,436	28,103	5,906	59,092
01-32-008-29W1M	9,732	-	14,000	10,579	34,311
02-32-008-29W1M	8,738	-	15,878	9,819	34,435
03-32-008-29W1M	7,733	-	16,975	8,957	33,666
04-32-008-29W1M	10,283	-	17,919	7,479	35,682
05-32-008-29W1M	10,245	273	19,522	7,048	37,089
06-32-008-29W1M	9,949	-	17,435	8,471	35,855
07-32-008-29W1M	9,355	-	15,110	9,679	34,144
08-32-008-29W1M	8,778	-	13,190	10,612	32,580
09-32-008-29W1M	7,264	-	11,461	10,557	29,282

UWI	MBKKN OOIP 0.5 md (m3)	Lyleton UA OOIP 0.5 md (m3)	Lyleton LA OOIP 0.5 md (m3)	Lyleton B OOIP 0.5 md (m3)	Total OOIP 0.5 md (m3)
10-32-008-29W1M	9,038	-	14,988	9,584	33,610
11-32-008-29W1M	9,487	10	18,846	8,236	36,578
12-32-008-29W1M	8,522	2,064	22,649	6,887	40,122
13-32-008-29W1M	7,582	2,669	25,417	6,973	42,642
14-32-008-29W1M	9,956	2	19,951	8,172	38,081
15-32-008-29W1M	9,837	-	14,908	9,624	34,368
16-32-008-29W1M	8,070	-	10,554	11,085	29,708
01-05-009-29W1M	9,509	-	9,770	11,899	31,177
02-05-009-29W1M	11,045	-	14,105	10,099	35,249
03-05-009-29W1M	11,147	701	19,288	8,390	39,526
04-05-009-29W1M	9,323	8,552	25,063	7,191	50,129
05-05-009-29W1M	7,986	4,264	22,497	8,180	42,927
06-05-009-29W1M	10,364	200	18,074	9,231	37,869
07-05-009-29W1M	13,328	-	13,673	10,981	37,982
08-05-009-29W1M	14,886	-	9,139	12,775	36,799
09-05-009-29W1M	20,160	-	9,787	13,786	43,733
10-05-009-29W1M	15,678	-	12,875	12,073	40,626
11-05-009-29W1M	10,517	-	15,970	10,360	36,847
12-05-009-29W1M	6,829	48	17,826	9,280	33,982
13-05-009-29W1M	7,940	-	15,252	10,503	33,694
14-05-009-29W1M	11,504	-	13,964	11,523	36,992
15-05-009-29W1M	16,492	-	12,008	12,911	41,411
16-05-009-29W1M	20,419	-	8,830	14,380	43,629
01-06-009-29W1M	4,550	21,094	31,562	6,561	63,768
02-06-009-29W1M	6,201	28,524	30,262	6,137	71,123
03-06-009-29W1M	8,372	25,110	29,346	5,542	68,371
04-06-009-29W1M	7,027	22,451	30,154	5,374	65,005
05-06-009-29W1M	5,539	11,733	23,260	6,458	46,990
06-06-009-29W1M	6,449	11,287	26,082	6,700	50,517
07-06-009-29W1M	6,032	17,748	26,656	7,153	57,588
08-06-009-29W1M	6,226	16,943	26,783	7,692	57,644
09-06-009-29W1M	6,312	747	21,536	8,727	37,322
10-06-009-29W1M	6,089	707	22,786	8,088	37,670
11-06-009-29W1M	6,145	413	22,686	7,582	36,826
12-06-009-29W1M	5,870	367	20,538	7,185	33,960
13-06-009-29W1M	5,938	-	19,136	7,620	32,694
14-06-009-29W1M	6,150	-	20,101	8,191	34,441
15-06-009-29W1M	6,263	-	18,794	8,860	33,917
16-06-009-29W1M	6,369	-	15,729	9,647	31,745
01-07-009-29W1M	7,857	-	15,555	10,414	33,826
02-07-009-29W1M	7,315	-	17,622	9,345	34,282
03-07-009-29W1M	6,611	-	19,024	8,404	34,039
04-07-009-29W1M	5,441	-	17,511	7,692	30,643
05-07-009-29W1M	8,037	-	23,160	7,344	38,540
06-07-009-29W1M	8,643	-	21,745	8,210	38,597
07-07-009-29W1M	8,881	-	18,538	9,474	36,893
08-07-009-29W1M	9,350	-	16,180	10,778	36,308
09-07-009-29W1M	9,732	-	15,959	11,135	36,826
10-07-009-29W1M	9,927	-	19,333	9,558	38,818
11-07-009-29W1M	10,876	-	24,939	8,073	43,888
12-07-009-29W1M	11,570	-	29,271	7,089	47,930
13-07-009-29W1M	11,310	-	26,085	7,546	44,941
14-07-009-29W1M	10,935	-	23,311	8,499	42,745
15-07-009-29W1M	10,100	-	19,398	9,969	39,467
16-07-009-29W1M	9,410	-	16,927	11,609	37,947
01-08-009-29W1M	19,912	-	7,614	15,140	42,666
02-08-009-29W1M	16,953	-	10,237	13,911	41,101
03-08-009-29W1M	12,234	-	12,570	12,684	37,488
04-08-009-29W1M	9,395	-	13,962	11,531	34,888
05-08-009-29W1M	10,969	-	13,426	12,142	36,537

UWI	MBKKN OOIP 0.5 md (m3)	Lyleton UA OOIP 0.5 md (m3)	Lyleton LA OOIP 0.5 md (m3)	Lyleton B OOIP 0.5 md (m3)	Total OOIP 0.5 md (m3)
06-08-009-29W1M	13,655	-	10,945	13,368	37,968
07-08-009-29W1M	16,070	-	9,245	14,705	40,020
08-08-009-29W1M	18,280	-	7,275	15,958	41,513
09-08-009-29W1M	16,708	-	5,561	16,549	38,818
10-08-009-29W1M	15,045	-	7,585	15,247	37,877
11-08-009-29W1M	13,498	-	9,684	13,930	37,112
12-08-009-29W1M	11,309	-	12,597	12,635	36,540
13-08-009-29W1M	10,728	-	13,474	13,204	37,407
14-08-009-29W1M	12,285	-	9,592	14,692	36,569
15-08-009-29W1M	13,504	-	5,790	15,865	35,160
16-08-009-29W1M	15,767	-	3,588	17,090	36,445
01-18-009-29W1M	7,800	684	21,260	12,309	42,052
02-18-009-29W1M	9,011	-	19,296	10,846	39,154
03-18-009-29W1M	10,232	-	19,509	9,479	39,221
04-18-009-29W1M	10,775	-	20,090	8,625	39,489
05-18-009-29W1M	10,541	-	14,520	9,910	34,971
06-18-009-29W1M	9,956	-	15,137	10,762	35,855
07-18-009-29W1M	8,539	1,733	17,323	11,913	39,508
08-18-009-29W1M	6,441	15,336	24,007	13,081	58,865
09-18-009-29W1M	8,865	2,320	14,287	14,376	39,847
10-18-009-29W1M	10,380	-	9,172	13,433	32,985
11-18-009-29W1M	11,015	-	9,102	12,163	32,279
12-18-009-29W1M	10,875	-	8,546	11,283	30,704
13-18-009-29W1M	11,609	-	6,277	12,628	30,514
14-18-009-29W1M	12,288	-	3,399	13,578	29,265
15-18-009-29W1M	12,508	-	2,485	15,024	30,017
16-18-009-29W1M	10,428	122	4,870	15,678	31,098

5,581,190 M3  
35,104,630 BBLS

Core Kmax cutoff >0.5md

	MBKkn	U Ly  A	L Ly  A	Ly  B
Average Phi	0.16	0.162	0.163	0.162
Sw	0.45	0.35	0.4	0.45
Bo	1.08			

### **Proposed Ebor Unit No. 3**

#### **Application for Enhanced Oil Recovery Waterflood Project**

##### **LIST OF APPENDICES**

Appendix 1	Ebor Unit No. 3 – Structural Cross Section
Appendix 2	Ebor Unit No. 3 – Offsetting Units
Appendix 3	Ebor Unit No. 3 – Upper Bakken Isopach
Appendix 4	Ebor Unit No. 3 – Middle Bakken Isopach
Appendix 5	Ebor Unit No. 3 – Upper Lyleton A Isopach
Appendix 6	Ebor Unit No. 3 – Lower Lyleton A Isopach
Appendix 7	Ebor Unit No. 3 – Red Shale Isopach
Appendix 8	Ebor Unit No. 3 – Lyleton B Isopach
Appendix 9	Ebor Unit No. 3 – Torquay Isopach
Appendix 10	Ebor Unit No. 3 – Upper Bakken Structure
Appendix 11	Ebor Unit No. 3 – Middle Bakken Structure
Appendix 12	Ebor Unit No. 3 – Upper Lyleton A Structure
Appendix 13	Ebor Unit No. 3 – Lower Lyleton A Structure
Appendix 14	Ebor Unit No. 3 – Red Shale Structure
Appendix 15	Ebor Unit No. 3 – Lyleton B Structure
Appendix 16	Ebor Unit No. 3 – Torquay Structure
Appendix 17	Ebor Unit No. 3 – Middle Bakken k-h
Appendix 18	Ebor Unit No. 3 – Middle Bakken phi-h
Appendix 19	Ebor Unit No. 3 – Upper Lyleton A k-h
Appendix 20	Ebor Unit No. 3 – Upper Lyleton A phi-h
Appendix 21	Ebor Unit No. 3 – Lower Lyleton A k-h
Appendix 22	Ebor Unit No. 3 – Lower Lyleton A phi-h
Appendix 23	Ebor Unit No. 3 – Lyleton B k-h
Appendix 24	Ebor Unit No. 3 – Lyleton B phi-h
Appendix 25	Core Data Coverage







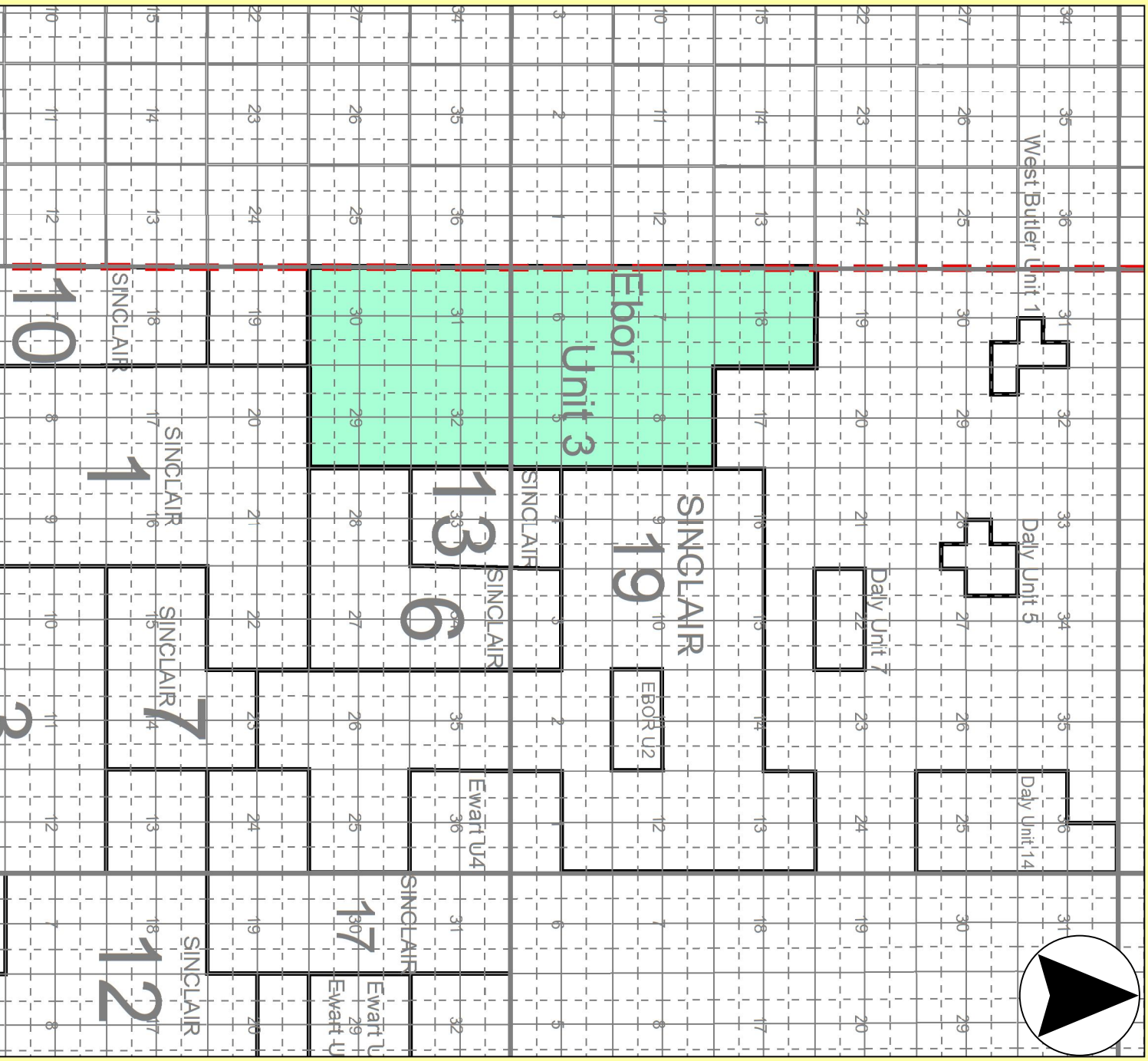
R30

R29

R28W1

T10

T10



R30

R29

R28W1

## Appendix No. 2

Tundra Oil and Gas Ltd

## PROPOSED EBOR UNIT 3

Proposed Ebor 3 Unit Boundary  
Offsetting Units in SW Manitoba

Licensed to: Tundra Oil and Gas Ltd

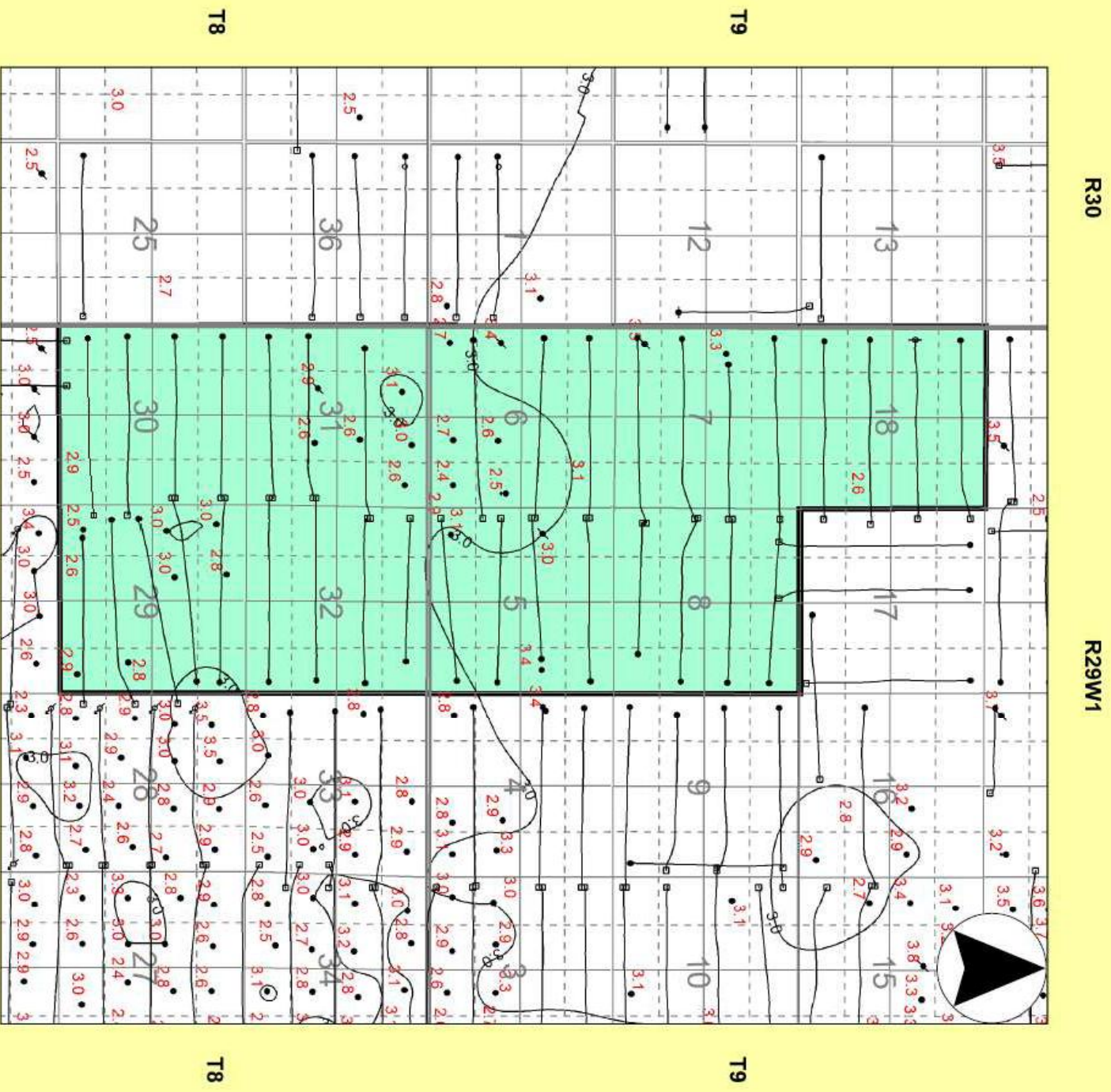
geOSCOUT

By: Howell

Date: 2016/06/07

Scale: 1:94000

Project: Sinclair Daly 2015 Expansion



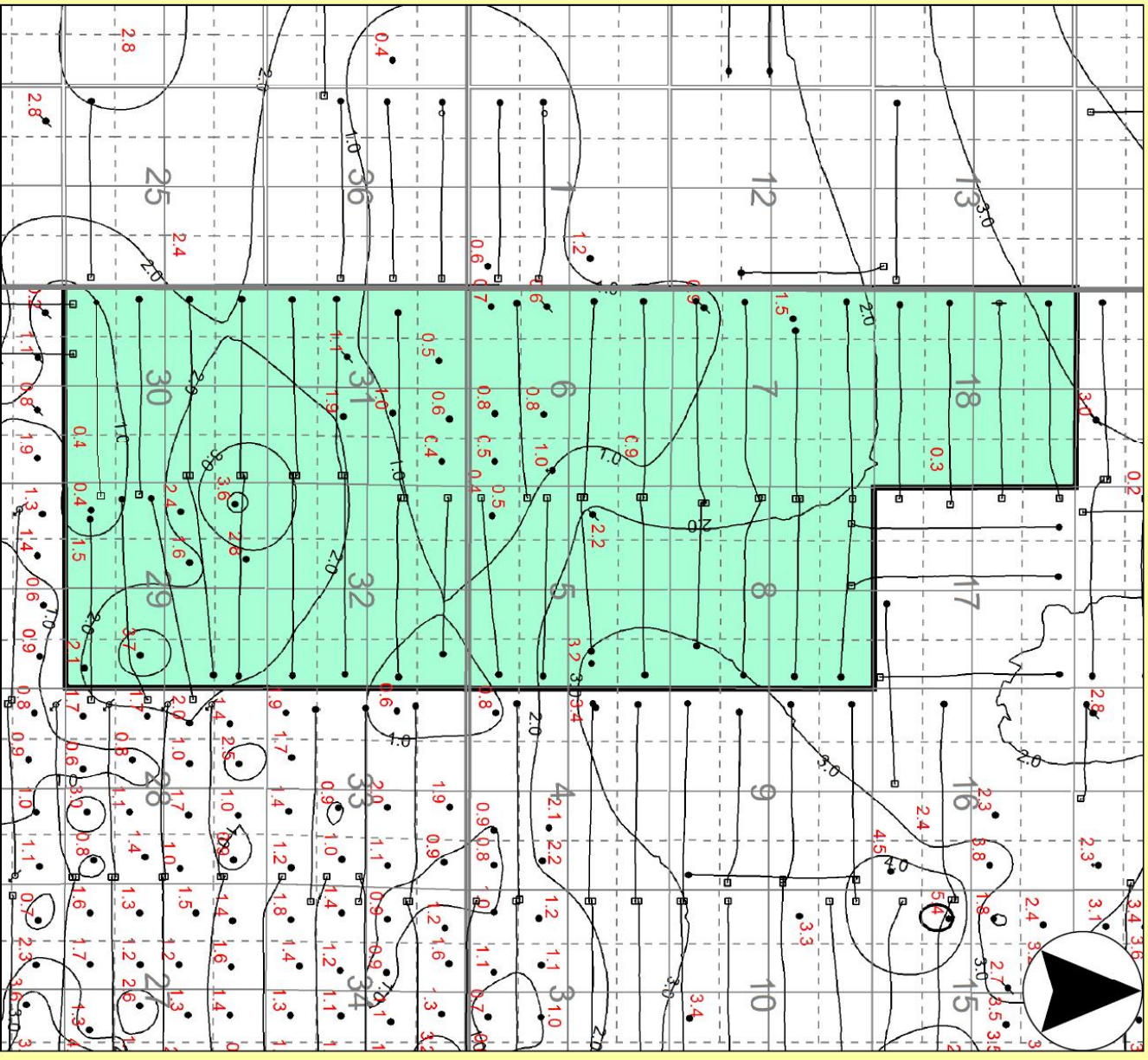
Appendix No. 3

Tundra Oil and Gas Ltd	
PROPOSED EBOR UNIT 3	
Upper Bakken Isopach	
CI=0.5m Well values posted in RED	
Licensed to: Tundra Oil and Gas Ltd	
By: Hovind	Date: 2016/06/07
Scale: 1:10000	Project: SENECA CANYON 2015 EXPANSION
qPOS/COUT	



R30

R29W1

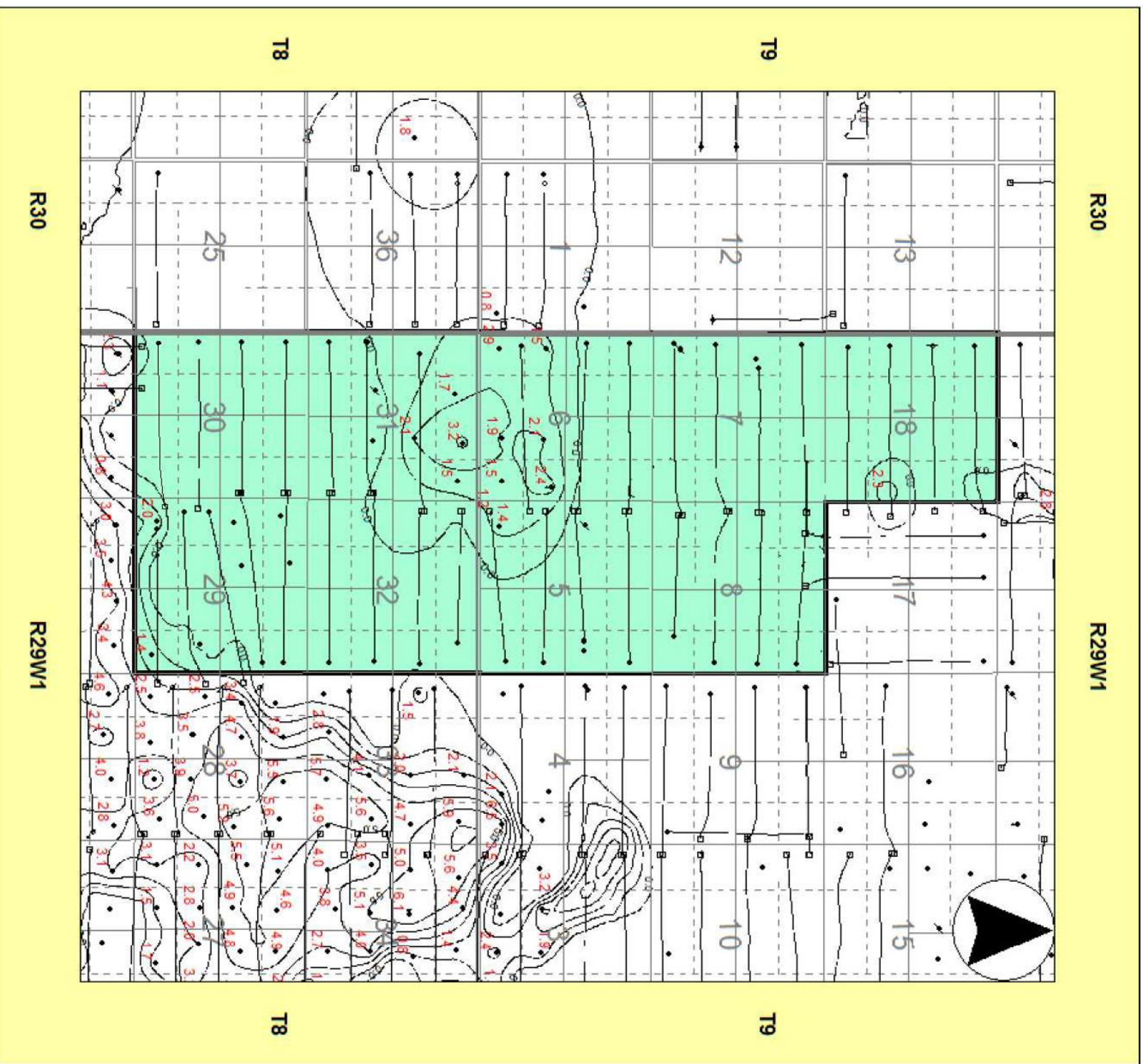


R30

R29W1

## Appendix No. 4

Tundra Oil and Gas Ltd	
PROPOSED EBOR UNIT 3	
Middle Bakken Isopach	
CI=1 0m, Well values posted in RED	
Licensed to: Tundra Oil and Gas Ltd	By: Howell
g605COUT	Scale = 1:47000
Project: SINDIR DAY 2015 Expansion	Date: 2016/06/07



Appendix No. 5



R30

R29W1

T9

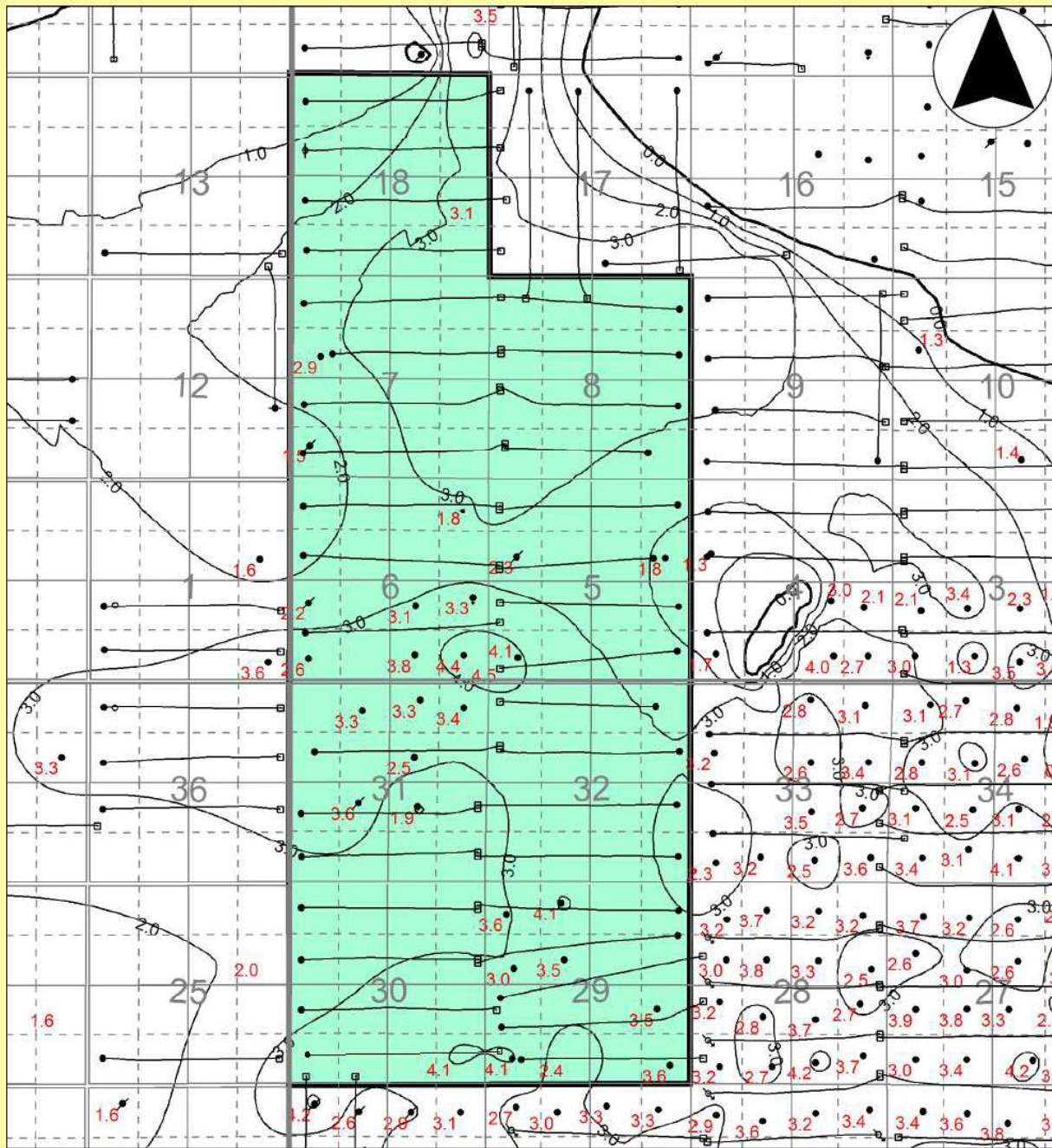
T9

T8

T8

R30

R29W1



## Appendix No. 6

Tundra Oil and Gas Ltd

PROPOSED EBOR UNIT 3

Lower Lyleton A Isopach

CI=1.0m, Well values posted in RED

Licensed to: Tundra Oil and Gas Ltd

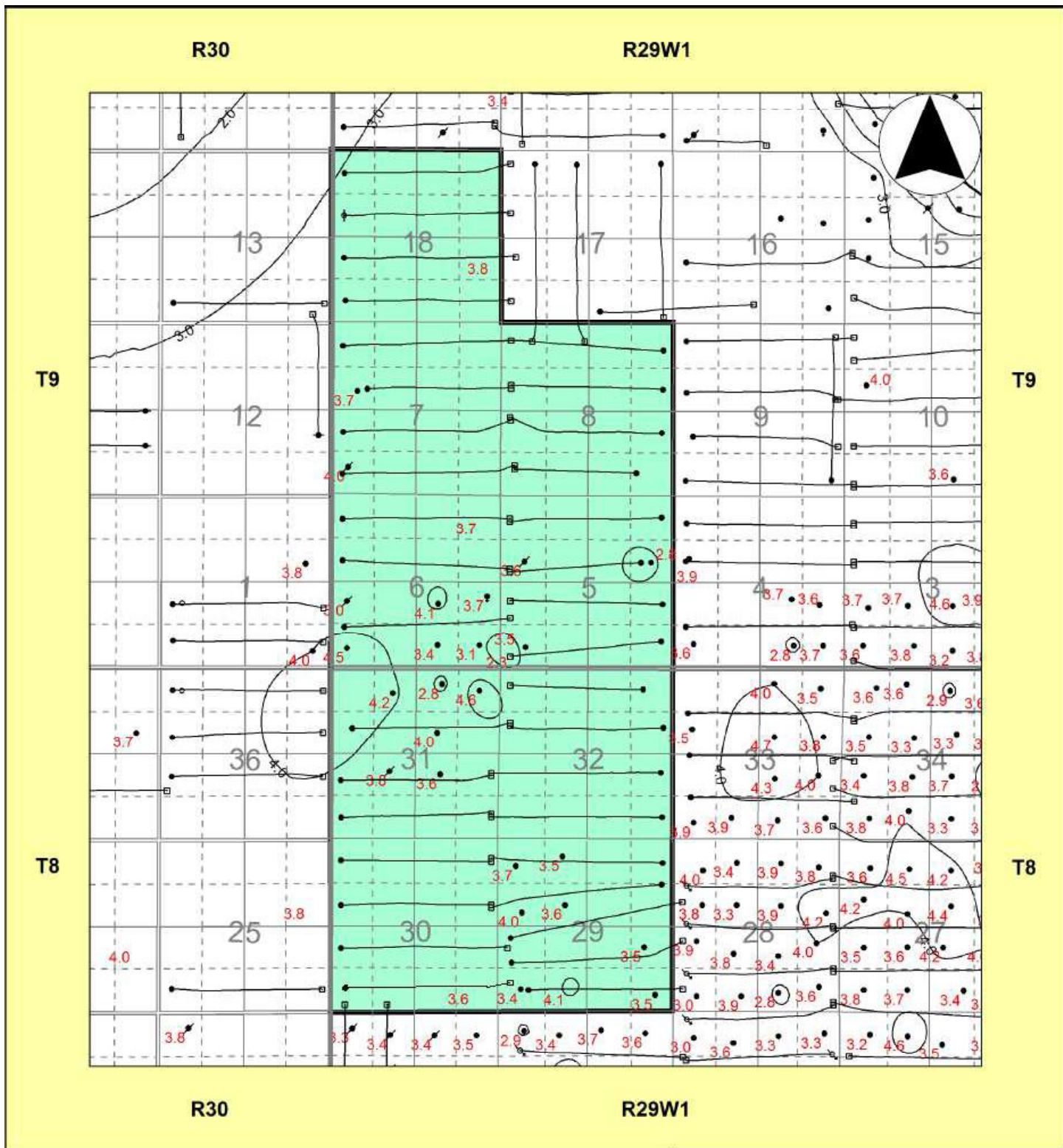
geoscout

By: Howell

Scale: 1:47000

Date: 2016/06/07

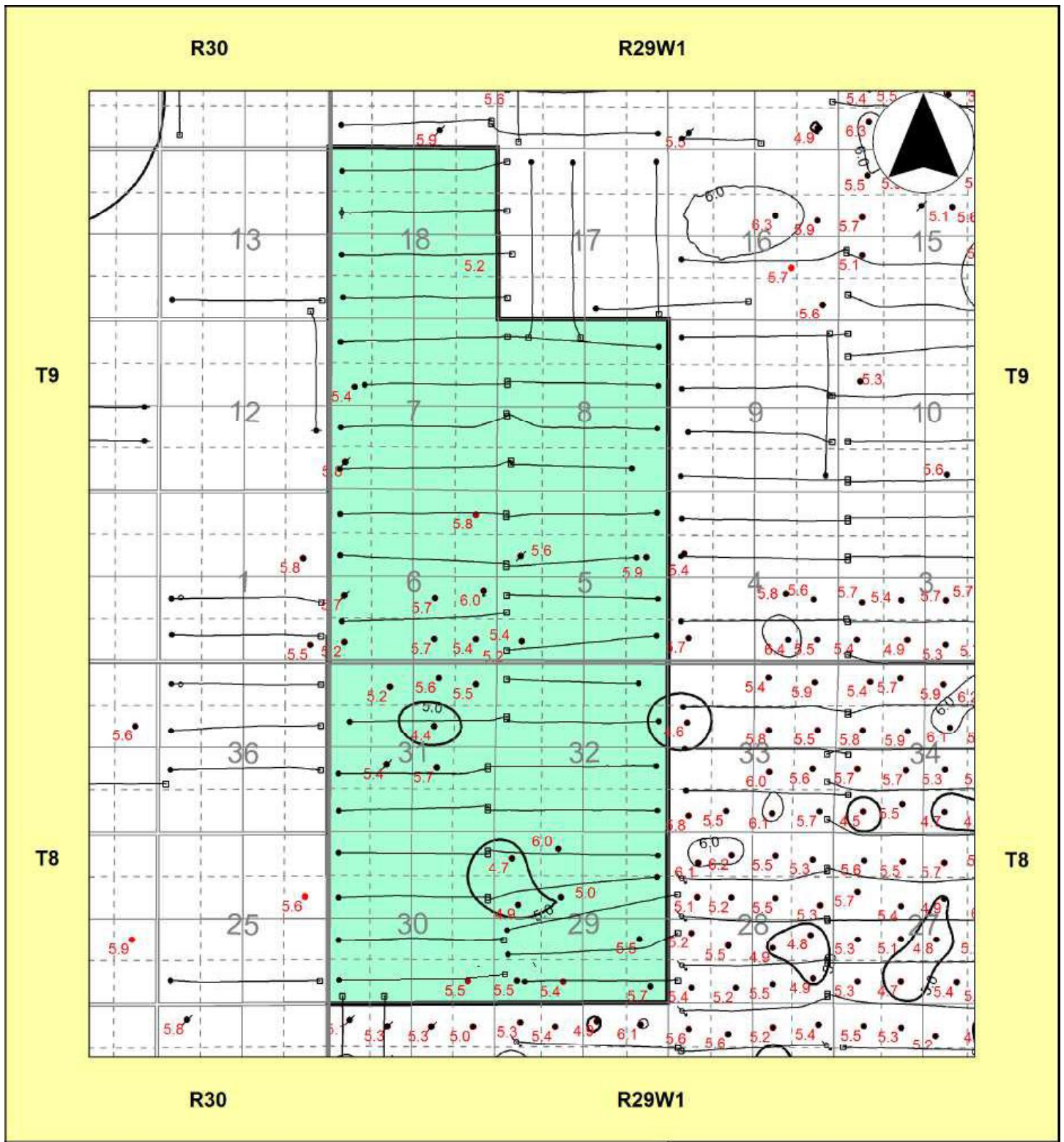
Project: Sinclair Dalt 2015 Expansion



Appendix No. 7

Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Red Shale Marker Isopach		
CI=1.0m. Well values posted in RED		
Licensed to: Tundra Oil and Gas Ltd		
By: Howell	Date: 2016/06/07	
Scale: 1:47000	Project: Sinclair Day 2015 Expansion	
geoscout		



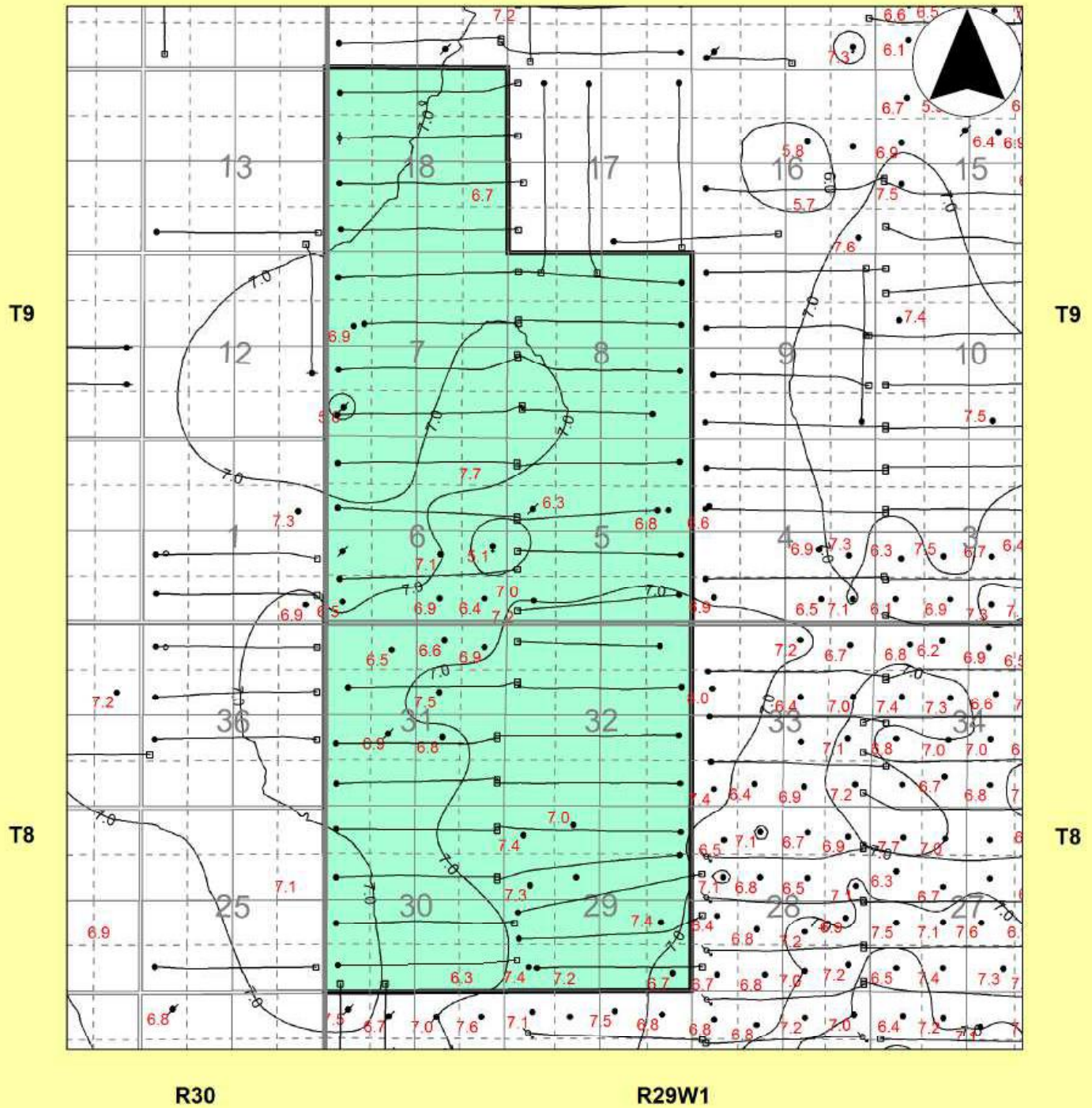


Appendix No. 8

Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Lyleton B Isopach		
CI=1.0m. Well values posted in RED		
Licensed to: Tundra Oil and Gas Ltd		
By: Howell	Date: 2016/06/07	
Scale: 1:47000	Project: Sinclair Daily 2015 Expansion	
geoSCOUT		

R30

R29W1



Appendix No. 9

Tundra Oil and Gas Ltd

PROPOSED EBOR UNIT 3

Torquay Shale Isopach

CI=1.0m. Well values posted in RED

Licensed to: Tundra Oil and Gas Ltd

geOSCOUT

By: Howell

Date: 2016/06/07

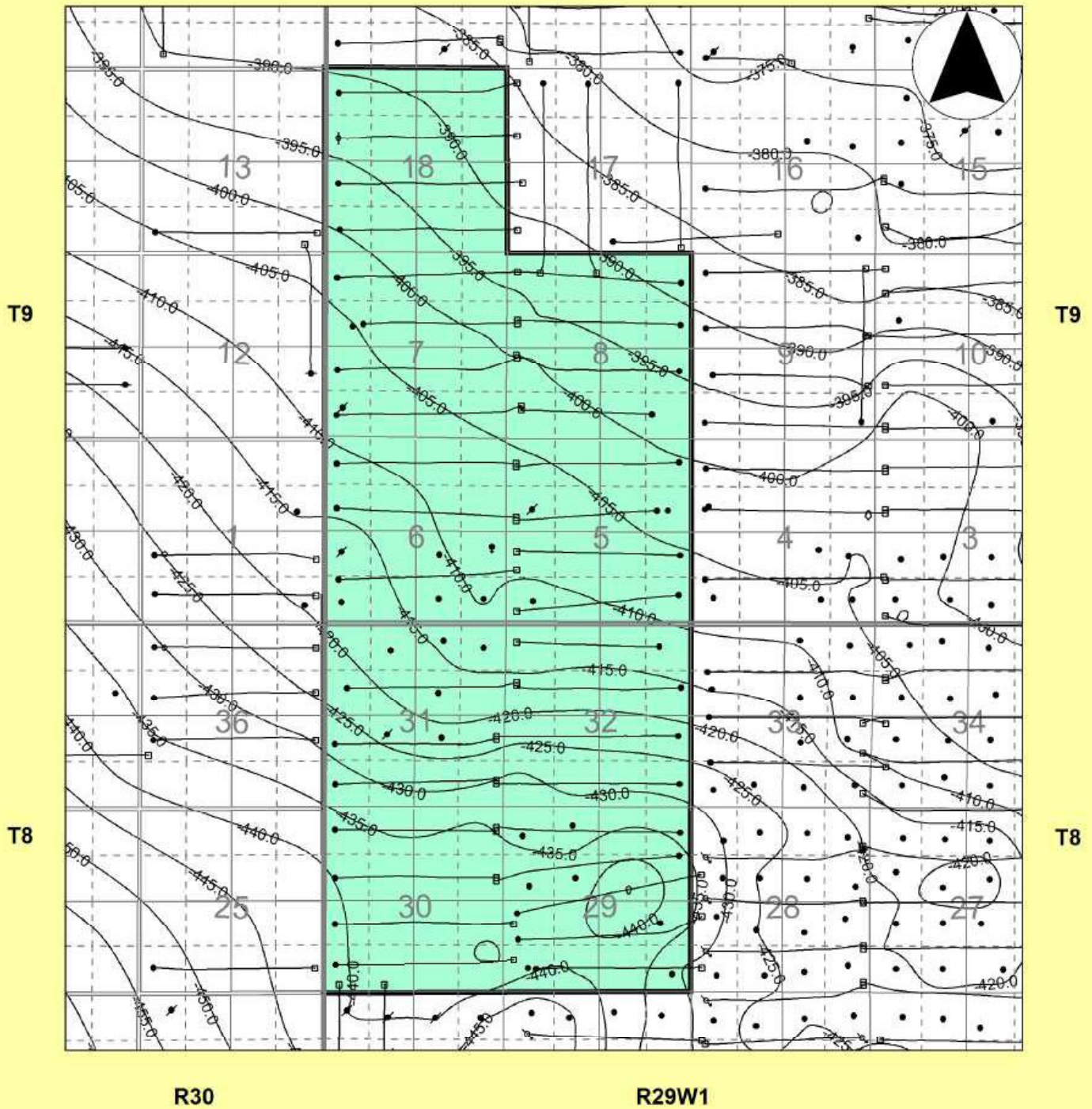
Scale: 1:47000

Project: Sinclair Daily 2015 Expansion



R30

R29W1



Appendix No. 10

Tundra Oil and Gas Ltd

PROPOSED EBOR UNIT 3

Upper Bakken Structure

CI=5.0m

Licensed to: Tundra Oil and Gas Ltd

geoscout

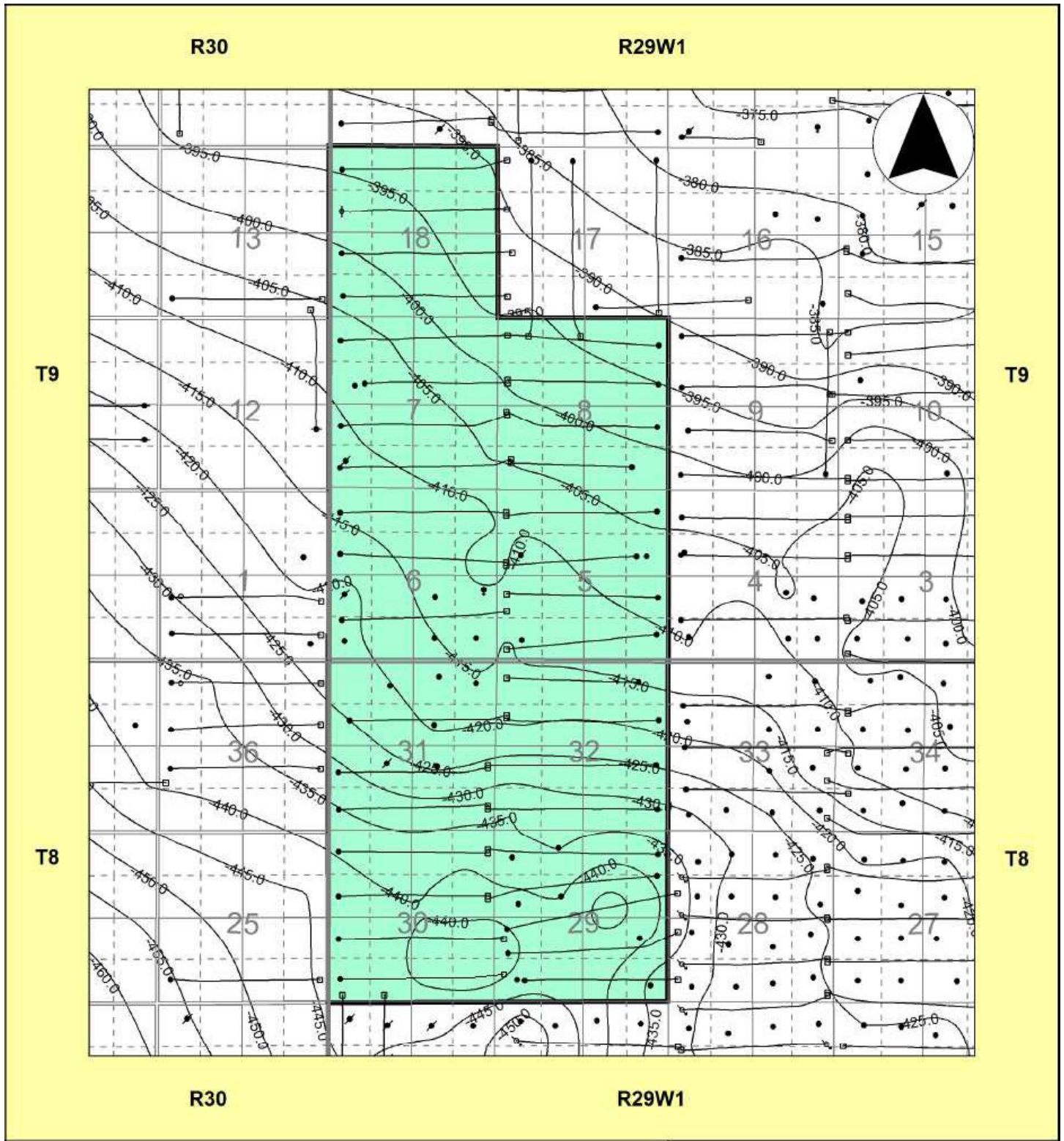
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Date: 2016/08/07


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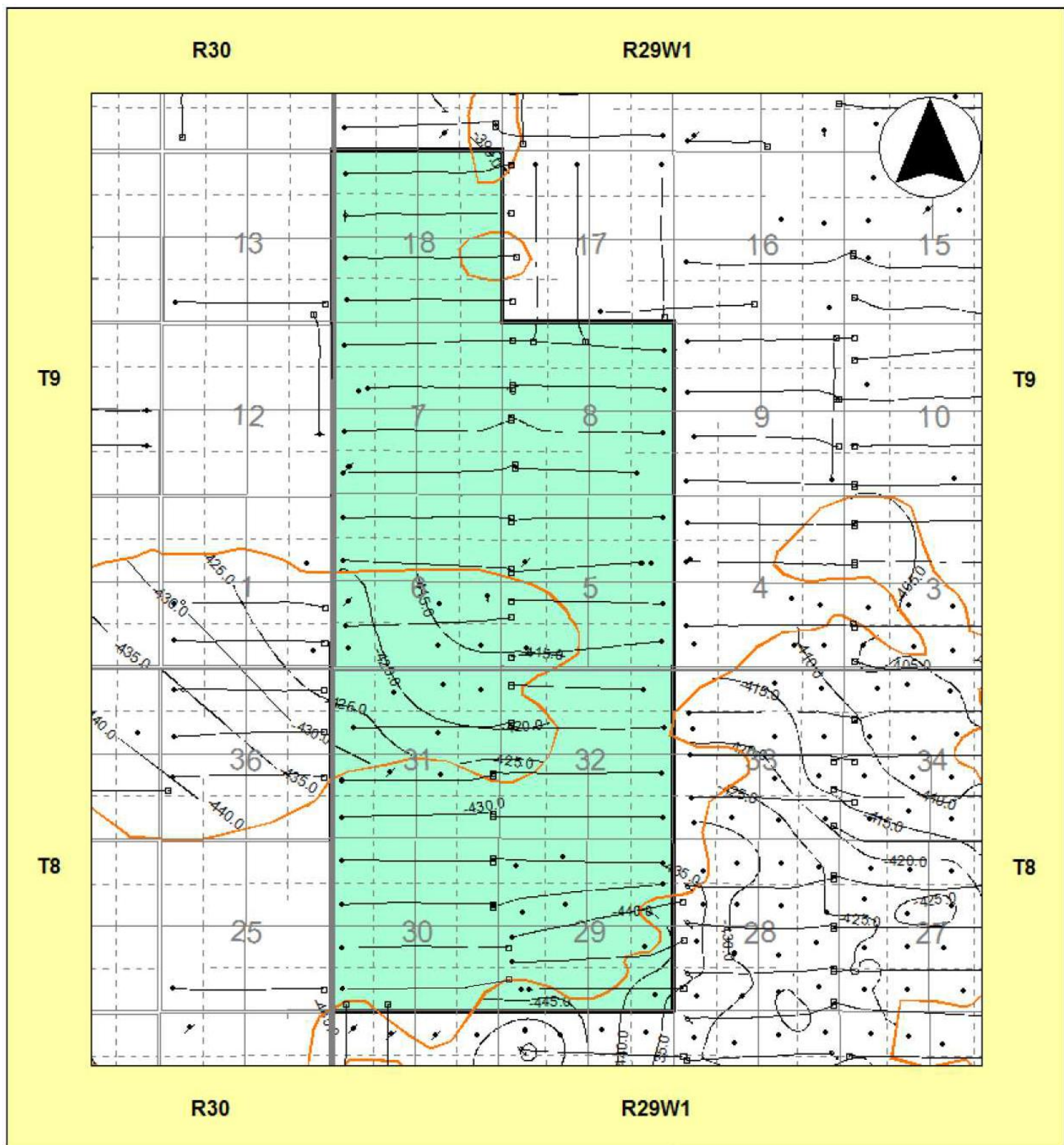
Project: Sinclair Dely 2015 Expansion





Appendix No. 11

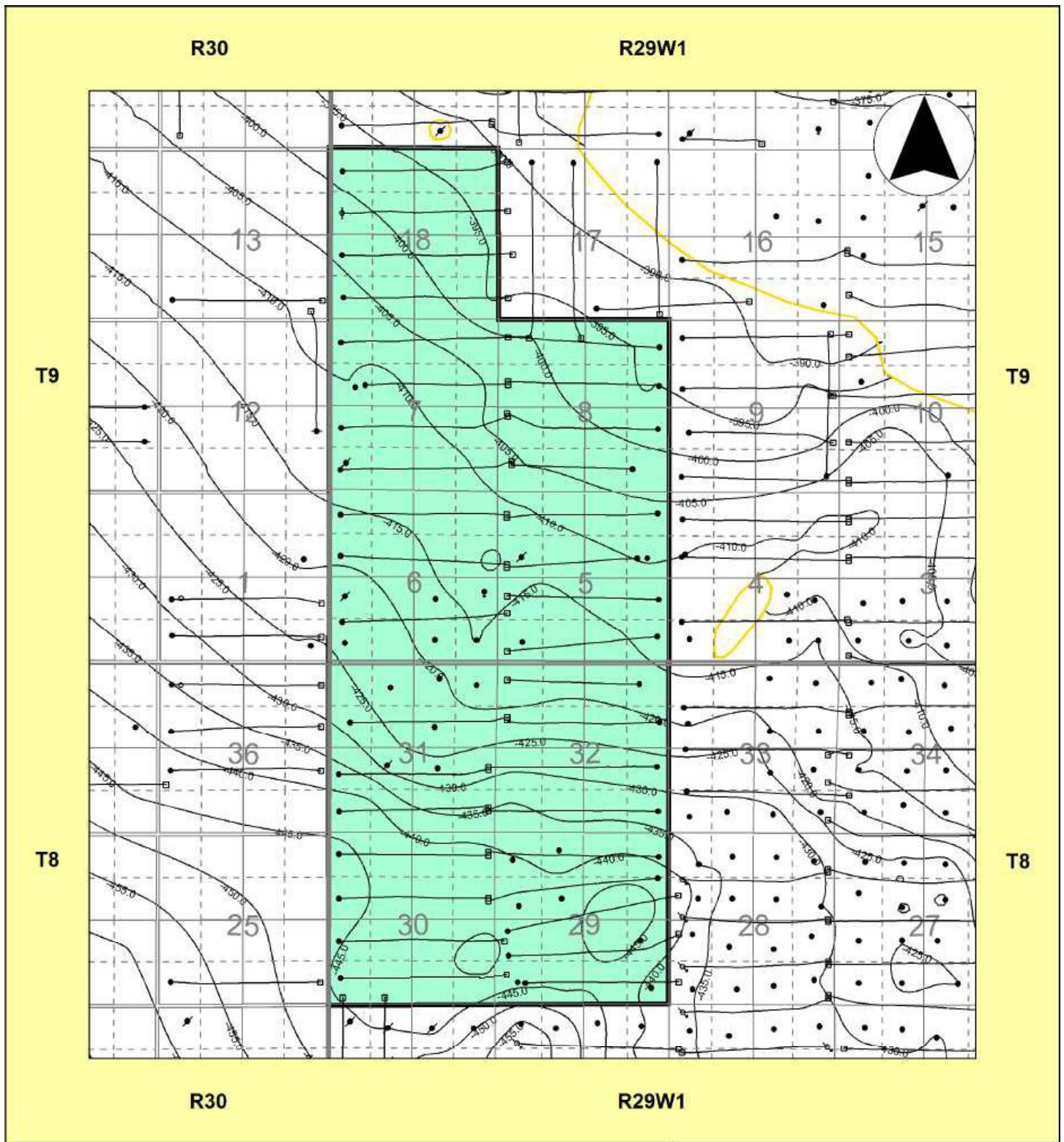
Tundra Oil and Gas Ltd			
PROPOSED EBOR UNIT 3			
Middle Bakken Structure			
CI=5.0m			
Licensed to : Tundra Oil and Gas Ltd			
By:  GeoSCOUT	By: Howell		Date: 2016/08/07
	Scale: 1:47000		Project: Sinclair Daly 2015 Expansion




Appendix No. 12

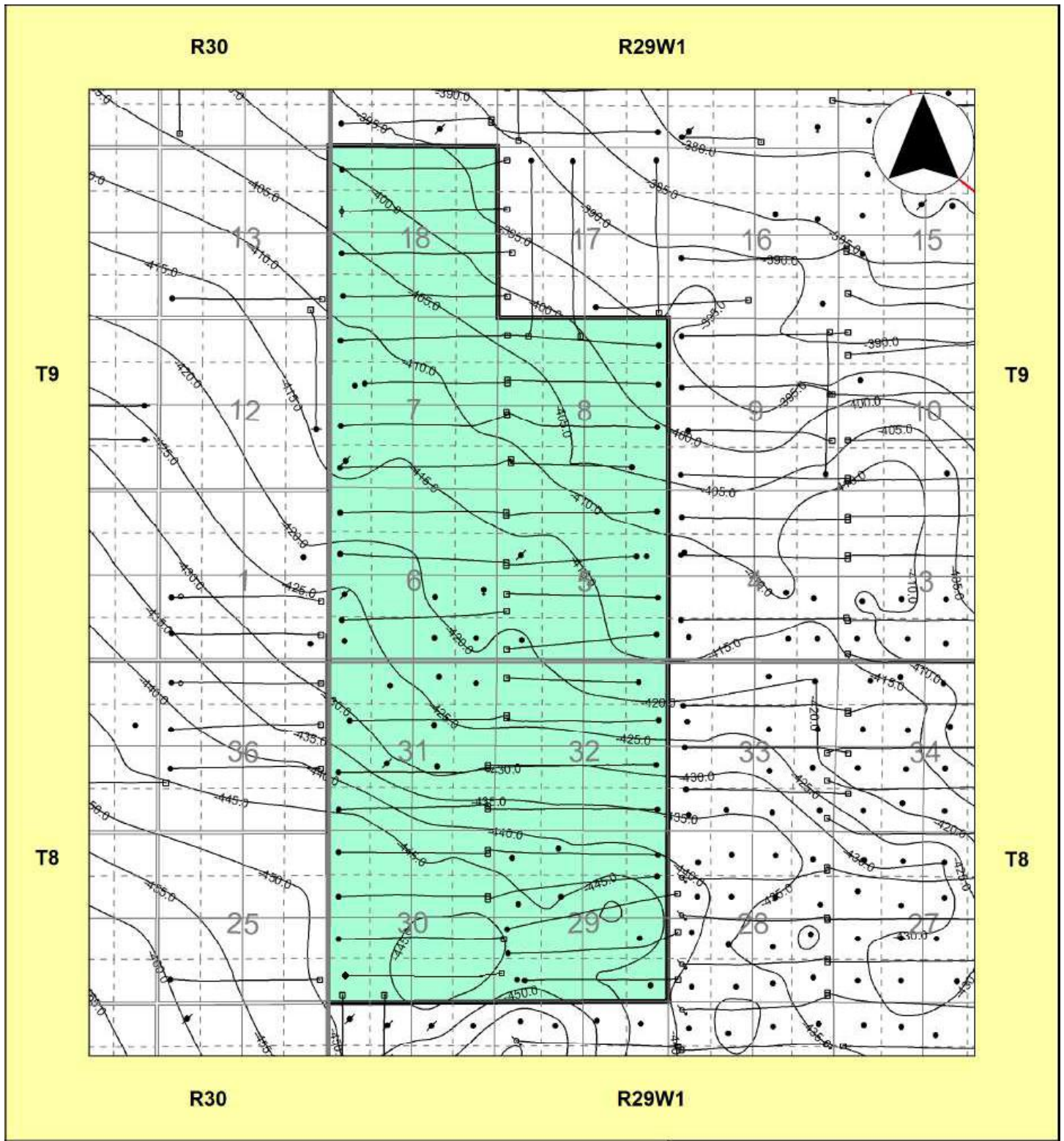
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Upper Lyleton A Structure		
CI=5.0m		
Licensed to: Tundra Oil and Gas Ltd		
By: Havel	Date: 2016/06/07	
Scale: 1:47000	Project: Sinclair Day 2015 Expansion	
geoSCOUT		






Appendix No. 13

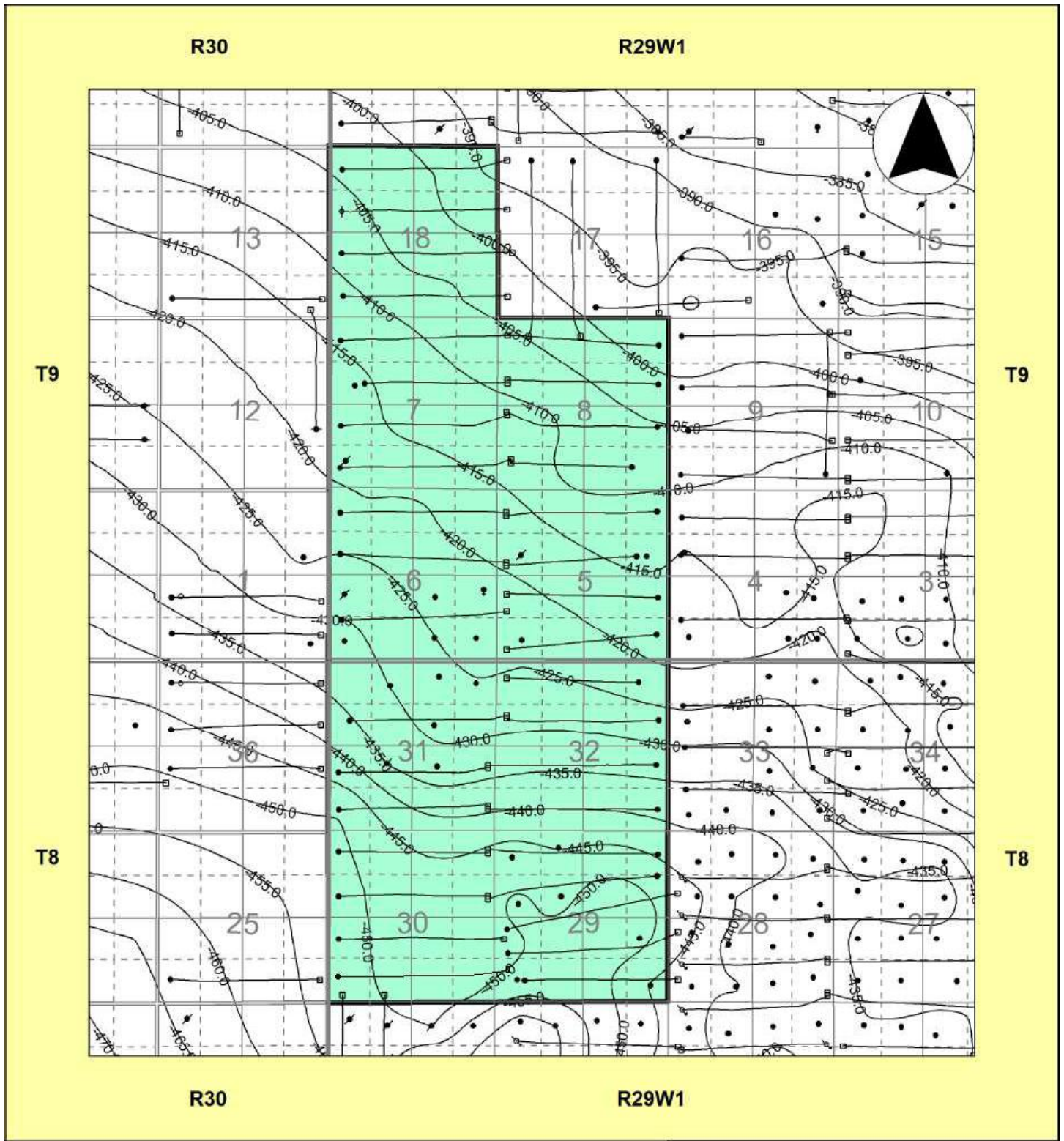
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Lower Lyleton A Structure		
CI=5.0m		
Licensed to: Tundra Oil and Gas Ltd		
By: Howell	Date: 2016/06/07	
Scale: 1:47000	Project: Sinclair Daly 2015 Expansion	
		



Appendix No. 14

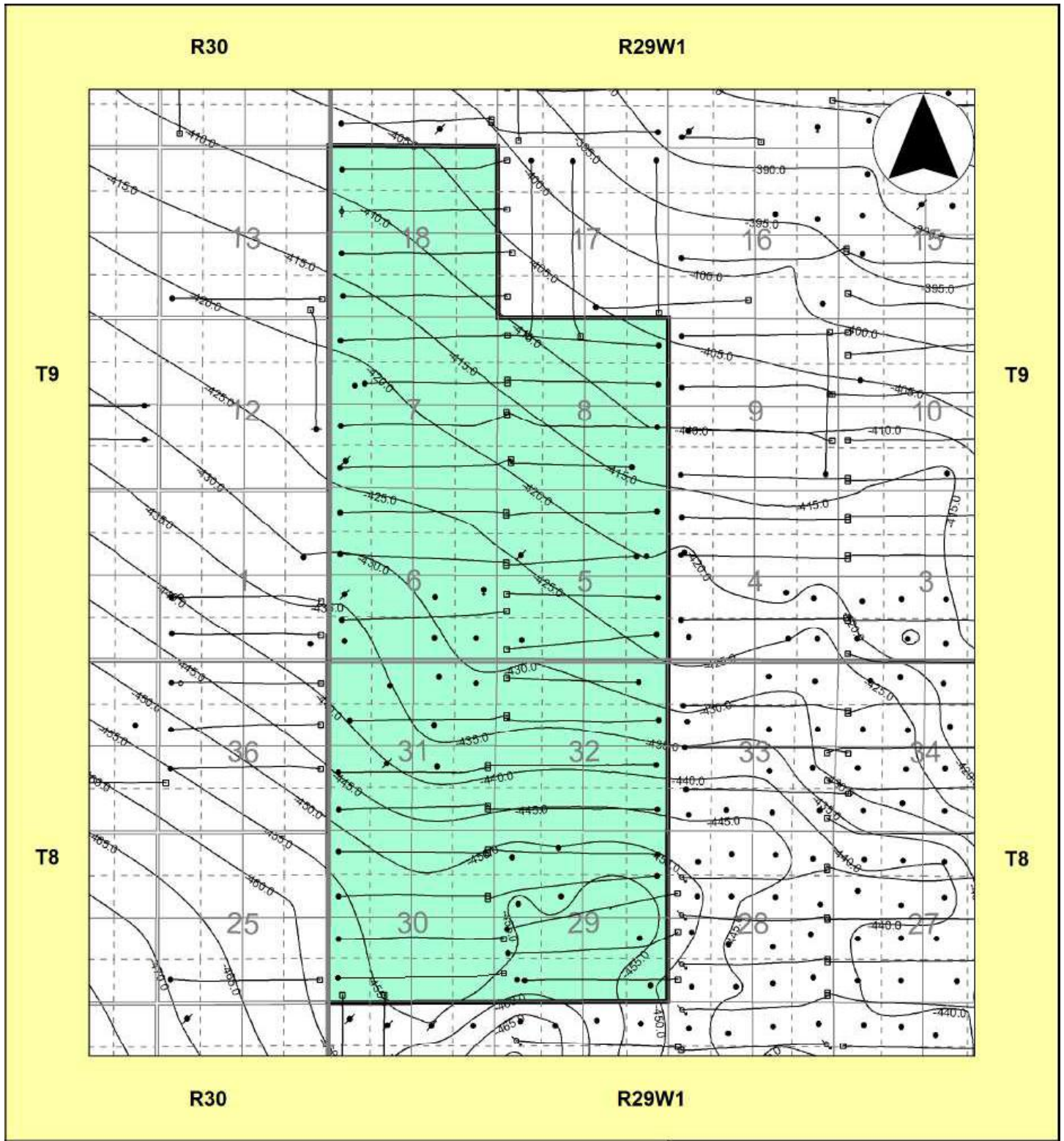
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Red Shale Structure		
CI=5.0m		
Licensed to : Tundra Oil and Gas Ltd		
	By: Howell	Date: 2016/06/07
	Scale = 1:47000	Project: Sinclair Dalv 2015 Expansion





Appendix No. 15

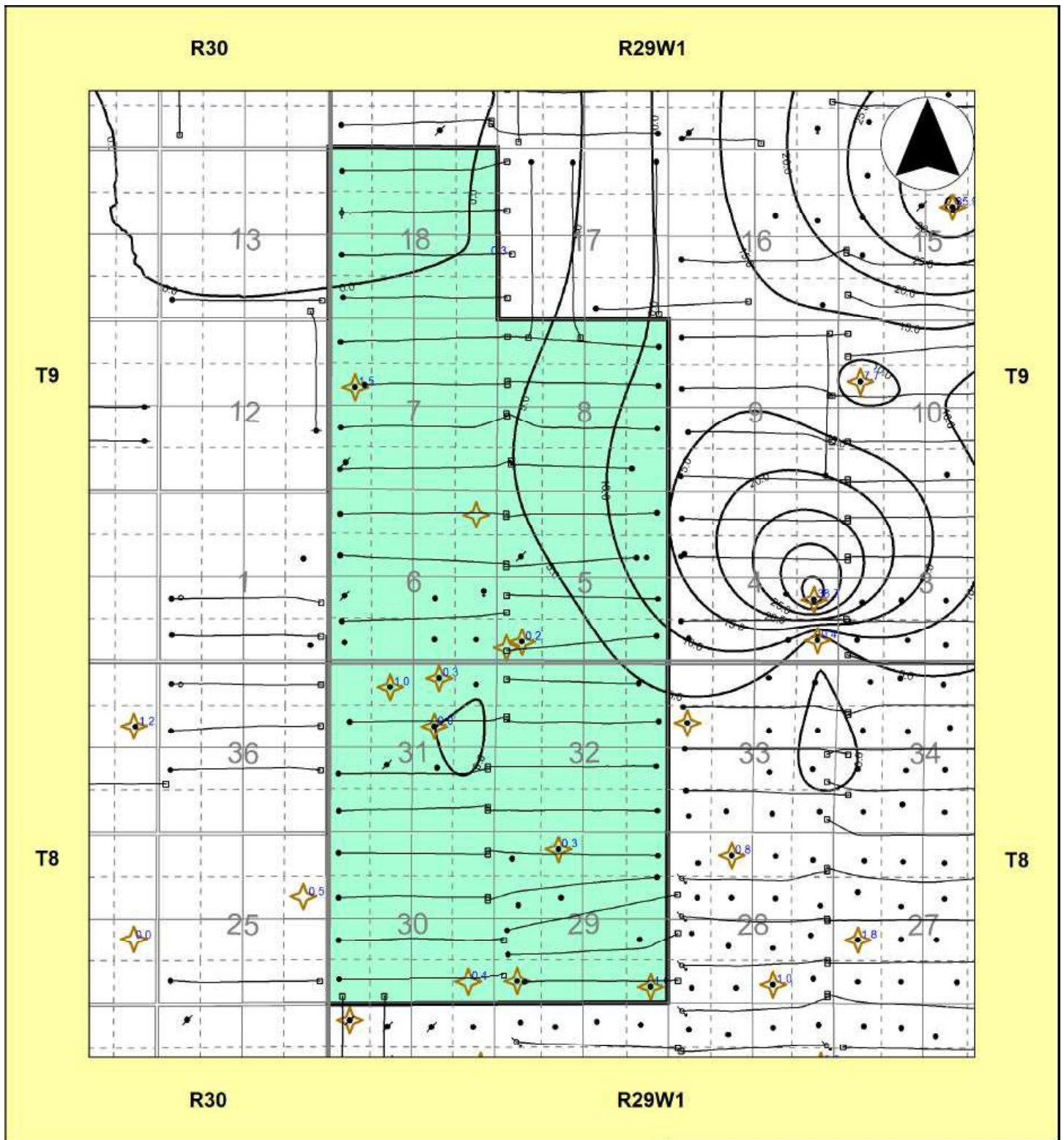
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Lyleton B Structure		
CI=5.0m		
Licensed to : Tundra Oil and Gas Ltd		
By: Howell	Date: 2016/08/07	
Scale: 1:47000	Project: Sinclair Dalu 2015 Expansion	
geoscout		



Appendix No. 16

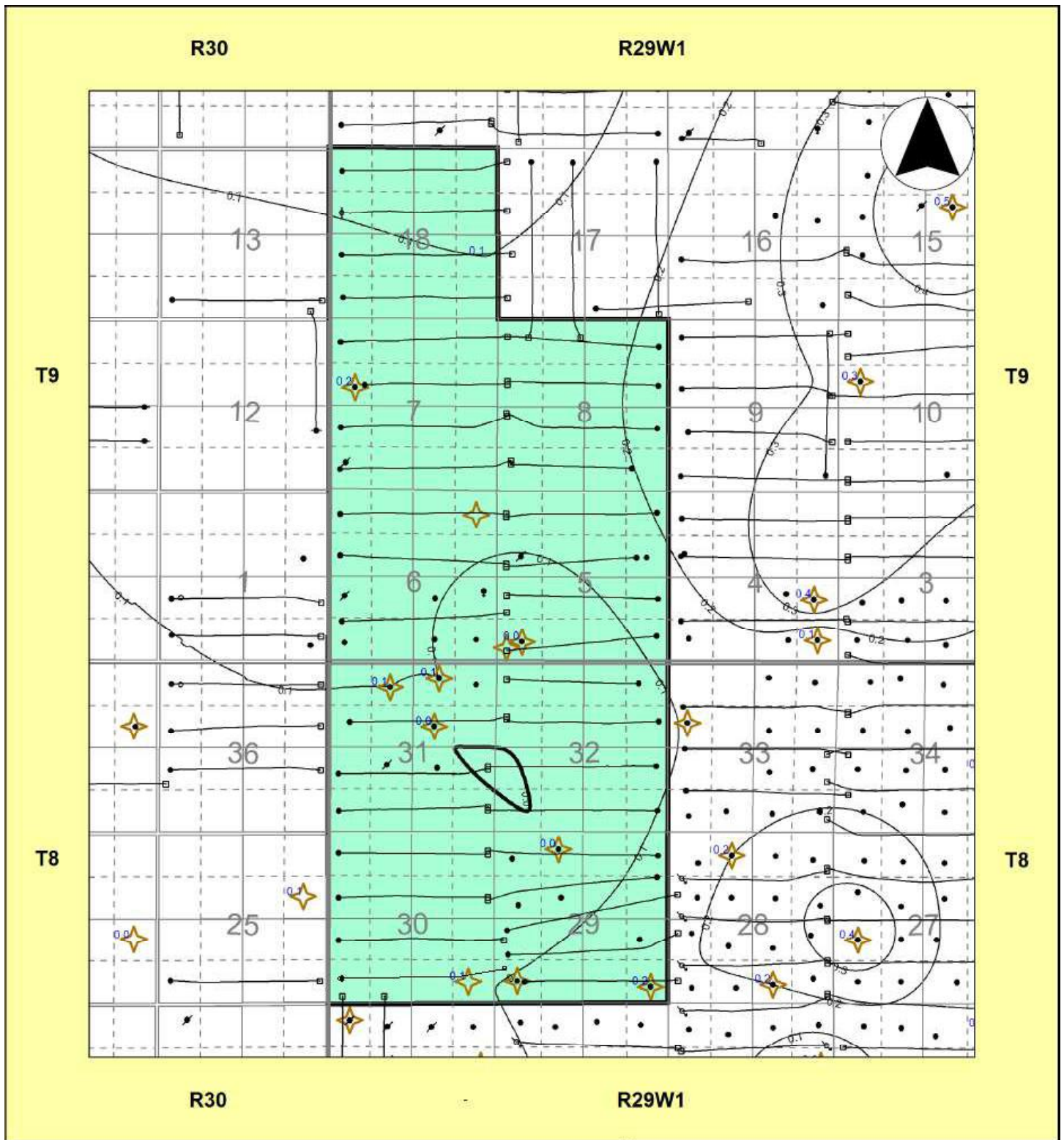
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Torquay Shale Structure		
CI=5.0m		
Licensed to : Tundra Oil and Gas Ltd		
By : Howell	Date : 2016/06/07	
Scale : 1:47000	Project : Sinclair Dalu 2015 Expansion	
geoSCOUT		





Appendix No. 17

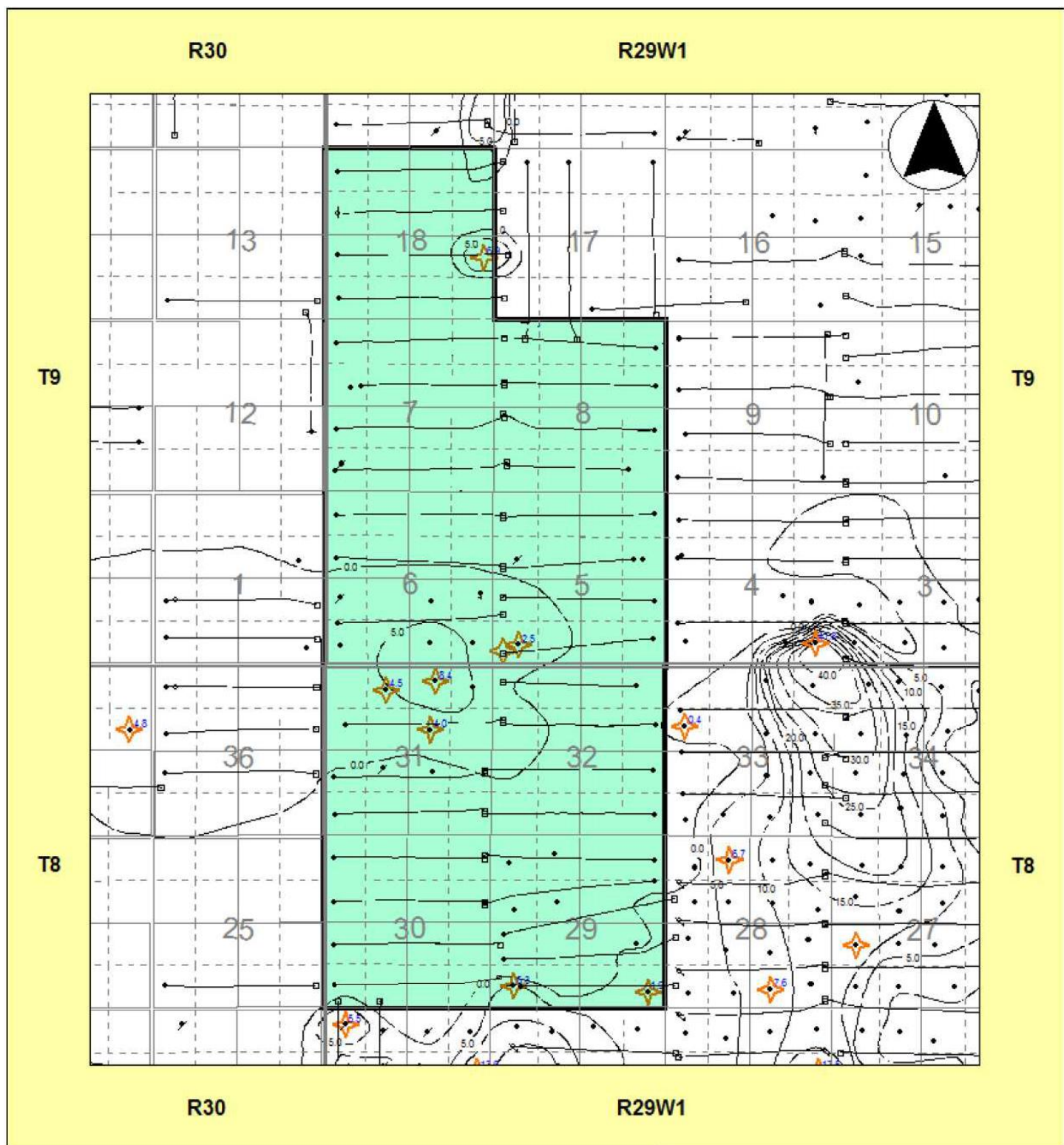
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Middle Bakken k*h@0.5mD CO, CI=5mD*m		
Core points starred and values posted		
Licensed to: Tundra Oil and Gas Ltd		
By: Howell	Date: 2018/06/07	
Scale: 1:47000	Project: Sinclair Data 2015 Expanded	
geoSCOUT		



Appendix No. 18

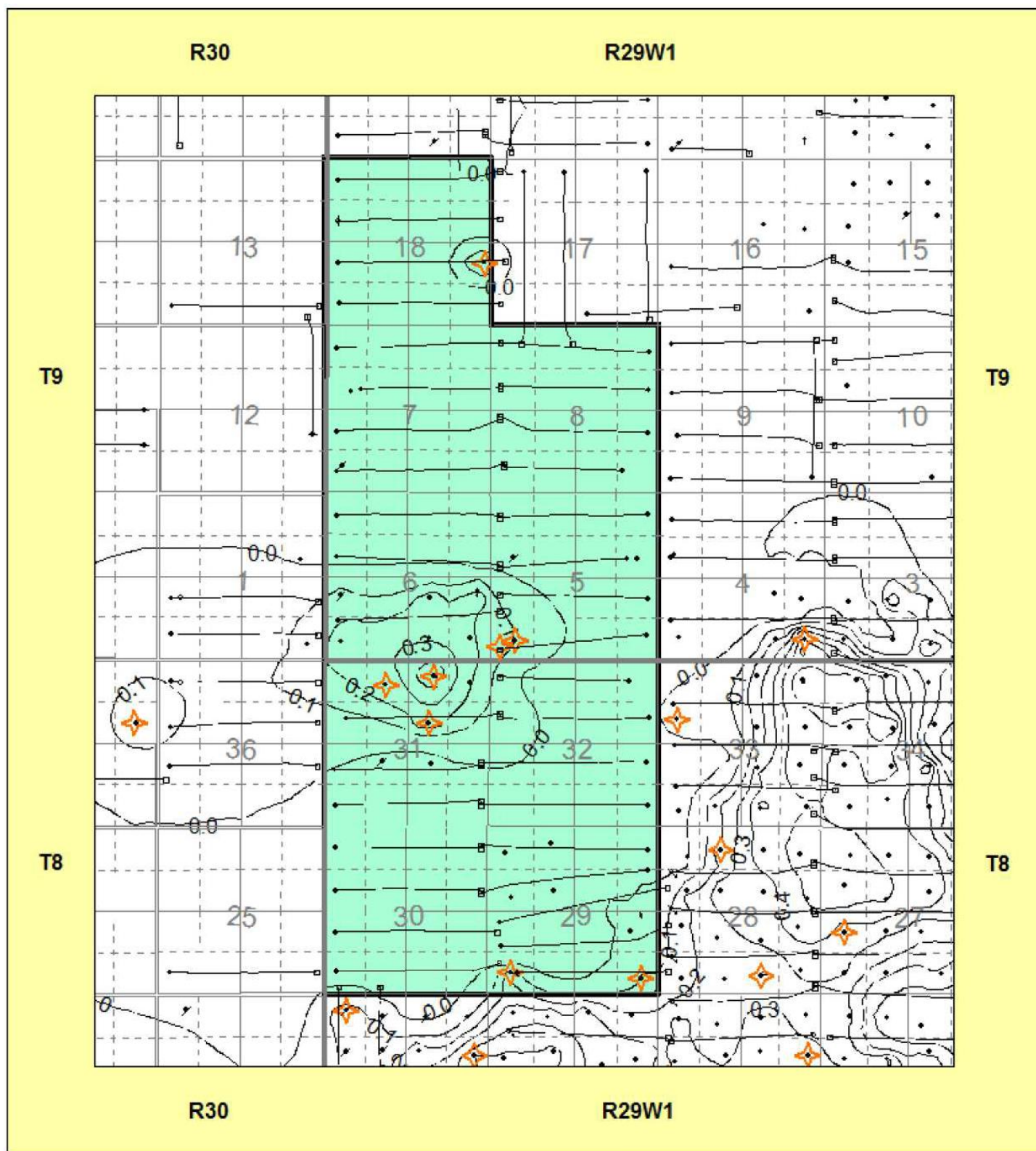
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Middle Bakken phi*h@0.5mD CO, CI=0.1phi*m		
Core points starred and values posted		
Licensed to: Tundra Oil and Gas Ltd		
By: Howell	Date: 2018/06/07	
Scale: 1:147000	Project: Sinclair Daily 2015 Expansion	
geoscout		





Appendix No. 19

Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
U Lyleton A k*h@0.5mD CO, CI=5mD*m		
Core points starred and values posted		
Licensed to: Tundra Oil and Gas Ltd		
By: Howell	Date: 2016/06/09	
Scale: 1:47000	Project: Sinclair Day 2015 Expansion	
geoSCOUT		



Appendix No. 20

Tundra Oil and Gas Ltd

**PROPOSED EOR UNIT 3**

U Lyleton A phi\* $\mu$  0.5mD CO<sub>2</sub> CI=0.1Phi\*m

Core points starred and values posted

UPDATES TO: TUNDRA OIL AND GAS LTD

BY: HENRI

DATE: 11/10/2000

DATE: 11/10/2000

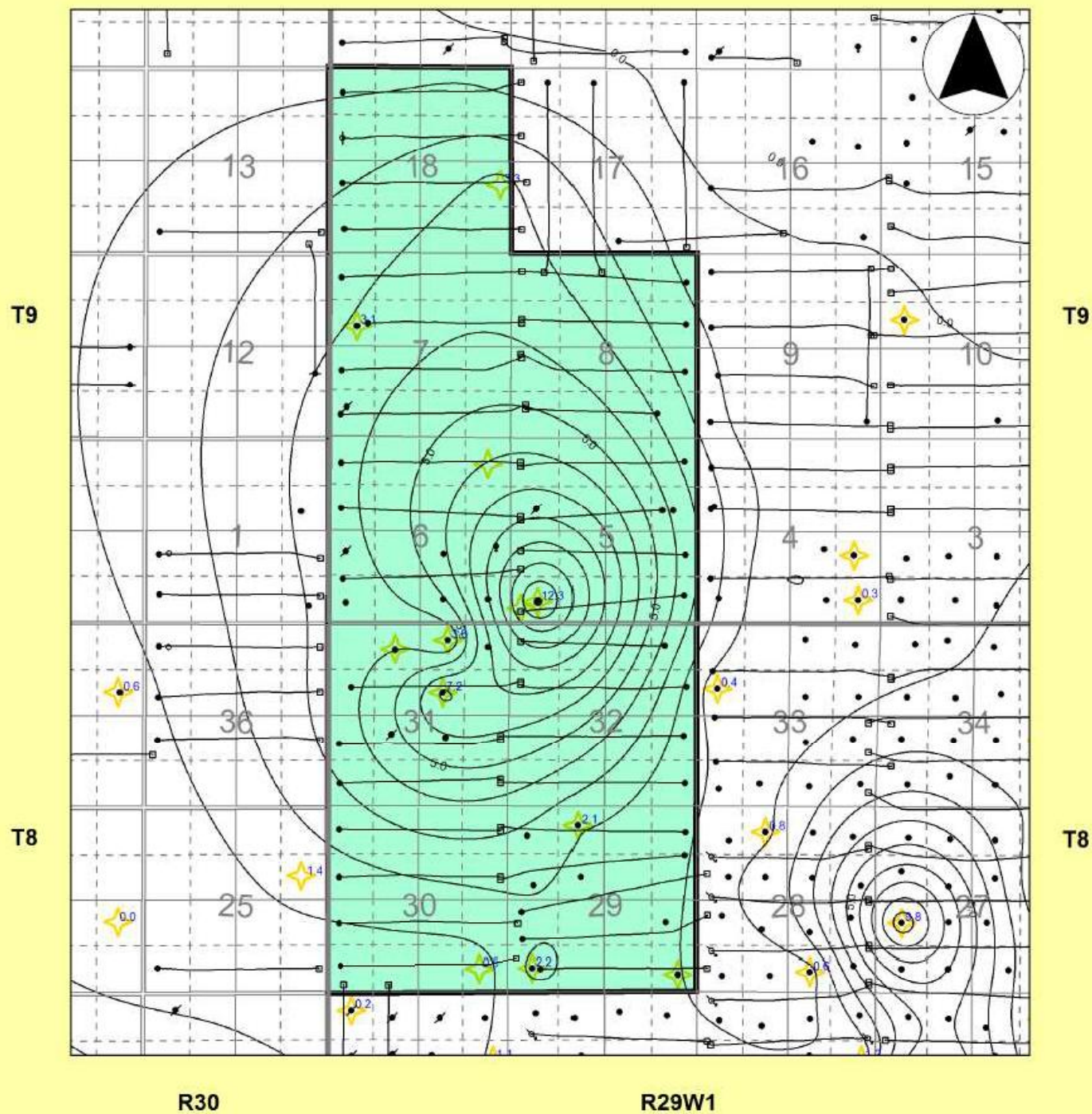
DATE: 11/10/2000

DATE: 11/10/2000



R30

R29W1



Appendix No. 21

Tundra Oil and Gas Ltd

PROPOSED EBOR UNIT 3

L Lyleton A k\*h@0.5mD CO, CI=1mD\*m

Core points and values posted

Licensed to: Tundra Oil and Gas Ltd

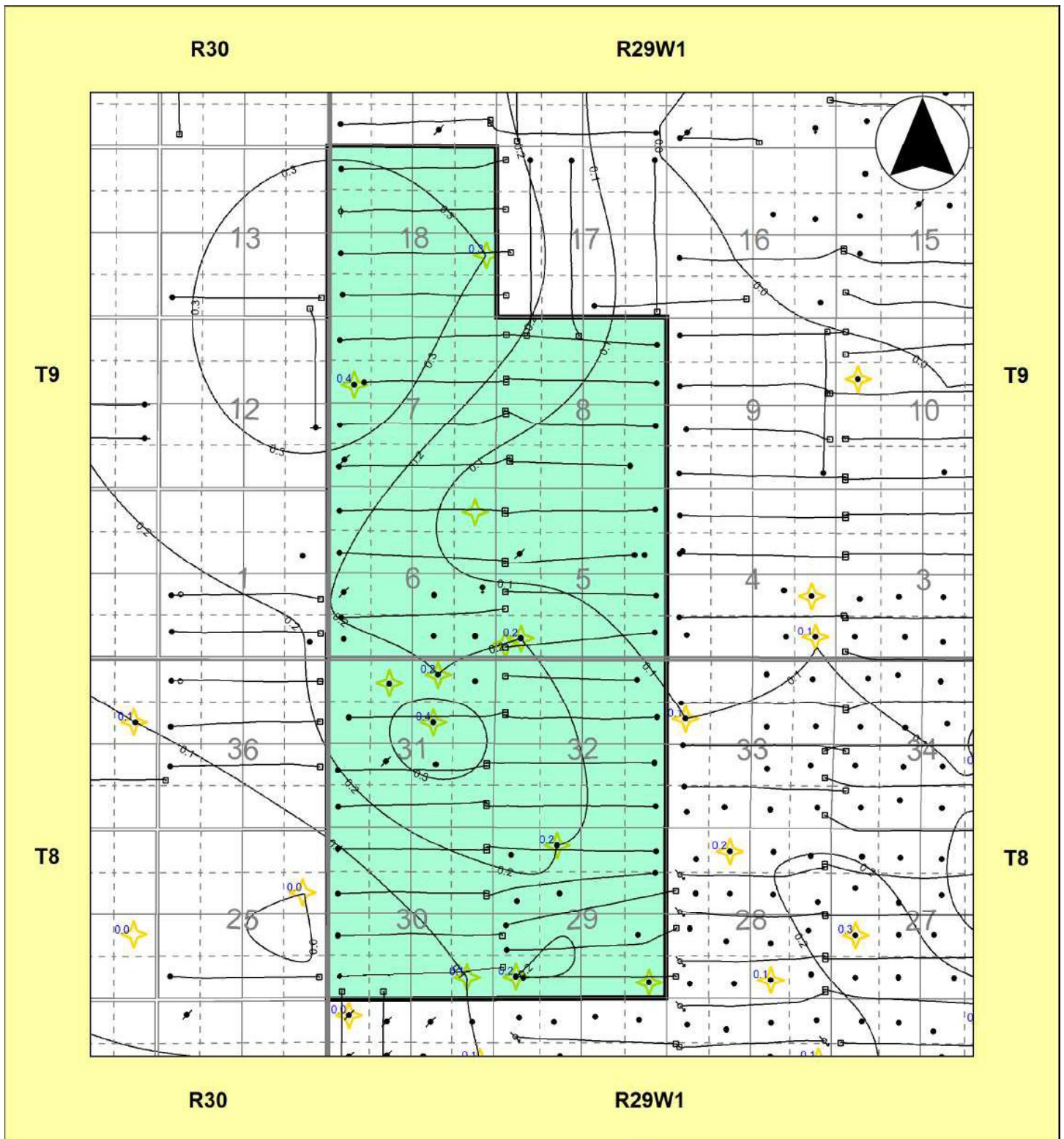
ge5SCOUT

By: Howell

Date: 2016/06/09

Scale: 1:48500

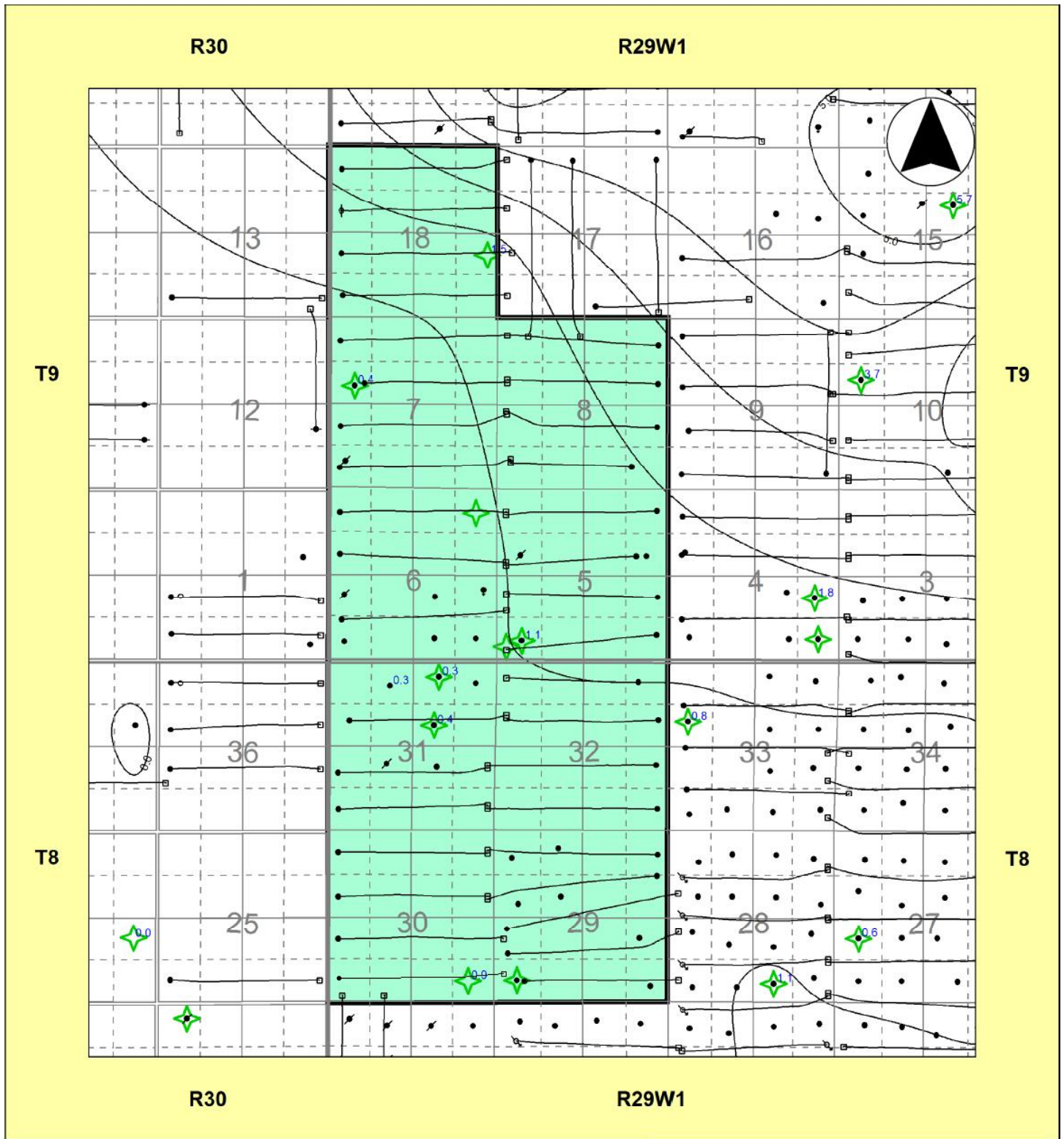
Project: Singar Dair 2015 Expansion




Appendix No. 22

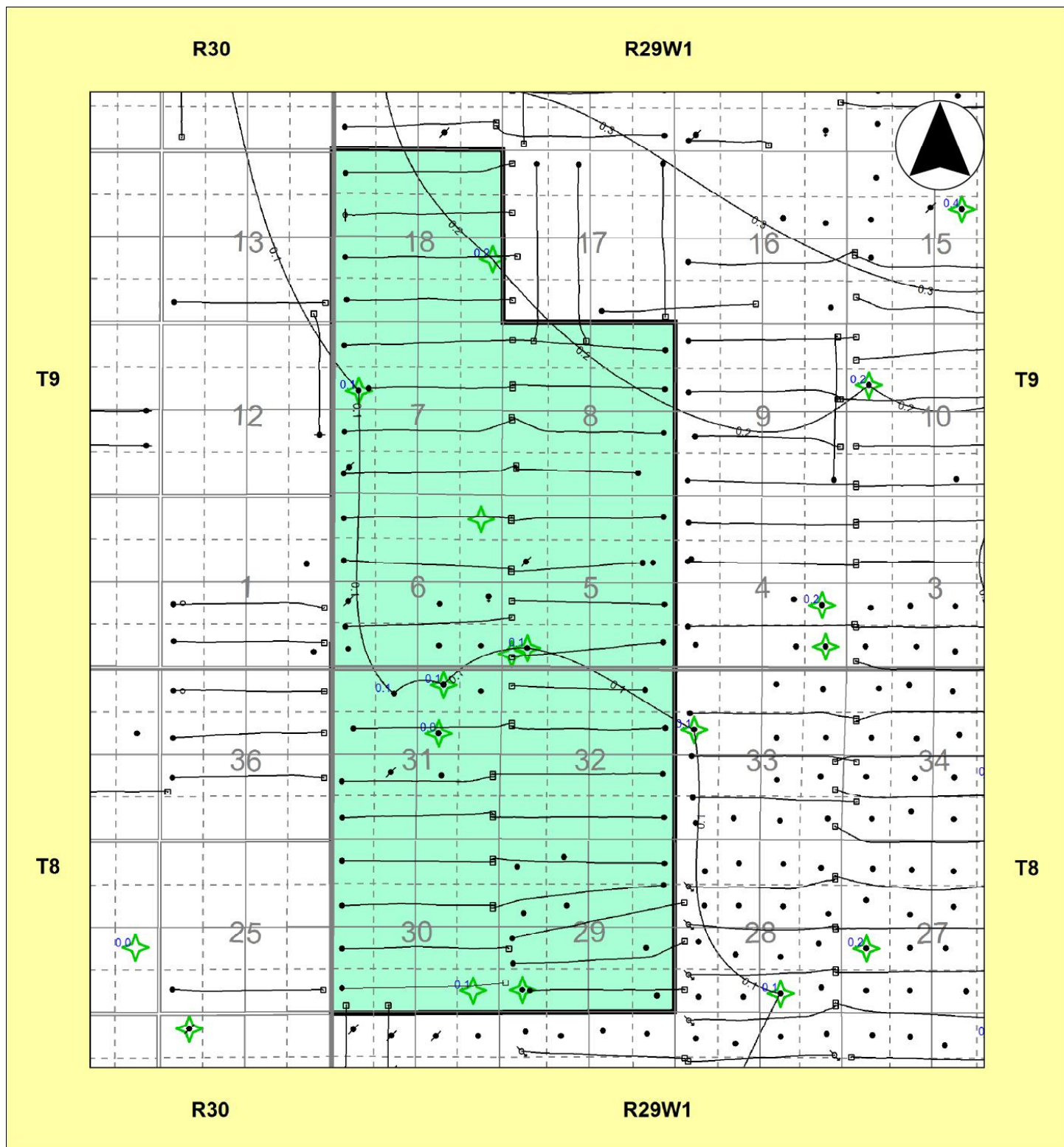
Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
L Lyleton A $\Phi_i h @ 0.5mD$ $CO, CI=0.1\phi i \cdot m$		
Core points and values posted		
Licensed to : Tundra Oil and Gas Ltd		
By : Howell	Date : 2016/06/03	
Scale : 1:48505	Project : Sinclair Daly 2015 Expansion	
geoscout		





# Appendix No. 23

Tundra Oil and Gas Ltd		
PROPOSED EBOR UNIT 3		
Lyleton B k*h@0.5mD CO, CI=1mD*m		
Core points starred and values posted		
Licensed to: Tundra Oil and Gas Ltd		
By: Howell	Date: 2016/06/07	
Scale: 1:47000	Project: Sinclair Dally 2016 Expansion	
		



Appendix No. 24

Tundra Oil and Gas Ltd	
PROPOSED EBOR UNIT 3	
Lyleton B phi*h@0.5mD CO, CI=0.1phi*m	
Core points starred and values posted	
Licensed to : Tundra Oil and Gas Ltd	
By: Howell	Date: 2018/06/07
Scale = 1:47000	Project: Sinclair Daily 2015 Expansion



R30

R29

R28W1

T10

T10

T9

T9

T8

T8



R30

R29

R28W1

## Appendix No. 25

Tundra Oil and Gas Ltd

**PROPOSED EBOR UNIT 3**  
**Cored well coverage over Ebor 3**  
**Cored Wells Starred**

Licensed to : Tundra Oil and Gas Ltd

geoSCOUT  
 www.geoscout.com

By : Howell  
 Scale = 1:94000

Date : 2016/06/07  
 Project : Sinclair Daly 2015 Expansion