

PROPOSED BIRDTAIL UNIT NO. 6

Application for Enhanced Oil Recovery Waterflood Project

Bakken Formation

Bakken A Pool (60A)

Birdtail Field (MB15), Manitoba

March 5th, 2021
Tundra Oil and Gas Limited

INTRODUCTION

Birdtail Units No. 1, No. 2 and No. 3, located in Township 16 Range 27 west of the prime meridian, first produced in September 1996, January 1997 and November 2009, respectively (Figure 1). The main production targets in the units are the Middle Bakken and Three Forks A pools.

For the lands east of Birdtail Unit No. 1, 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. 6 (LSDs 6-10, 15-16 of Section 4-016-27W1 and LSDs 1-3, 5-16 of Section 9-016-27W1) 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 15-60A Bakken A Pool of the Birdtail Oilfield (Figure 3).

SUMMARY

1. The proposed Birdtail Unit No. 6 will include 3 vertical, 1 directional and 9 horizontal wells (4 dual-leg), within 22 Legal Sub Divisions (LSD) of the Middle Bakken/Three Forks producing reservoir. The project is located east of Birdtail Unit No. 1 (Figure 2).
2. Total Net Original Oil in Place (OOIP) in Birdtail Unit No. 6 has been calculated to be **584.4** e³m³ (3,676 Mbbbl) for an average of **26.6** net e³m³ (167.1 Mbbbl) OOIP per 40 acre LSD.
3. Cumulative production to the end of November 2020 from the 13 wells within the proposed Birdtail Unit No. 6 project area was **47.6** e³m³ (299.3 Mbbbl) of oil, and **62.2** e³m³ (391.1 Mbbbl) of water, representing a **8.1%** Recovery Factor (RF) of the Net OOIP.
4. Estimated Ultimate Recovery (EUR) of Primary Proved Producing oil reserves in the proposed Birdtail Unit No. 6 project area has been calculated to be **80.3** e³m³ (505.2 Mbbbl), with **32.7** e³m³ (206.0 Mbbbl) remaining as of the end of November 2020.
5. Ultimate oil recovery of the proposed Birdtail Unit No. 6 OOIP, under the current Primary Production method, is forecasted to be **13.7%**.
6. Figure 4 shows the production from the Birdtail Unit No. 6 peaked in August 2014 at 20.0 m³ (OPD). As of November 2020, production was 11.2 m³ OPD, 43.1 m³ of water per day (WPD) and a 78.9% water cut.
7. In August 2014, production averaged 4.0 m³ OPD per well in Birdtail Unit No. 6. As of November 2020, average per well production has declined to 1.2 m³ OPD. Decline analysis of the group primary production data forecasts total oil to continue declining at an annual rate of approximately **13.0%** in the project area.
8. Estimated Ultimate Recovery (EUR) of proved oil reserves under Secondary WF EOR for the proposed Birdtail Unit No. 6 has been calculated to be **120.5** e³m³ (758.0 Mbbbl), with **72.9** e³m³ (458.8 Mbbbl) remaining. An incremental **40.2** e³m³ (252.8 Mbbbl) of proved oil reserves, or **6.9%**, 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 Birdtail Unit No. 6 is estimated to be **20.6%**.
10. Based on waterflood response in Birdtail Units 1, 2 & 3, 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 will be converted to injection wells (Figure 5) within the proposed Birdtail Unit No. 6, to complete waterflood patterns with effective 20 to 40 acre spacing, similar to that of Birdtail Unit No. 3.

DISCUSSION

The proposed Birdtail Unit No. 6 project area is located within Townships 16-17, Range 27 W1 of the Birdtail oil field. The proposed Birdtail Unit No. 6 currently consists of 3 vertical, 1 directional and 9 horizontal wells within an area covering 22 LSDs (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, 2 and 3 demonstrates 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. 6.

Geology

Stratigraphy

The stratigraphy of the reservoir section in the Birdtail Unit No. 6 area is shown as cross-section A – A' (Appendix 1). The cross-section runs from northwest to southeast through wells offsetting the proposed unit. There are no vertical wells drilled in the proposed unit – it has been developed with horizontal wells. The producing sequence from youngest to oldest is: 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. The main productive zone is considered to be the Middle Bakken Formation.

Sedimentology

The Middle Bakken reservoir consists of fine to coarse grained dolomitic siltstone to sandstone. It can be divided into two units – the upper Middle Bakken and the lower Middle Bakken. The upper Middle Bakken is about 1.5 – 2.0m thick in the Birdtail Unit No. 6 area and is mainly considered non – reservoir. It is composed of heavily bioturbated grey dolomitic siltstone with small brachiopod shells and 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 dolomitic grey and tan colored siltstone and fine-grained sandstone interbeds with occasional bioturbation. Where there is a higher sand content, bioturbation is rare. This is the main reservoir unit of the Middle Bakken. Geological mapping together with horizontal well data suggests that net pay ranges from 0.5 meters to over 2.0 meters thick in Birdtail Unit No. 6 (Appendix 2). The Middle Bakken sand is notably thin over the structural high encountered in the western part of Section 9 and generally thickens on the flanks of this feature. The interpretation of the lower Middle Bakken is of a tidally influenced middle to upper shoreface environment. Overall, the Bakken interval is representative of a shallow marine transgressive system.

The upper Lyleton B unit is typically the uppermost unit preserved at the M Bakken-Lyleton unconformity. It is composed of ripple – cross laminated dolo-siltstones increasingly interbedded with tight greenish/grey dolomitic shales with depth. The upper Lyleton B is occasionally of reservoir quality and 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 shows the Lyleton Subsea Structure integrated with proprietary seismic data together with data points from horizontal wells. The Lyleton surface is useful for more detailed structure mapping since horizontal wells often encounter the Lyleton providing more data points. The lower Middle Bakken reservoir sits directly on top of the Lyleton making the Lyleton surface particularly useful when evaluating the oil water contact. Lyleton subsea structure ranges from approximately -47m in the east side of the unit and rises to approximately -36m in the north part of the unit. The structural high noted here appears to have influenced Middle Bakken sand deposition as thinning is noted over the high. The Middle Bakken within Birdtail Unit No. 6 is above the local oil/water contact of approximately -46m subsea, however it appears to be encroaching close to it along the southeast boundary.

Reservoir Continuity

Cross Section A – A' (Appendix 1) and existing production (Table 3) indicate that there is likely very good lateral continuity in the basal Middle Bakken formation within Birdtail Unit No. 6. Vertical reservoir continuity between 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

There are five (5) vertical wells drilled in proposed Birdtail Unit No. 6. Cores were cut in two (2) of these wells, however, there is no core analysis data available. Four (4) wells in close proximity to the proposed unit have core analysis in the Middle Bakken formation. Permeability data is summarized below:

1. 100/14-04-016-27W1/0, Kmax.h: 7.4 mD.m. This well is the closest well cored offsetting the proposed Birdtail Unit No. 6. It is situated on the structural high and does not have well developed sand and had very thin net pay (h);
2. 100/16-05-016-27W1/0, Kmax.h: 135.5 mD.m. This well is situated on the west flank of the structural high and encountered good quality lower M Bakken sand;
3. 100/09-08-016-27W1/0, Kmax.h: 52.8 mD.m.
4. 100/04-16-16-27W1/0, Kmax.h: 142.5mD.m. This well is drilled on the northern edge of the pool but did contain some thinner lower M Bakken sand.

The horizontal wells drilled in the proposed Unit 6 have performed well. Drill cuttings described in these horizontal wells indicate that better and thicker sand development lies in a flank position to the east of the structural high. The 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. The Kmax.h values have been posted to the map but have not been contoured due to limited data points. (Appendix 4).

The good reservoir interpretation is also supported with relatively high average porosity values as shown in Appendix 5. Tundra has mapped the average porosity of the lower Middle Bakken reservoir that exceeds

a Limestone Density porosity cutoff of 15.4%. Average porosity values range from 19.8% to 22.0% throughout the proposed unit.

Fluid Contacts

The oil/water contact locally is considered to be at -46m subsea and was mapped by integrating proprietary seismic and well control. The oil water contact generally runs north-south along the east side of proposed Birdtail Unit No. 6. High watercuts were observed in the production from the wells situated on the south row of Lsds ([Appendix 3](#)).

Gross OOIP Estimates

The total volumetric OOIP for the Middle Bakken within the proposed Birdtail Unit No. 6 has been calculated to be **584.4 e³m³** (3,676 Mbbbl) of oil ([Table 4](#)).

The OOIP was calculated LSD by LSD interpolating between vertical wells using the equation

OOIP= [Ah phi (1-Swi)/Boi], where,

OOIP = Original Oil in Place

A =Reservoir Area (m²)

h = Reservoir Thickness (m)

phi = Reservoir Porosity

Swi = Connate Water Saturation – estimated to be 0.42 in the area

Boi = Initial Formation Volume factor – assumed to be 1.003 in the area

Net pay cut-offs for the Middle Bakken applied were: Limestone Density Porosity greater than or equal to 15.4% and a water saturation less than or equal to 60%.

Historical Production

A historical group production history plot for the proposed Birdtail Unit No. 6 is shown as [Figure 4](#). Oil production commenced from the proposed Unit area in November 1996 and peaked during August 2014 at 20.0 m³ OPD. As of November 2020, production was 11.2 m³ OPD, 43.1 m³ WPD and a 78.9% watercut.

From peak production in August 2014 to date, oil production is declining at an annual rate of approximately **13.0%** 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 Birdtail Unit No. 6.

Unit Operator

Tundra Oil and Gas Limited (Tundra) will be the Operator of record for Birdtail Unit No. 6.

Unitized Zone

The Unitized zone(s) to be waterflooded in Birdtail Unit No. 6 will be the Middle Bakken and Three Forks formations.

Unit Wells

The 3 vertical, 1 directional and 9 horizontal wells to be included in the proposed Birdtail Unit No. 6 are outlined in [Table 3](#).

Unit Lands

Birdtail Unit No. 6 will consist of 22 LSDs as follows:

LSDs 6-10, 15-16 of Section 4 of Township 16, Range 27, W1M
LSDs 1-3, 5-16 of Section 9 of Township 16, Range 27, W1M

The lands included in the 40 acre tracts are outlined in [Table 1](#).

Tract Factors

The proposed Birdtail Unit No. 6 will consist of 22 Tracts based on the 40 acre LSDs containing the existing 3 vertical, 1 directional and 9 horizontal wells.

The Tract Factor contribution for each of the LSD's within the proposed Birdtail Unit No. 6 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 Birdtail Unit No. 6.

Tundra Oil and Gas Limited will own 100% WI in the proposed Birdtail Unit No. 6.

WATERFLOOD EOR DEVELOPMENT

Technical Studies

The waterflood performance predictions for the proposed Birdtail Unit No. 6 are based on internal engineering assessments. Project area specific reservoir and geological parameters were used to guide the overall Secondary Waterflood recovery factor. Internal reviews included analysis of available open-hole logs, core data, petrophysics, seismic, drilling and 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. 6 OOIP (Table 4).

Pre-Production of New Horizontal Injection Wells

Primary production from the original vertical/horizontal producing wells in the proposed Birdtail Unit No. 6 has declined significantly from peak rate indicating a need for secondary pressure support. Through the process of developing similar waterfloods, Tundra has measured a significant variation in reservoir pressure depletion by the existing primary producing wells. 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.

Considering the expected reservoir pressures and reservoir lithology described, Tundra believes an initial period of producing all horizontal wells prior to placing them 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 performance predictions for the proposed Birdtail Unit No. 6 are based on oil production decline curve analysis, and the secondary waterflood predictions are based on internal engineering analysis performed by the Tundra reservoir engineering group.

Primary Production Forecast

Cumulative production in the Birdtail Unit No. 6 project area, to the end of November from 13 wells, was **47.6 e³m³** of oil and **62.2 e³m³** of water for a recovery factor of **8.1%** of the calculated Net OOIP.

Ultimate Primary Proved Producing oil reserves recovery for Birdtail Unit No. 6 has been estimated to be **80.3 e³m³**, or a **13.7%** Recovery Factor (RF) of OOIP. Remaining Producing Primary Reserves has been estimated to be **32.7 e³m³** to the end of November 2020.

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

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

Tundra will devise an injection conversion schedule to allow for the most expeditious development of the waterflood within the proposed Birdtail Unit No. 6, while maximizing reservoir knowledge. This schedule is usually based on the economics of converting wells to injection.

Criteria for Conversion to Water Injection Well

Four (4) water injection wells are required for this proposed unit as shown in **Figure 5**, which will result in an effective 20 - 40 acre line drive waterflood pattern within Birdtail Unit No. 6.

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 Birdtail Unit No. 6 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 Birdtail Unit No. 3 WF (**Figure 6**).

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 Birdtail Unit No. 6 is estimated to be **120.5 e³m³** with **72.9 e³m³** remaining, representing a total secondary recovery factor of **20.6%** for the proposed Unit area. An incremental **40.2 e³m³** of oil, or an incremental **6.9%** 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 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. 6 will be supplied from the Tundra Lodgepole source water well at 100/02-32-016-27W1. Lodgepole water from the 100/02-32 source well is pumped to the main Tundra 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. 6 project area injection wells is shown as **Figure 13**.

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. 6.

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 & 3). Review and monitoring of the source water scale inhibition system is also part of an existing routine maintenance program.

Injection Wells

All of the four water injection wells for the proposed Birdtail Unit No. 6 have been drilled, are currently producing and plans are in progress to re-configure the wells for downhole injection after approval for waterflood has been received **Figure 11**. The horizontal injection wells 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 new 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 new 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 Birdtail Unit No. 6 horizontal water injection well rate is forecasted to average **10 – 35 m³** 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. 6 is shown in **Figure 12**. The estimated reservoir pressure for the proposed unit area is in the range of 3200 - 4700 kPa.

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

Birdtail Unit No. 6 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 Birdtail Unit No. 6 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. 6.

On Going Reservoir Pressure Surveys

Any pressures taken during the operation of the proposed unit will be reported within the Annual Progress Reports for Birdtail Unit No. 6 as per Section 73 of the Drilling and Production Regulation.

Economic Limits

Under the current Primary recovery method, existing wells within the proposed Birdtail Unit No. 6 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. 6 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 13).

A complete description of all planned system design and operational practices to prevent corrosion related failures is shown in Figure 14. 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 Figure 14 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. 6. 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 Birdtail Unit No. 6 Application.

Birdtail Unit No. 6 Unitization, and execution of the formal Birdtail Unit No. 6 Agreement by affected Mineral Owners, is expected during Q3 2021. Copies of same will be forwarded to the Petroleum Branch, when available, to complete the Birdtail Unit No. 6 Application.

Should the Petroleum Branch have further questions or require more information, please contact Angel Duran at 403.910.1673 or by email at angel.duran@tundraoilandgas.com.

TUNDRA OIL & GAS LIMITED

Original Signed by Angel Duran, March 5th 2021, in Calgary, AB

Proposed Birdtail Unit No. 6

Application for Enhanced Oil Recovery Waterflood Project

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TABLE NO. 2: TRACT FACTOR CALCULATIONS FOR PROPOSED BIRDTAIL UNIT NO. 6
TRACT FACTORS BASED ON OIL-IN-PLACE (OOIP) - CUMULATIVE PRODUCTION TO NOV 2020

Tract No.	LSD-SEC	UWI	OOIP (m3)	Hz Cum Prodn Nov 2020 (m3)	Vertical Cum Prodn Nov 2020 (m3)	OOIP Minus Cum Oil Prodn (m3)	Tract Factor (%)
1	06-04	06-04-16-27W1	39,881	4,008.4	1,425.5	34,448	6.415181394%
2	07-04	07-04-16-27W1	42,001	5,589.5	0.0	36,411	6.780886214%
3	08-04	08-04-16-27W1	26,205	4,717.9	0.0	21,488	4.001630961%
4	09-04	09-04-16-27W1	28,643	2,022.9	0.0	26,620	4.957527446%
5	10-04	10-04-16-27W1	40,908	1,904.7	0.0	39,003	7.263556926%
6	15-04	15-04-16-27W1	36,003	3,369.3	0.0	32,634	6.077464042%
7	16-04	16-04-16-27W1	26,733	3,758.2	0.0	22,975	4.278569996%
8	01-09	01-09-16-27W1	24,884	928.5	0.0	23,955	4.461169142%
9	02-09	02-09-16-27W1	35,401	1,091.6	0.0	34,309	6.389419519%
10	03-09	03-09-16-27W1	14,493	940.4	0.0	13,552	2.523825669%
11	05-09	05-09-16-27W1	10,210	1,330.9	0.0	8,879	1.653593559%
12	06-09	06-09-16-27W1	17,158	1,573.9	0.0	15,585	2.902312494%
13	07-09	07-09-16-27W1	36,828	1,572.6	0.0	35,255	6.565633014%
14	08-09	08-09-16-27W1	23,680	1,482.3	0.0	22,198	4.133948940%
15	09-09	09-09-16-27W1	22,520	1,852.2	588.2	20,079	3.739371353%
16	10-09	10-09-16-27W1	36,280	2,306.5	0.0	33,973	6.326890807%
17	11-09	11-09-16-27W1	16,210	2,142.3	0.0	14,068	2.619855775%
18	12-09	12-09-16-27W1	11,664	1,615.3	0.0	10,048	1.871317760%
19	13-09	13-09-16-27W1	25,319	866.8	0.0	24,452	4.553653257%
20	14-09	14-09-16-27W1	24,564	927.8	0.0	23,636	4.401836290%
21	15-09	15-09-16-27W1	30,416	883.7	0.0	29,532	5.499819097%
22	16-09	16-09-16-27W1	14,436	568.2	0.0	13,867	2.582536348%
			584,436	45,453	2,014	536,969	100.000000000%

Table No. 3 - Birdtail Unit No. 6 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 (%)
100/06-04-016-27W1/C	004828	Dir/Dev	BAKKEN A	BAKKEN	Abandoned Zone	2/26/2001	12/31/2011	0.00	0.00	1425.50	0.00	0.00	209.00	0.00
100/08-04-016-27W1/C	008133	Horizontal	BAKKEN A	BAKKENM	Producing	9/18/2011	11/30/2020	2.23	66.80	14315.70	6.18	185.30	12291.70	73.50
100/09-04-016-27W1/C	009116	Horizontal	BAKKEN A	BAKKENM	Producing	4/2/2013	11/30/2020	0.66	19.80	3927.60	5.01	150.30	8156.50	88.36
100/16-04-016-27W1/C	007648	Horizontal	BAKKEN A	BAKKEN	Producing	10/31/2010	11/30/2020	0.60	17.90	7051.80	7.48	224.50	15441.60	92.62
100/01-09-016-27W1/C	008632	Horizontal	BAKKEN A	BAKKEN	Producing	7/25/2012	11/30/2020	0.46	13.70	2777.60	2.24	67.20	6567.70	83.07
102/01-09-016-27W1/C	011190	Horizontal	BAKKEN A	BAKKEN	Producing	7/25/2012	11/30/2020	0.78	23.30	334.30	6.69	200.70	2902.60	89.60
102/01-09-016-27W1/2	011190	Horizontal	BAKKEN A	BAKKEN	Producing	4/1/2020	4/30/2020	0.00	0.00	15.80	0.00	0.00	188.90	0.00
100/08-09-016-27W1/C	009934	Horizontal	BAKKEN A	BAKKENM	Producing	7/16/2014	11/30/2020	0.70	20.90	5959.60	2.53	75.80	3528.30	78.39
100/09-09-016-27W1/C	004612	Vertical	BAKKEN A	BAKKENU	Abandoned Zone	11/15/1996	10/31/2002	0.00	0.00	588.20	0.00	0.00	1326.20	0.00
102/09-09-016-27W1/C	010514	Horizontal	BAKKEN A	BAKKENU,BAKKENM	Producing	3/4/2016	11/30/2020	2.08	62.50	5920.70	4.39	131.80	6862.00	67.83
100/11-09-016-27W1/C	002559	Vertical	BAKKEN A	BAKKENU,BAKKENM	Abandoned	N/A								
100/16-09-016-27W1/C	004639	Vertical	BAKKEN A	BAKKENM	Abandoned	N/A								
102/16-09-016-27W1/C	010761	Horizontal	BAKKEN A	BAKKENM	Producing	1/3/2018	11/30/2020	1.67	50.10	3977.10	3.99	119.60	3101.40	70.48
103/16-09-016-27W1/C	011191	Horizontal	BAKKEN A	BAKKENM	Producing	9/27/2019	11/30/2020	1.99	59.80	1264.90	3.27	98.00	1605.80	62.10
								11.16		47558.8			62181.7	

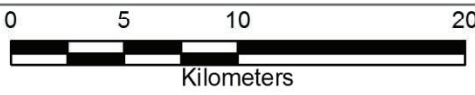
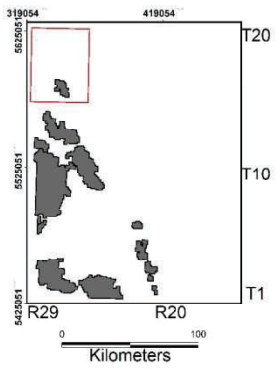
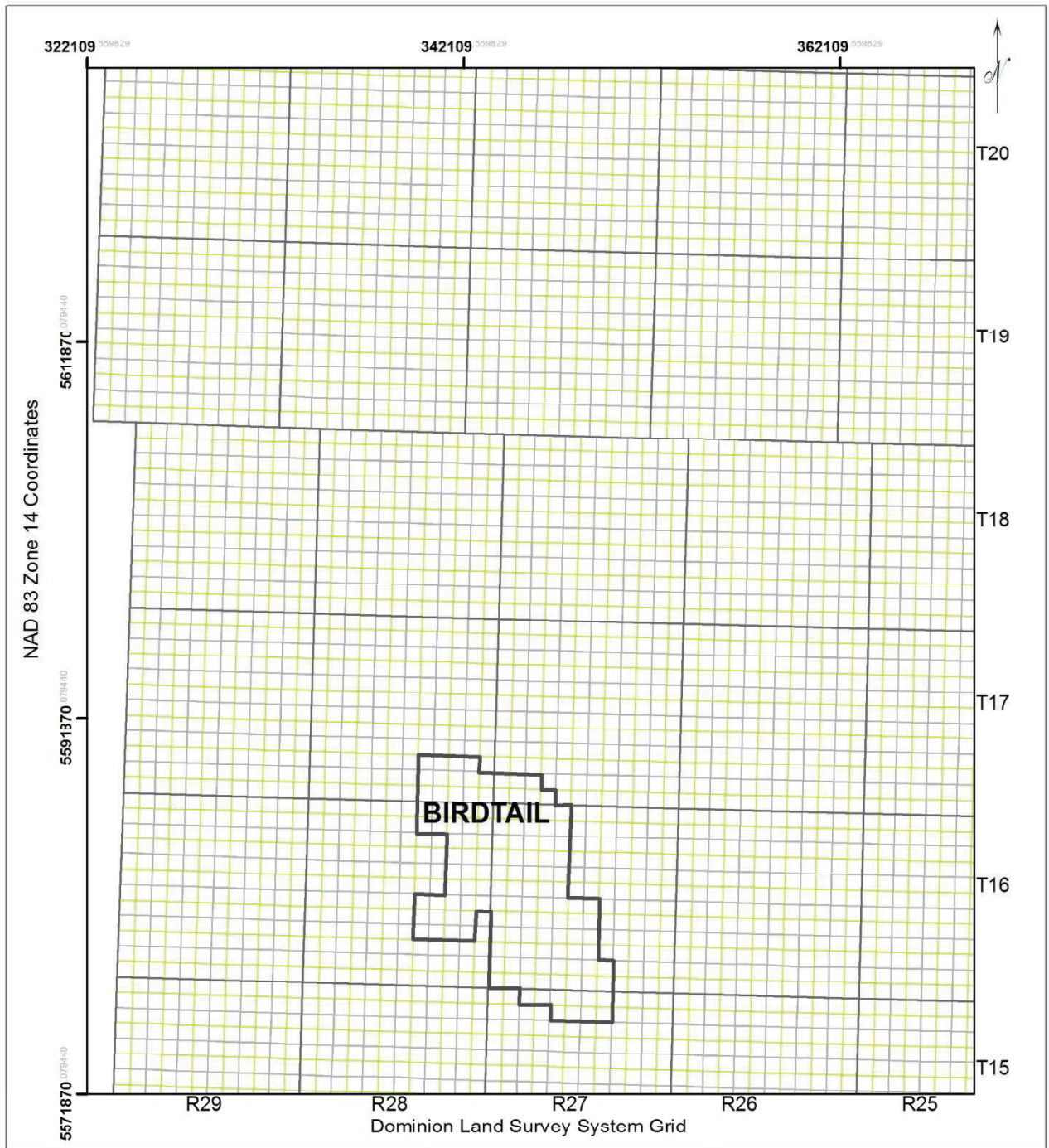
TABLE NO. 4: OOIP Calculation

LSD	Total Area (m2)	Data Area (m2)	Net Pay (m)	Porosity (>15.4%)	Adjusted Por (+ 1.6%)	Sw	Bo	OOIP(m3)	OOIP(bbls)
6-4-16-27W1	163,002	163,002	1.94	0.202	0.218	0.420	1.003	39,881	250,846
7-4-16-27W1	163,348	163,348	2.05	0.201	0.217	0.420	1.003	42,001	264,177
8-4-16-27W1	163,688	163,688	1.29	0.198	0.214	0.420	1.003	26,205	164,827
9-4-16-27W1	164,075	164,075	1.44	0.194	0.210	0.420	1.003	28,643	180,161
10-4-16-27W1	163,690	163,690	2.06	0.194	0.210	0.420	1.003	40,908	257,302
15-4-16-27W1	164,100	164,100	1.91	0.182	0.198	0.420	1.003	36,003	226,454
16-4-16-27W1	164,486	164,486	1.37	0.189	0.205	0.420	1.003	26,733	168,144
1-9-16-27W1	163,441	163,441	1.30	0.186	0.202	0.420	1.003	24,884	156,513
2-9-16-27W1	163,153	163,153	1.88	0.183	0.199	0.420	1.003	35,401	222,664
3-9-16-27W1	162,691	162,691	0.78	0.182	0.198	0.420	1.003	14,493	91,155
5-9-16-27W1	162,105	162,105	0.53	0.188	0.204	0.420	1.003	10,210	64,220
6-9-16-27W1	162,472	162,472	0.91	0.186	0.202	0.420	1.003	17,158	107,923
7-9-16-27W1	162,910	162,910	1.94	0.186	0.202	0.420	1.003	36,828	231,641
8-9-16-27W1	163,197	163,197	1.24	0.186	0.202	0.420	1.003	23,680	148,945
9-9-16-27W1	162,920	162,920	1.19	0.185	0.201	0.420	1.003	22,520	141,644
10-9-16-27W1	162,561	162,561	1.92	0.185	0.201	0.420	1.003	36,280	228,194
11-9-16-27W1	162,146	162,146	0.85	0.187	0.203	0.420	1.003	16,210	101,958
12-9-16-27W1	161,846	161,846	0.59	0.195	0.211	0.420	1.003	11,664	73,362
13-9-16-27W1	161,626	161,626	1.33	0.187	0.203	0.420	1.003	25,319	159,249
14-9-16-27W1	161,925	161,925	1.32	0.183	0.199	0.420	1.003	24,564	154,504
15-9-16-27W1	162,318	162,318	1.63	0.183	0.199	0.420	1.003	30,416	191,311
16-9-16-27W1	162,676	148,945	0.85	0.182	0.198	0.420	1.003	14,436	90,798
Total/Average			1.38		0.204	0.420	1.003	584,436	3,675,991

Proposed Birdtail Unit No. 6
Application for Enhanced Oil Recovery Waterflood Project

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Map 1

Manitoba's Designated Fields & Pools 2016
 Well Information: January 1, 2016.
 Geology by: P. Fulton-Regula
 Petroleum Branch

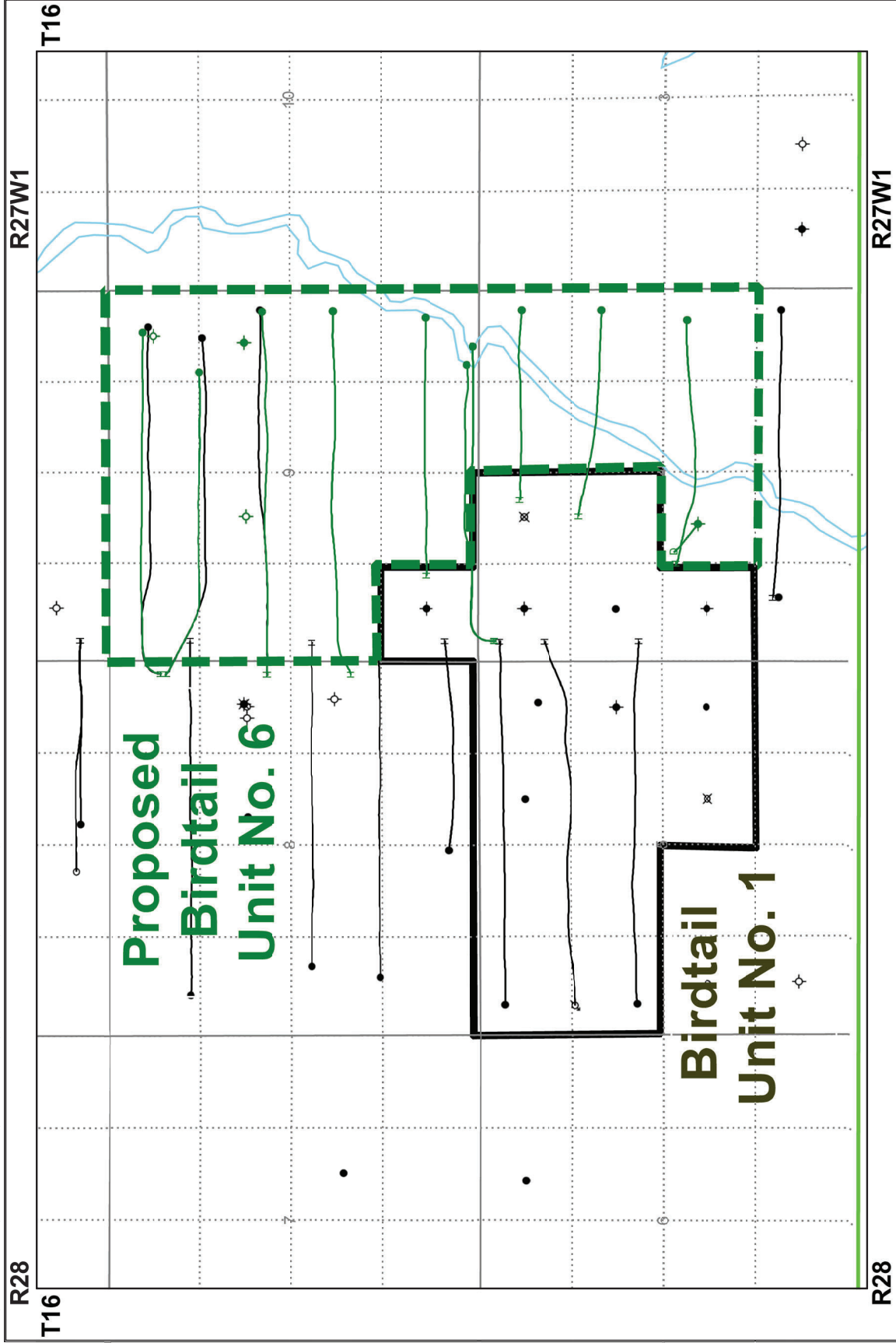
Legend

-  2016 Fields
-  Township Grid
-  Section Grid
-  Quarter Section Grid



Figure 1 - Map 1 Birdtail Field

Figure No. 2

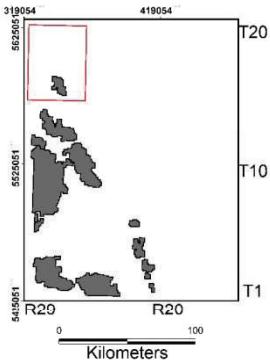
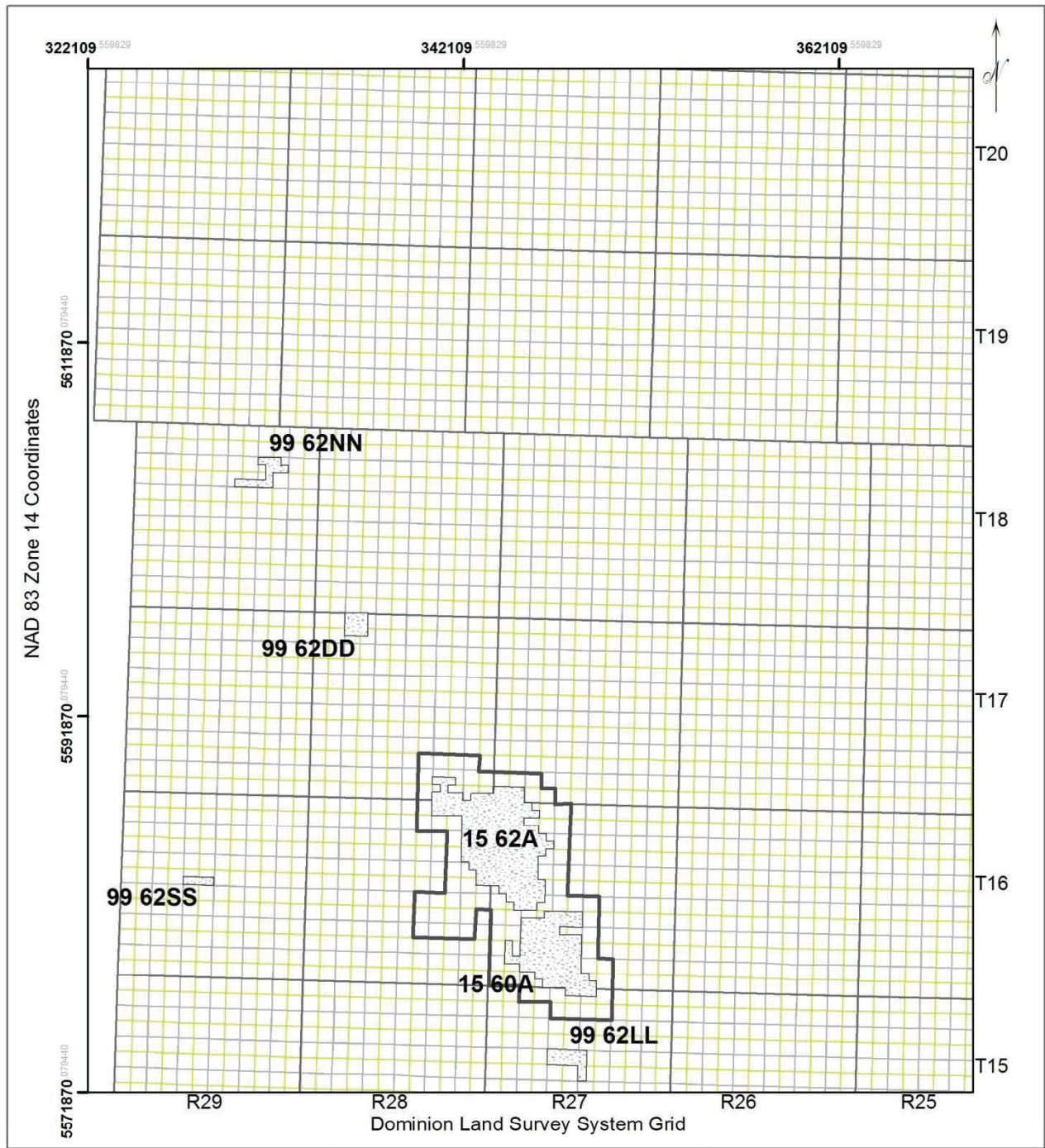


Datum: NAD27 Projection: Stereographic DLS Version AB: ATS 2.6, BC: PRB 2.0, SK: STS 2.5, MB: MLI07

Map Title



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- Legend**
- 2016 Fields
 - Oil Pools
 - Township Grid
 - Section Grid
 - Quarter Section Grid

Map 1
 Manitoba's Designated Fields & Pools 2016
 Well Information: January 1, 2016.
 Geology by: P. Fulton-Regula
 Petroleum Branch



Figure 3 - Bakken & Bakken Torquay Formation Pools (60 & 62)

Well Information as of 2021-02-08 - Group Well Report

Production Graph

Figure No. 4

Group: birdtail blue unit.lwell	On Prod: 1996-11 to 2020-11	Cum Oil: 47558.8 m3
# of Wells: 14	Prod Form: BAKKEN; BAKKENM; BAKKENU	Cum Gas: 0.0 E3m3
Fluid: Oil	Field: BIRDTAIL (MB15); MANITOBA OTHER AREAS (MB99)	Cum Wtr: 62181.7 m3
Mode: Abandoned Zone; Producing; Abandoned	Pool Code: MB001560A	Cum Inj Oil: 0.0 m3
	Unit Code:	Cum Inj Gas: 0.0 E3m3
		Cum Inj Wtr: 0.0 m3

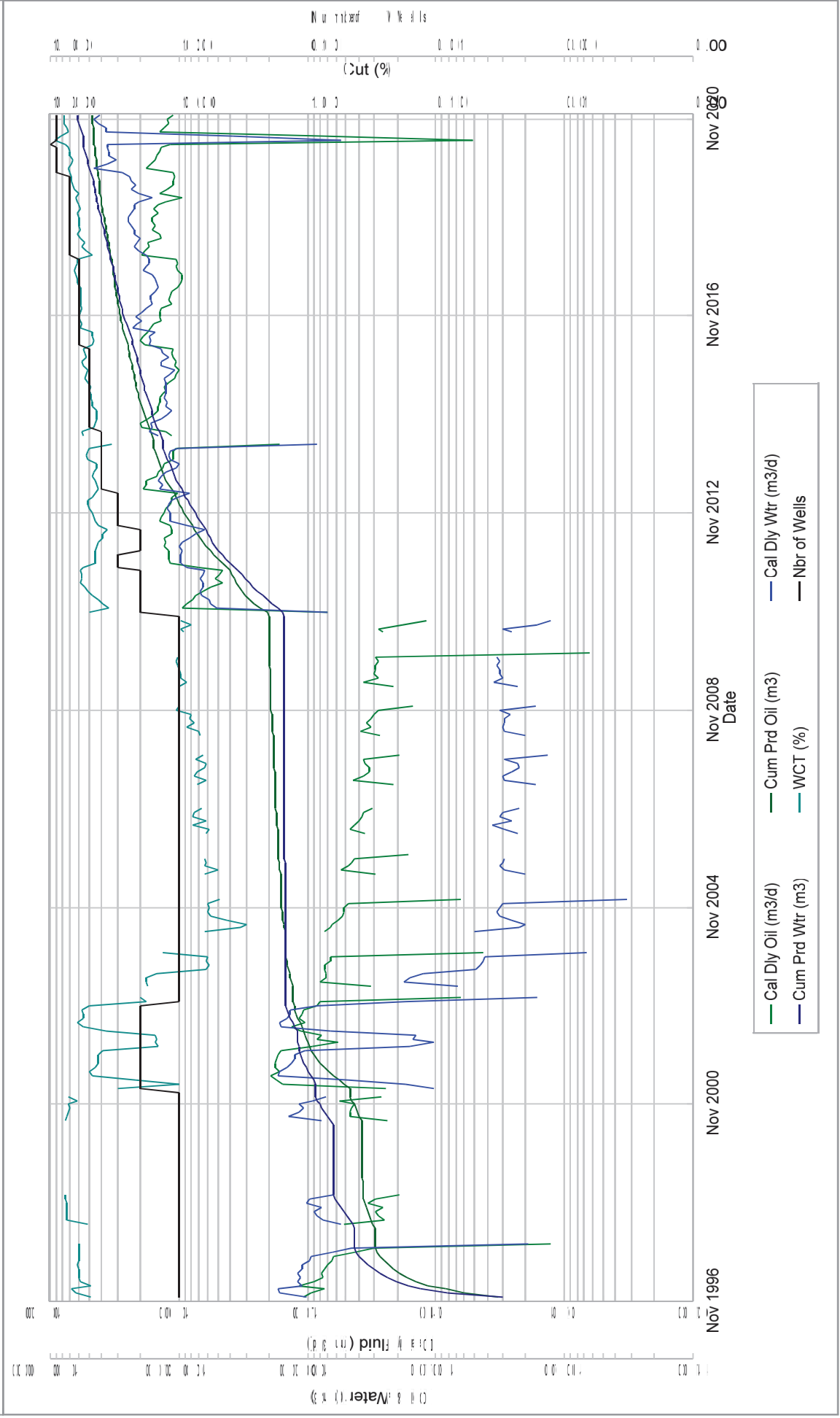
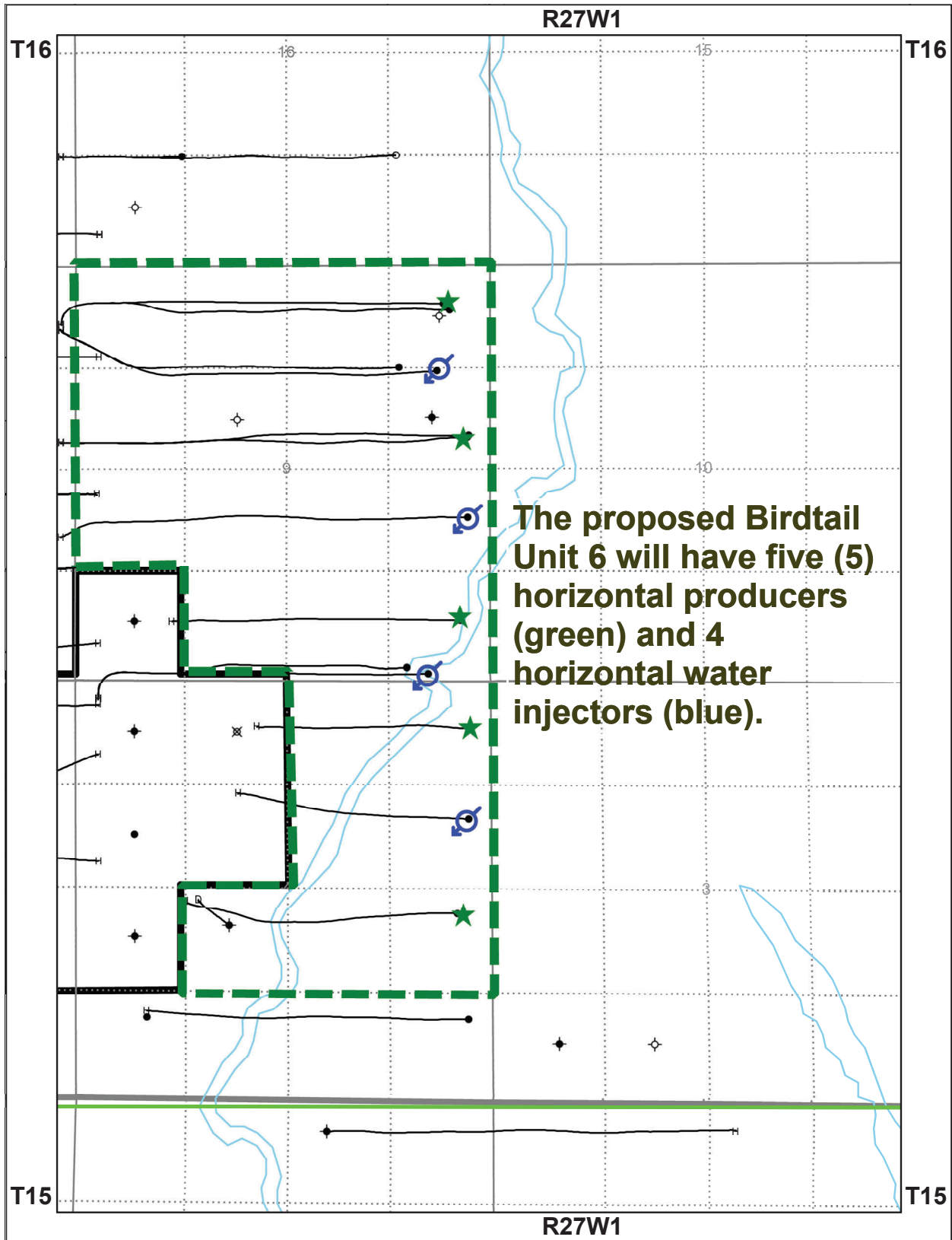


Figure No. 5



Map Title

Datum: NAD27 Projection: Stereographic DLS Version AB: ATS 2.6, BC: PRB 2.0, SK: STS 2.5, MB: MLI07



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Figure No. 6

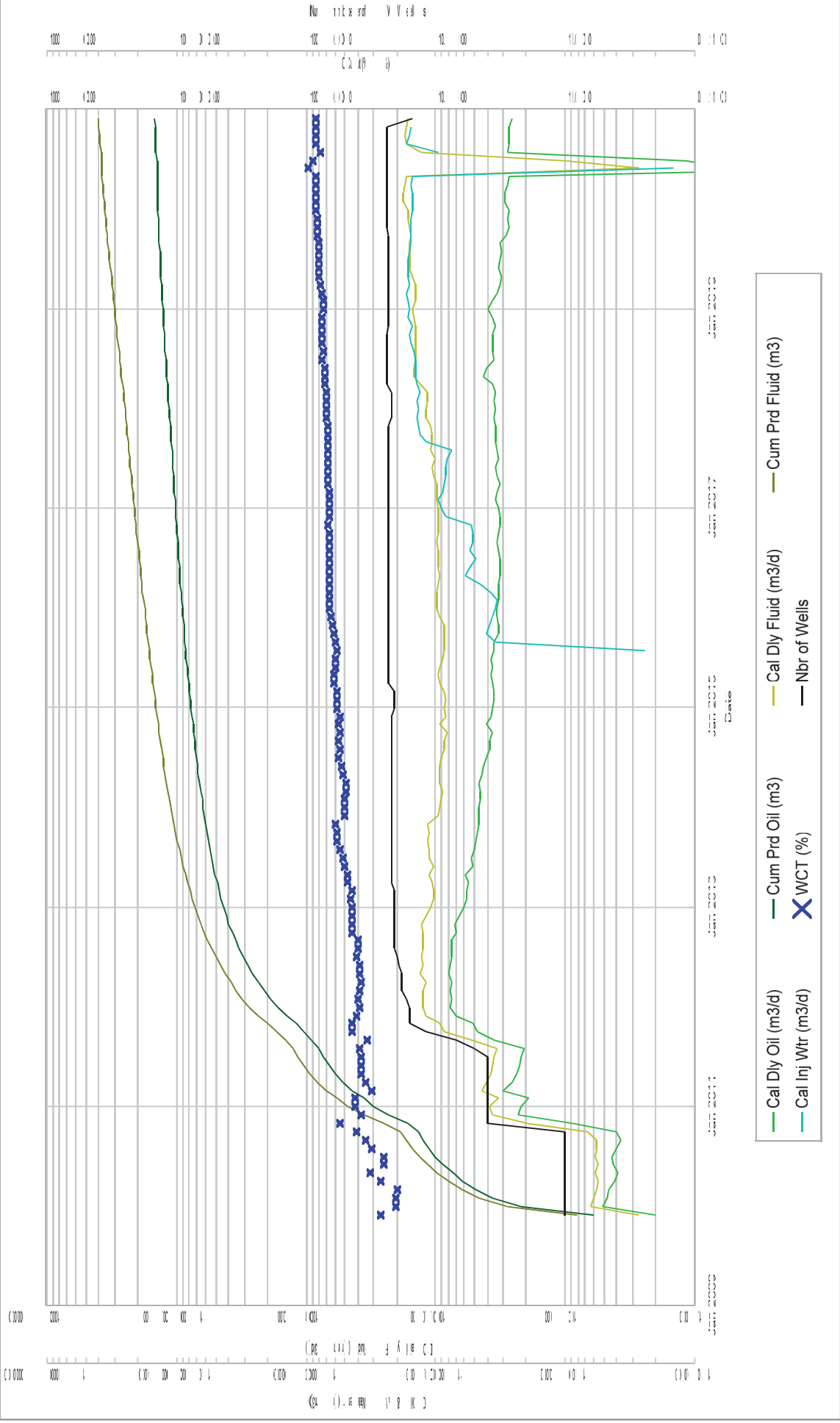
Production Graph

Group: BIRDTAIL UNIT NO. 3
 # of Wells: 28
 Fluid: Oil; Water Injection
 Mode: Producing; Injection; Drilled & Cased; Suspended

On Prod: 2009-11 to 2020-11
 Prod Form: BAKKEN; BAKKENM; BAKKENU; THREEFK
 Field: BIRDTAIL (MB15)
 Pool Code: MB001562A

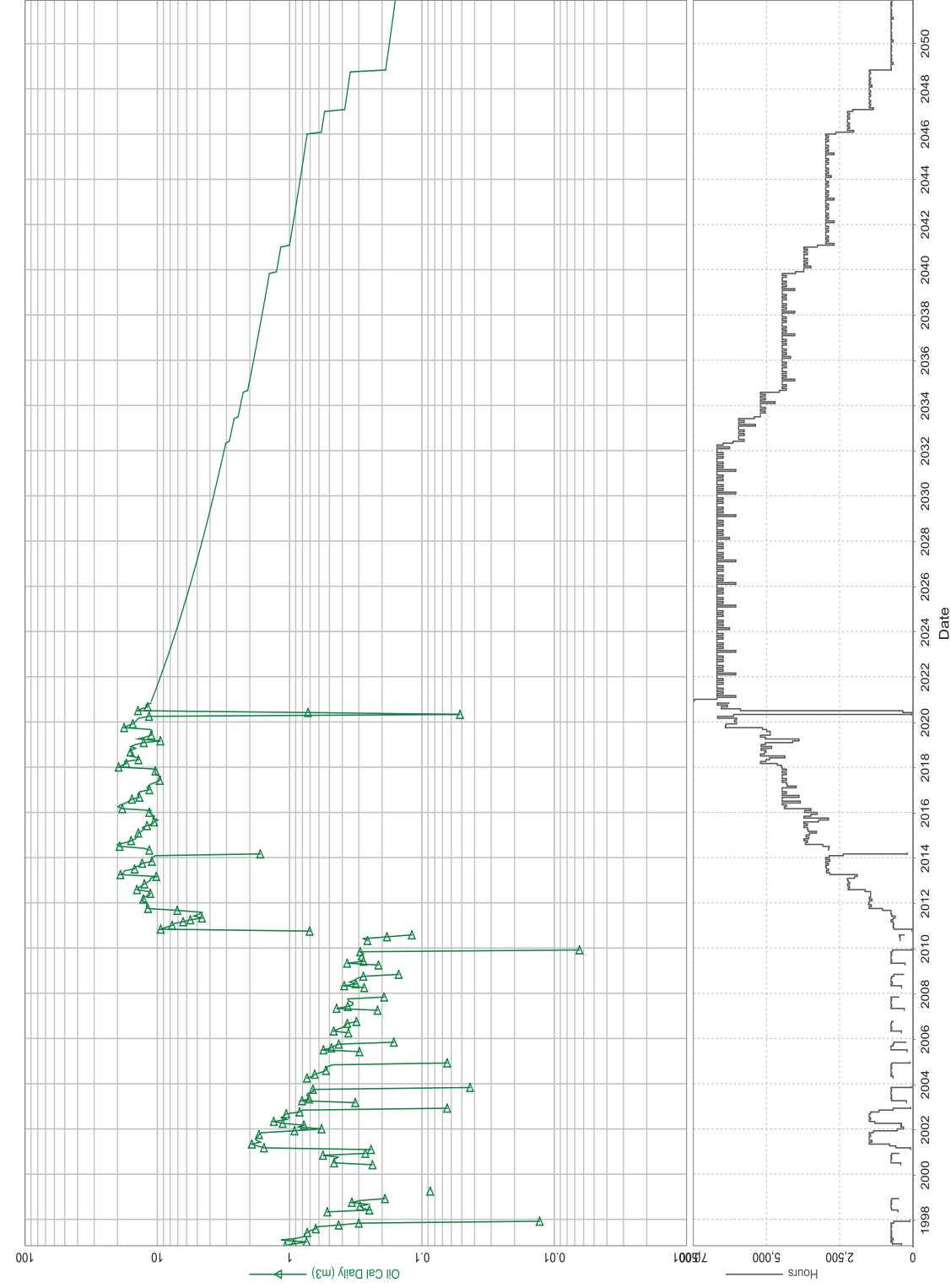
Unit Code: 1562A3

Cum Oil: 146824.5 m3
 Cum Gas: 0.0 E3m3
 Cum Wtr: 257280.9 m3
 Cum Inj Oil: 0.0 m3
 Cum Inj Gas: 0.0 E3m3
 Cum Inj Wtr: 213220.0 m3



Tundra Oil and Gas
 VOLUME FORECAST REPORT
 Figures 7 & 8 - Birdtail Unit 6 Primary Forecast

Effective December 01, 2020



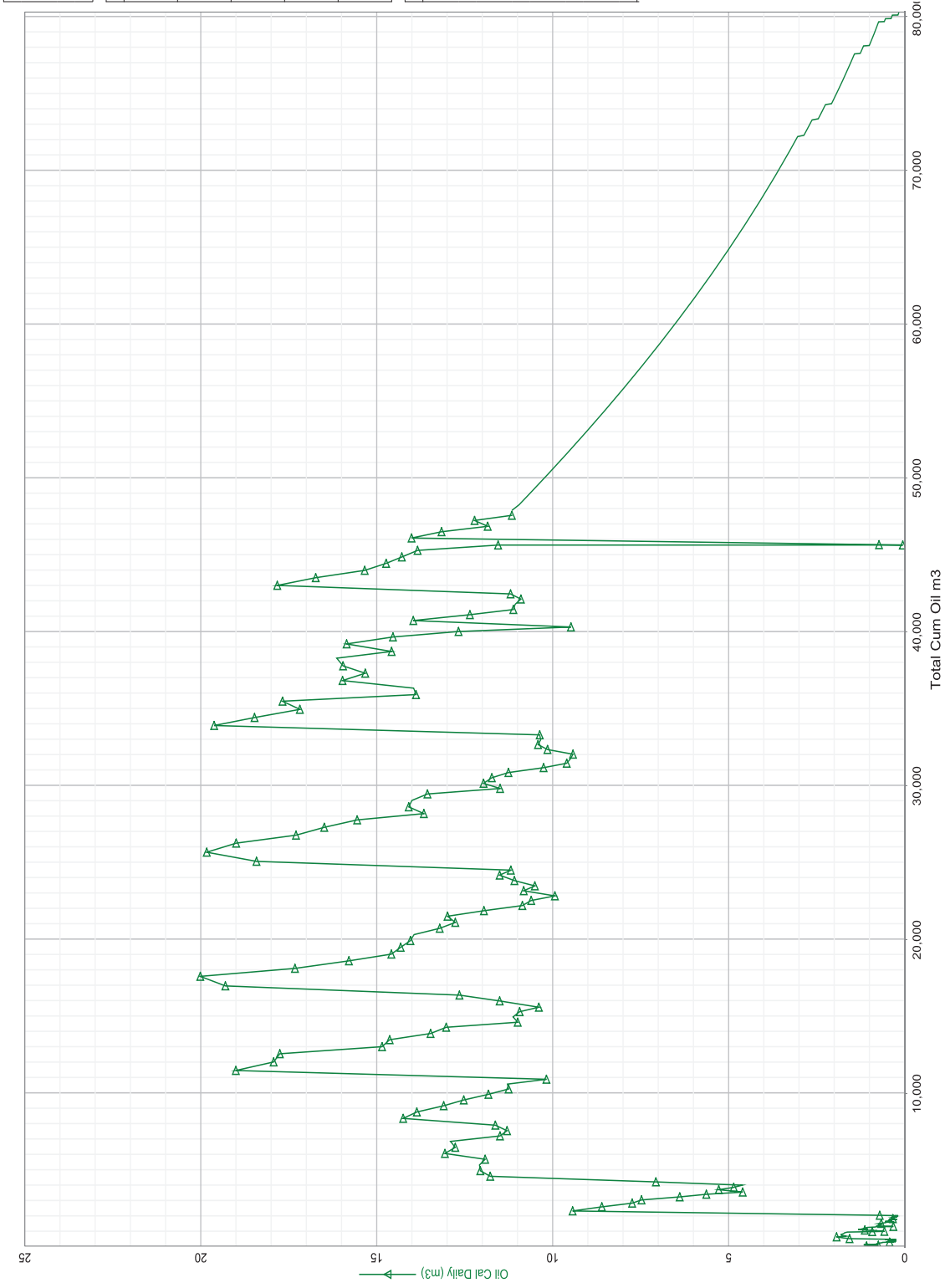
Selection: Figures 7 & 8 - Birdtail
 Volume: Oil Production
 Category: Base
 Aggregation: Sum
 Normalization: None

Volume Summary	
Oil	Cum (m3) 47,559
	Rem Rec (m3) 32,730
	Ult Rec (m3) 80,288
Gas	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0
Water	Cum (m3) 62,182
	Rem Rec (m3) 273,622
	Ult Rec (m3) 335,804
Field	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0
NGL	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0

Forecast and Indicators @ Eff Date	
Product	Oil
Forecast Start	2020/12/01
Forecast End	2051/12/01
Presentation	Default Private
Initial Rate (m3/d)	11.14
Final Rate (m3/d)	0.16
Ult Rec (m3)	80,288.42
Cum (m3)	47,558.80
Rem Rec (m3)	32,729.62
Res Life (yrs)	31.00
RLI Full Year (yrs)	1.37
Res Half Life (yrs)	29.91

**Tundra Oil and Gas
VOLUME FORECAST REPORT
Figures 7 & 8 - Birdtail Unit 6 Primary Forecast**

Effective December 01, 2020



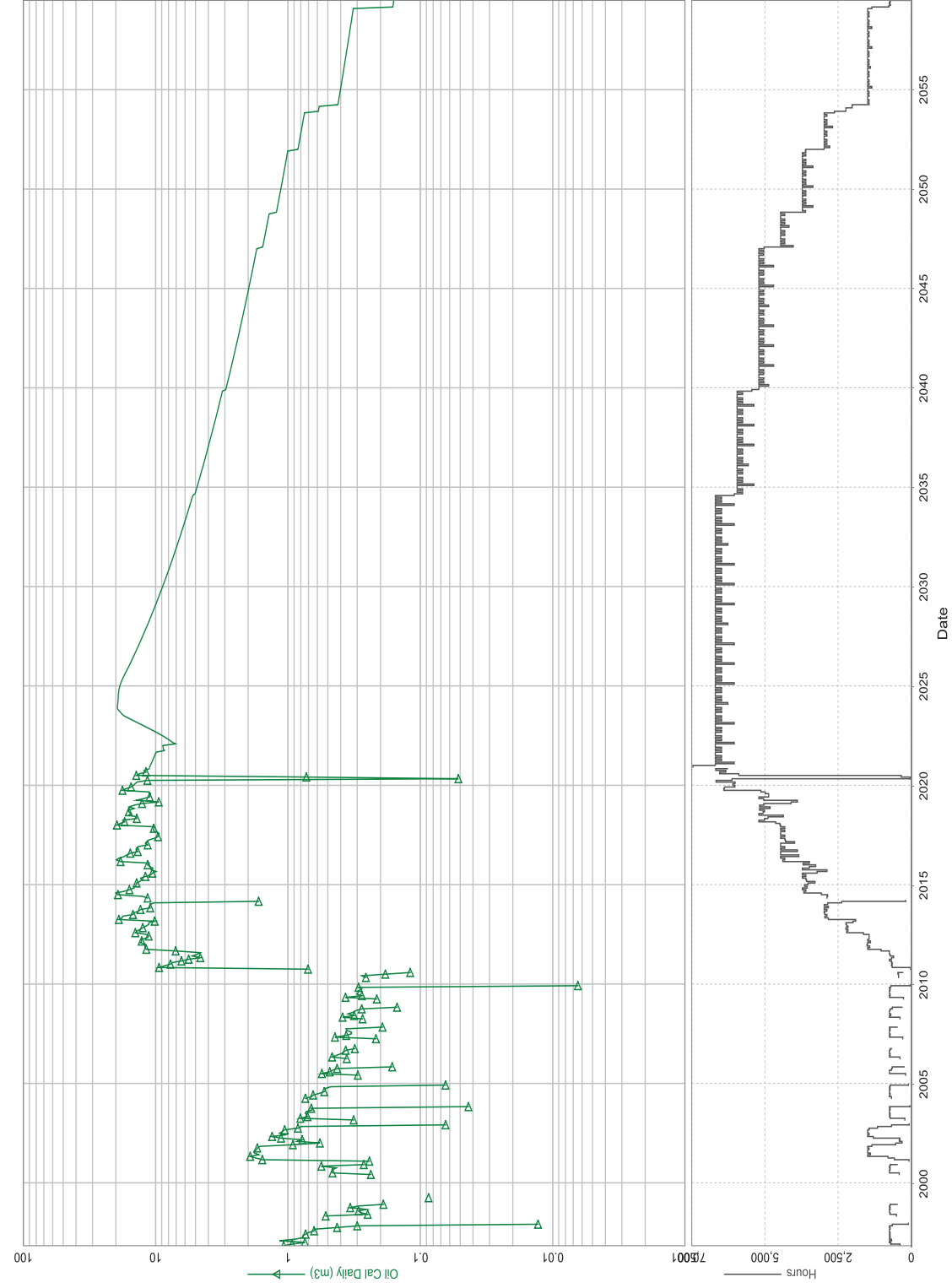
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 Volume: Oil Production
 Category: Base
 Aggregation: Sum
 Normalization: None

Volume Summary	
Oil	Cum (m3) 47,559
	Rem Rec (m3) 32,730
	Ult Rec (m3) 80,288
Gas	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0
Water	Cum (m3) 62,182
	Rem Rec (m3) 273,622
	Ult Rec (m3) 335,804
Field	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0
NGL	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0

Forecast and Indicators @ Eff Date	
Product	Oil
Forecast Start	2020/12/01
Forecast End	2051/12/01
Presentation	Default Private
Initial Rate (m3/d)	11.14
Final Rate (m3/d)	0.16
Ult Rec (m3)	80,288.42
Cum (m3)	47,558.80
Rem Rec (m3)	32,729.62
Res Life (yrs)	31.00
RLI Full Year (yrs)	1.37
Res Half Life (yrs)	29.91

Tundra Oil and Gas
VOLUME FORECAST REPORT
Figures 9 & 10 - Birdtail Unit 6 Primary + Secondary Forecast

Effective December 01, 2020



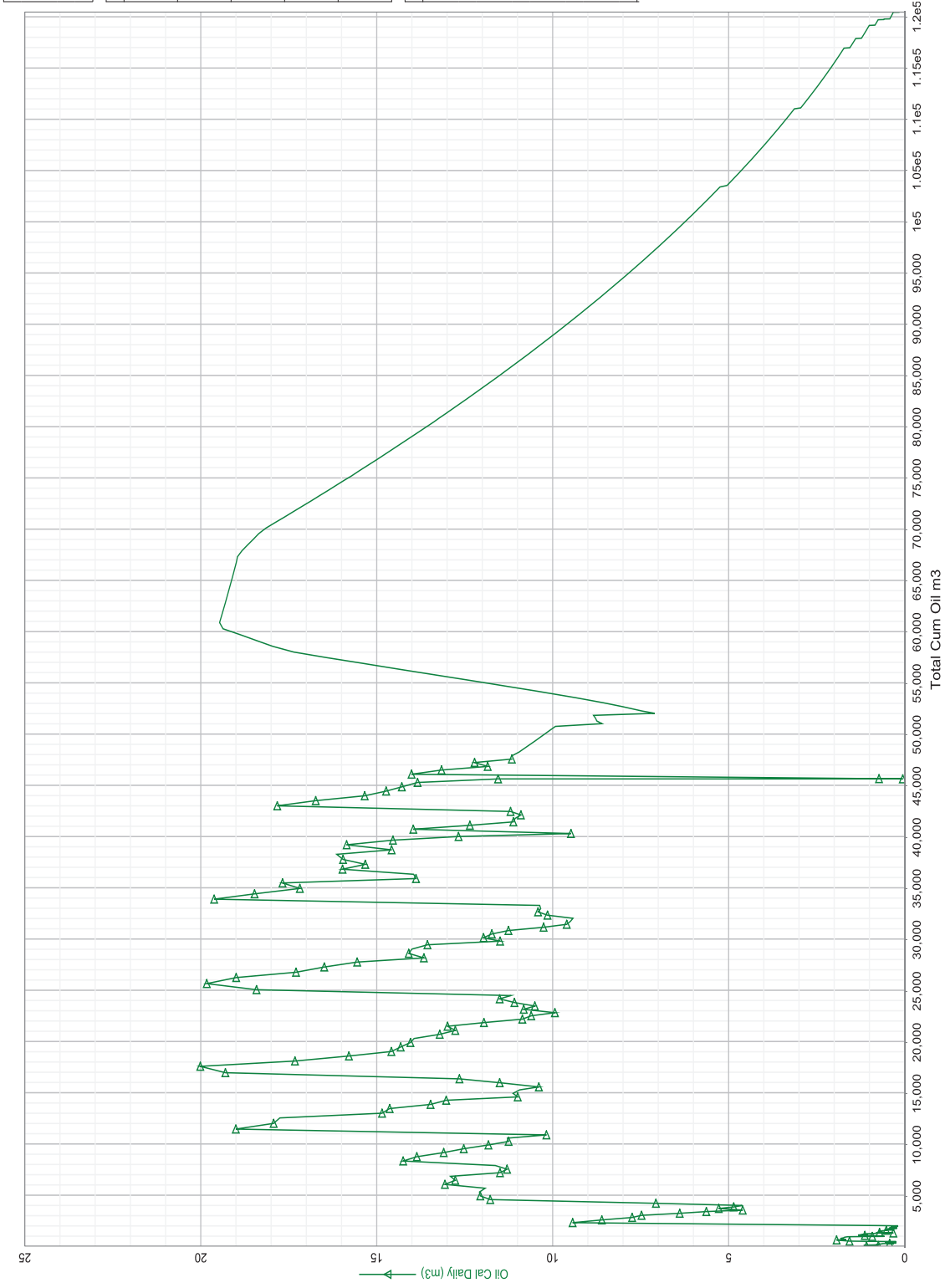
Selection: Figures 9 & 10 - Birdtail
 Volume: Oil Production
 Category: Base + Growth 1
 Aggregation: Sum
 Normalization: None

Volume Summary	
Oil	Cum (m3) 47,559
	Rem Rec (m3) 72,904
	Ult Rec (m3) 120,462
Gas	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0
Water	Cum (m3) 62,182
	Rem Rec (m3) 252,419
	Ult Rec (m3) 314,600
Field	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0
NGL	Cum (m3) 0
	Rem Rec (m3) 0
	Ult Rec (m3) 0

Forecast and Indicators @ Eff Date	
Product	Oil
Forecast Start	2020/12/01
Forecast End	2059/07/01
Presentation	Default Private
Initial Rate (m3/d)	11.14
Final Rate (m3/d)	0.16
Ult Rec (m3)	120,462.43
Cum (m3)	47,558.80
Rem Rec (m3)	72,903.63
Res Life (yrs)	38.58
RLI Full Year (yrs)	3.11
Res Half Life (yrs)	31.10

**Tundra Oil and Gas
VOLUME FORECAST REPORT
Figures 9 & 10 - Birdtail Unit 6 Primary + Secondary Forecast**

Effective December 01, 2020

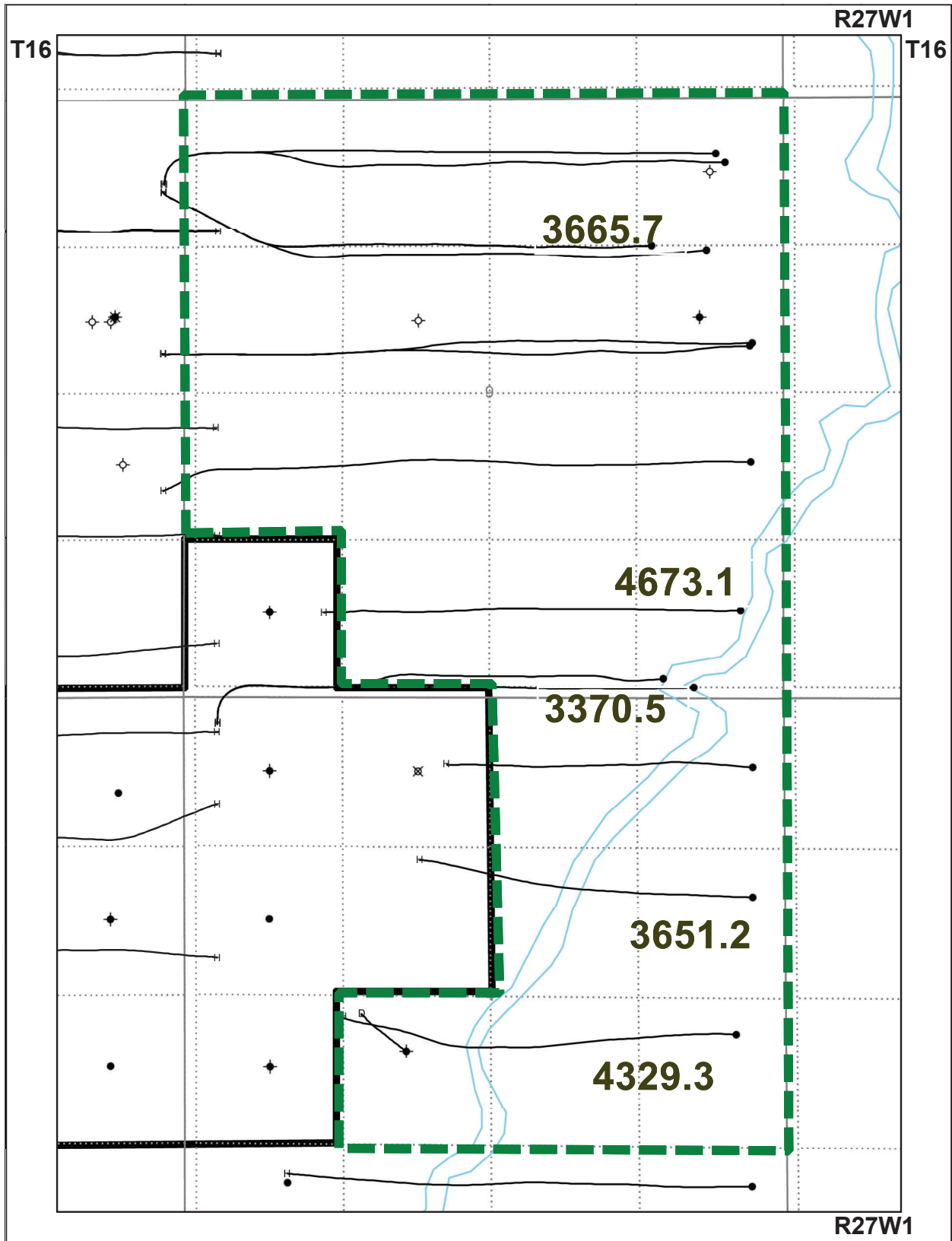


Selection: Figures 9 & 10 - Birdtail
 Volume: Oil Production
 Category: Base + Growth 1
 Aggregation: Sum
 Normalization: None

Volume Summary		
Oil	Cum (m3)	47,559
	Rem Rec (m3)	72,904
	Ult Rec (m3)	120,462
Gas	Cum (m3)	0
	Rem Rec (m3)	0
	Ult Rec (m3)	0
Water	Cum (m3)	62,182
	Rem Rec (m3)	252,419
	Ult Rec (m3)	314,600
Field	Cum (m3)	0
	Rem Rec (m3)	0
	Ult Rec (m3)	0
NGL	Cum (m3)	0
	Rem Rec (m3)	0
	Ult Rec (m3)	0

Forecast and Indicators @ Eff Date	
Product	Oil
Forecast Start	2020/12/01
Forecast End	2059/07/01
Presentation	Default Private
Initial Rate (m3/d)	11.14
Final Rate (m3/d)	0.16
Ult Rec (m3)	120,462.43
Cum (m3)	47,558.80
Rem Rec (m3)	72,903.63
Res Life (yrs)	38.58
RLI Full Year (yrs)	3.11
Res Half Life (yrs)	31.10

Figure 12 - Proposed Birdtail Unit 6 Initial Reservoir Pressures (kPa)



Map Title

Datum: NAD27 Projection: Stereographic DLS Version AB: ATS 2.6, BC: PRB 2.0, SK: STS 2.5, MB: MLI07



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Figure 14 – 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

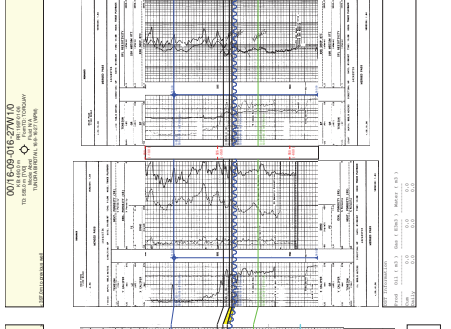
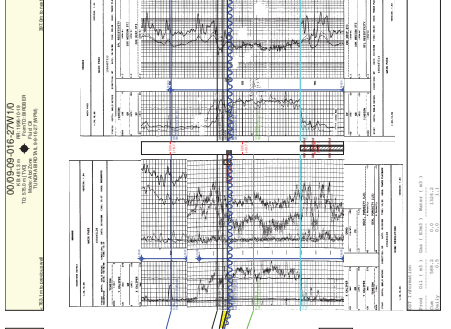
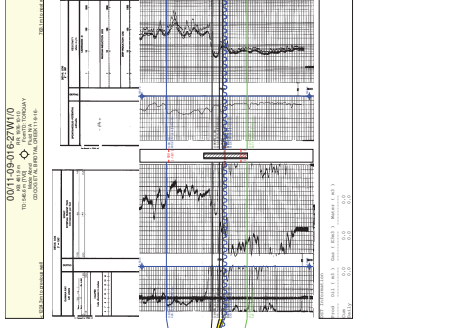
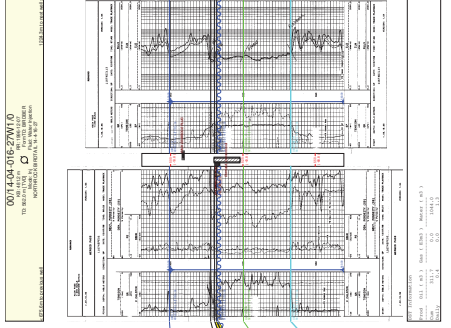
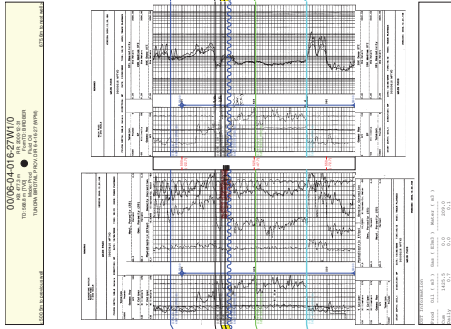
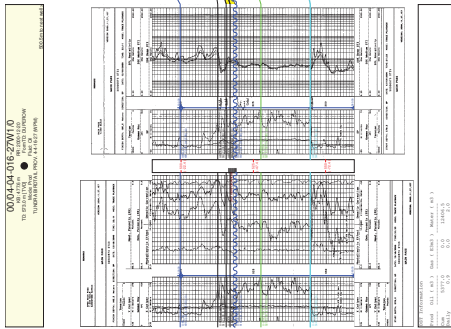
- Plant piping – internally coated, fiberglass or stainless steel.
- Filtration – stainless steel.
- Pumps – ceramic plungers, stainless steel disc valves.
- Tanks – fiberglass with stainless steel valves.

Proposed Birdtail Unit No. 6

Application for Enhanced Oil Recovery Waterflood Project

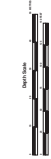
LIST OF APPENDICES

- Appendix 1: Birdtail Unit 6 Stratigraphic Cross-Section
- Appendix 2: Middle Bakken Net Pay Map
- Appendix 3: Lyleton Subsea Structure Map
- Appendix 4: Middle Bakken Kmax.h Values Map
- Appendix 5: Middle Bakken Average Porosity Map



Legend

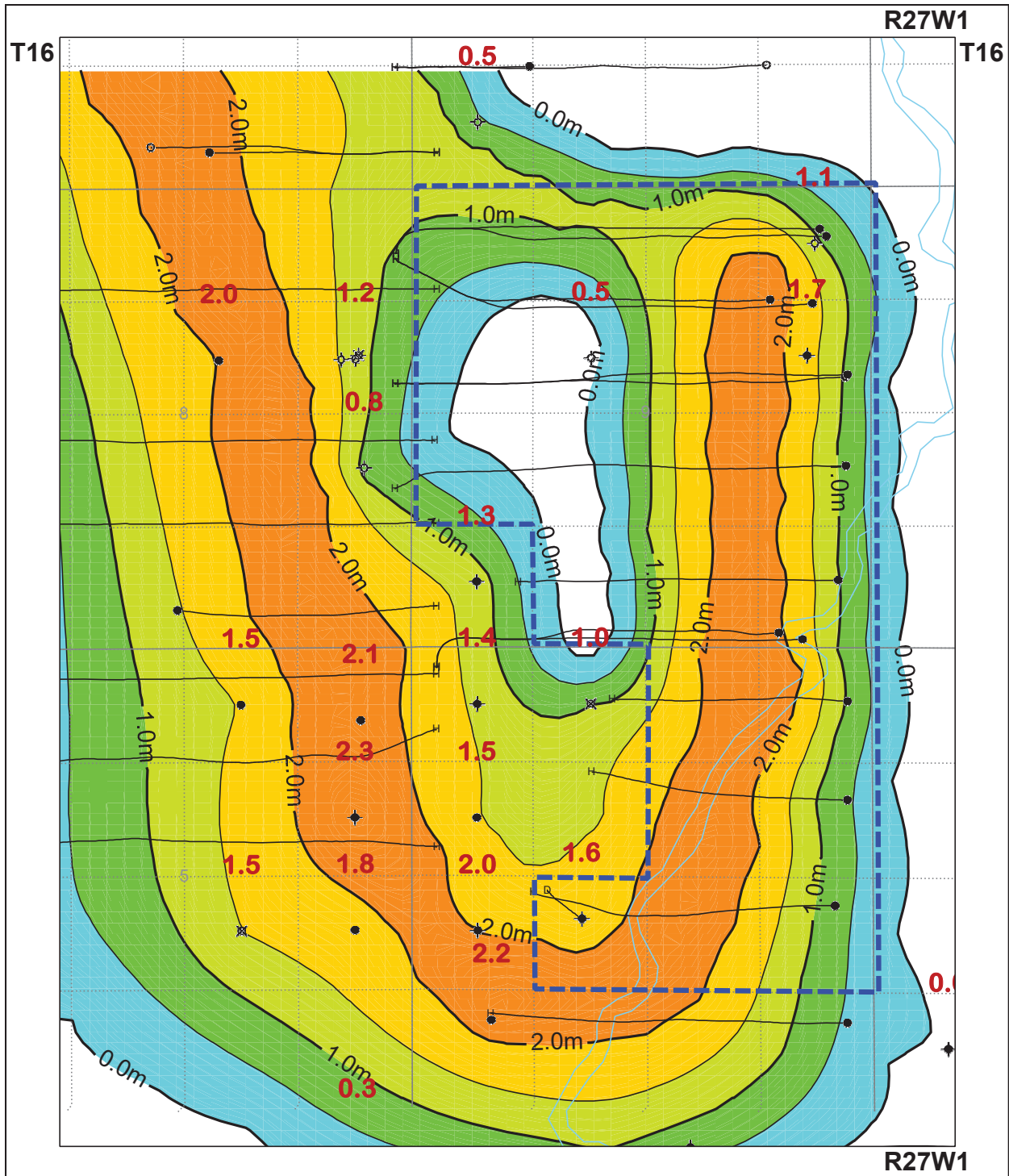
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- 2nd Pass
- 3rd Pass
- 4th Pass
- 5th Pass
- 6th Pass
- 7th Pass
- 8th Pass
- 9th Pass
- 10th Pass



Tundra Oil & Gas Limited

Appendix 1
Strata Unit 6
Section 16 of the Section A.A.

0011-09-016-27W10
TO: 0011-09-016-27W10
FROM: 0011-09-016-27W10
TEMPERATURE AND PRESSURE



Tundra Oil & Gas Limited

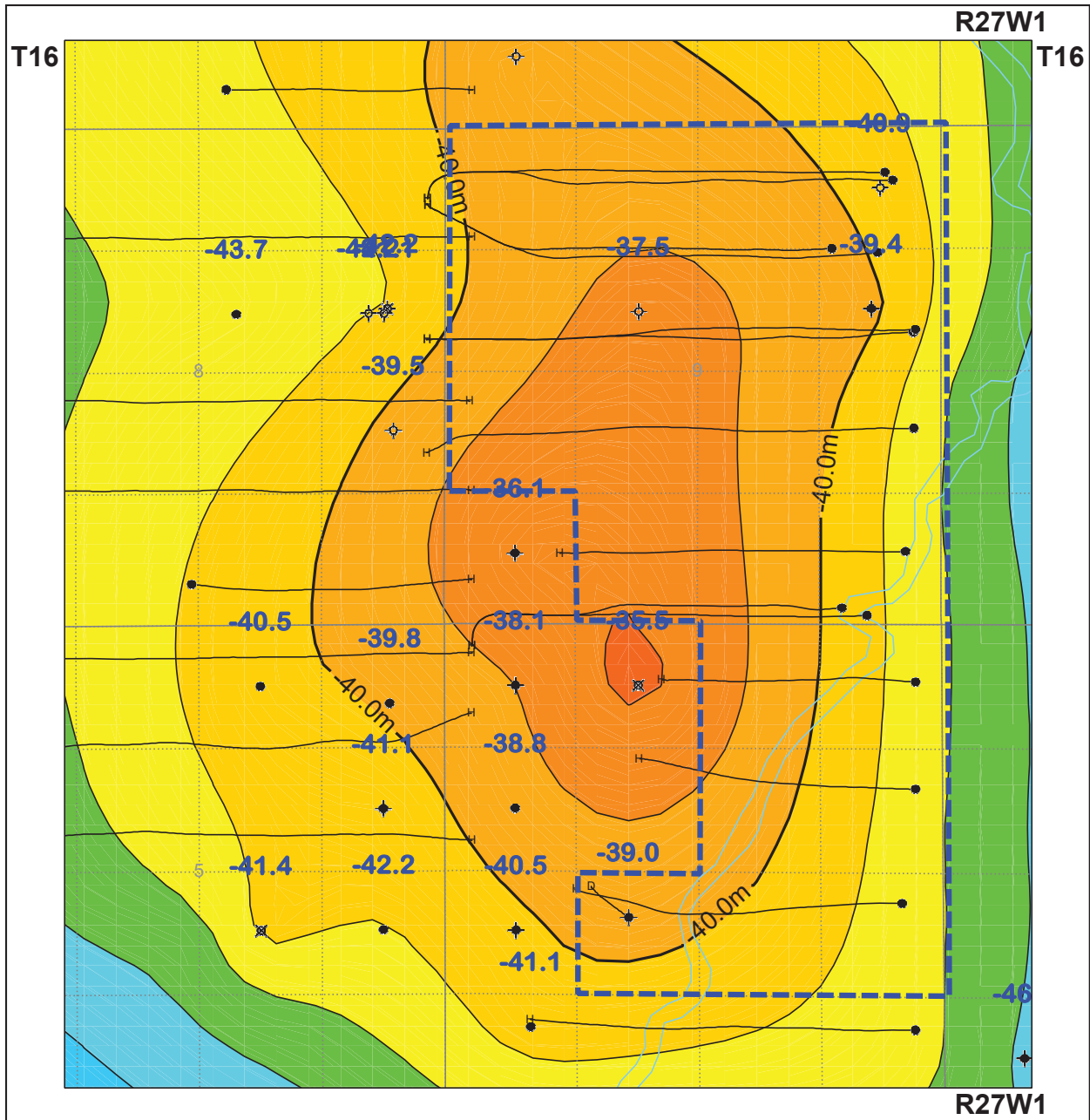
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Well Legend			

Tundra Oil & Gas Limited
APPENDIX 2
Birdtail Unit 6
M Bakken Net Pay (m)
BW. 17 Februarv. 2021
Northman Bakken accumap



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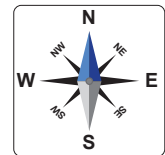
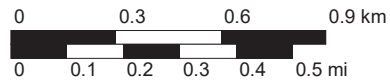
Tundra Oil & Gas Limited

Datum: NAD27 Projection: Stereographic DLS Version AB: ATS 2.6, BC: PRB 2.0, SK: STS 2.5, MB: MLI07

Well Legend		
✱ Abandoned Gas	✱ Gas Injection	✱ Suspended Heavy Oil
✱ Abandoned Heavy Oil	✱ Heavy Oil	✱ Suspended Oil
✱ Abandoned Oil	♂ Injection	✱ Suspended Oil & Gas
✱ Abandoned Oil & Gas	● Oil	Wells Postings
✱ Abandoned Service	✱ Oil & Gas	U-Sub (m) (U-LYLETON_B)
♂ Drilling	♂ Service or Drain	✱
⊕ Dry & Abandoned	⊕ Suspended	
✱ Gas	✱ Suspended Gas	

Center: 50.3454, -101.1487

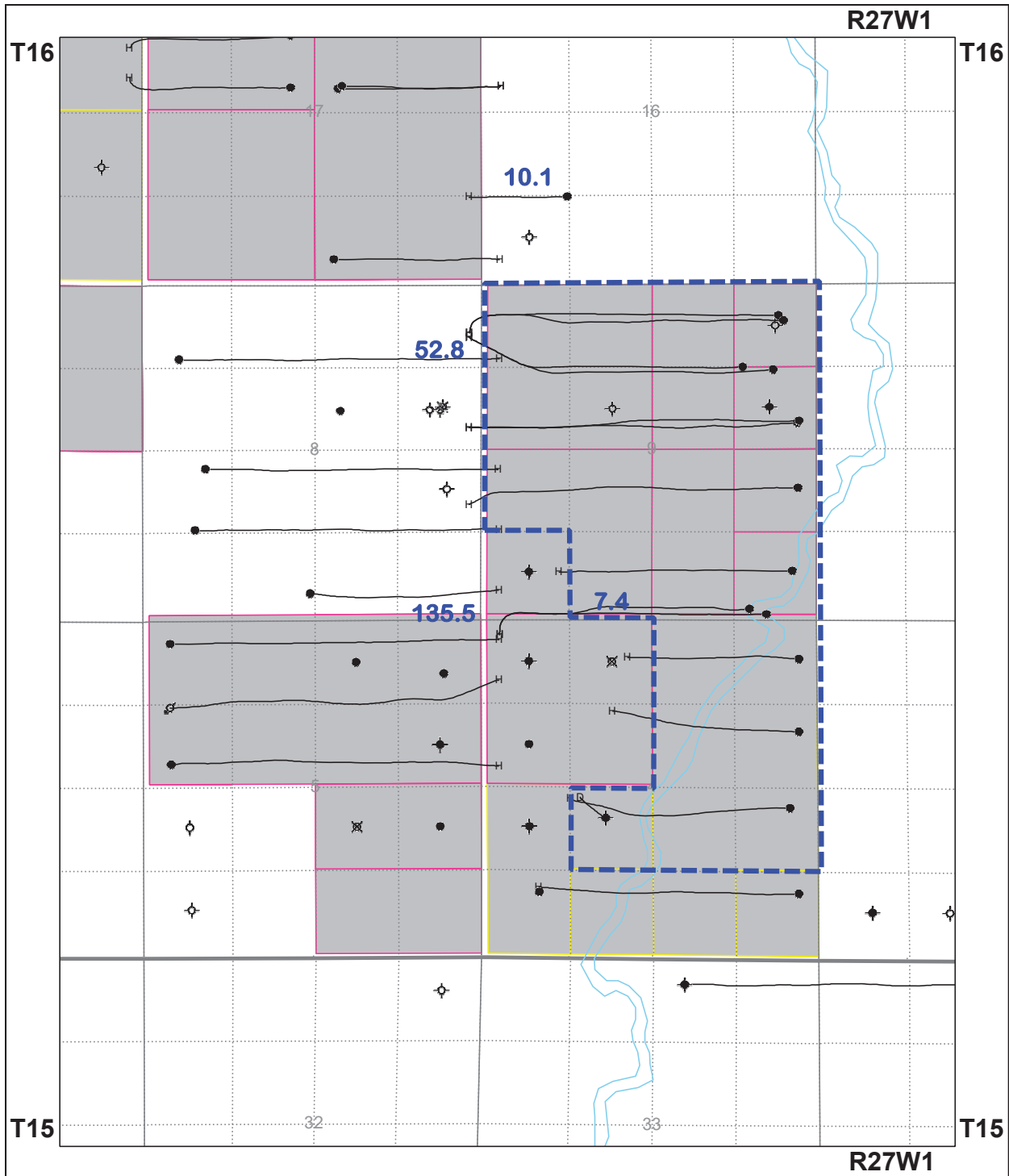
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Tundra Oil & Gas Limited
APPENDIX 3
Birdtail Unit 6
Lyleton Subsea Structure (mss)
BW. 17 Februarv. 2021
<small>Northman Bakken.accumap</small>



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Tundra Oil & Gas Limited

Datum: NAD27 Projection: Stereographic DLS Version AB: ATS 2.6, BC: PRB 2.0, SK: STS 2.5, MB: MLI07

Well Legend			

Tundra Oil & Gas Limited
APPENDIX 4
Birdtail Unit 6
M Bakken Kmax*h (mDm)
BW. 18 Februarv. 2021
Northman Bakken.accumap



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