PROPOSED WASKADA UNIT NO. 20

Application for Enhanced Oil Recovery Waterflood Project

Lower Amaranth Formation

Lower Amaranth A (03 29A) and Lower Amaranth I Pool (03 29I)

Waskada Field, Manitoba

May 31, 2016

Tundra Oil and Gas Partnership

INTRODUCTION

The Waskada Oil Field is located in Townships 1 and 2, Ranges 23-26 W1. The Waskada Lower Amaranth Oil pool was discovered in June 1980 when Omega Hydrocarbons recompleted a former Mississippian producer in the stratigraphically higher Lower Member of the Amaranth Formation. Secondary recovery through waterflood has been initiated throughout much of the pool. Tundra Oil and Gas (Tundra) currently operates Waskada Lower Amaranth Unit 1, 2, 3, 4, 5, 6, 7, 8, 13, 14, 15, 16, 17, 18 and 19 as shown on Figure 1.

In the eastern part of the Waskada field, potential exists for incremental production and reserves from a Waterflood EOR project in the Lower Amaranth oil reservoirs. The following represents an application by Tundra to establish Waskada Unit No. 20 (NE/4 Sec 32, W/2 Sec 33, Sec 28, and LSD 13 Sec 21-1-25W1) and implement a Secondary Waterflood EOR scheme within the Lower Amaranth Formation as outlined on Figure 2.

The proposed project area falls within the existing designated 03-29A Lower Amaranth A Pool and 03-29I Lower Amaranth I Pool of the Waskada Oilfield (Figure 3).

SUMMARY

1. The proposed Waskada Unit No. 20 will include 43 horizontal wells and 23 vertical wells, from which 9 of the vertical wells are abandoned, within 29 Legal Sub Divisions (LSD) of the Lower Amaranth producing reservoir. The project is located west of Waskada Unit No. 19, north of Waskada Unit No. 18, south of Waskada Unit No. 16 and east of Waskada Unit No. 14 (Figure 2).

2. Total Net Original Oil in Place (OOIP) in Waskada Unit No. 20 has been calculated to be 3,482.1 e^3m^3 (**21,901.5** Mbbl) for an average of **120.1 net e^3m^3 (755.2** Mbbl) OOIP per 40 acre LSD based on a 0.5 md cutoff for the Green to Red Sands as defined by Type log in Appendix/Figure.

3. Cumulative production to the end of Feb 2016 from the 66 wells within the proposed Waskada Unit No. 20 project area was **356.7** e^3m^3 (2,244.8 Mbbl) of oil, and **928.6** e^3m^3 (5,841.1 Mbbl) of water, representing a **10.2%** Recovery Factor (RF) of the Net OOIP.

4. Estimated Ultimate Recovery (EUR) of Primary Proved Producing oil reserves in the proposed Waskada Unit No. 20 project area has been calculated to be **379.0** e^3m^3 (**2,383.6** Mbbl), with **22.0** e^3m^3 (**138.8** Mbbl) remaining as of the end of February 2016.

5. Ultimate oil recovery of the proposed Waskada Unit No. 20 OOIP, under the current Primary Production method, is forecasted to be **10.9%**

6. The production from the Waskada Unit No. 20 peaked in September 2012 at 198.6 m^3 (OPD) as shown in Figure 4. As of February 2016, production was 31.2 m^3 OPD, 345.4 m^3 of water per day (WPD) and a 91.7% watercut.

7. In September, production averaged 4.3 m^3 OPD per well in Waskada Unit No. 20. As of February 2016, average per well production has declined to 0.8 m^3 OPD. Decline analysis of the group primary production data forecasts total oil to continue declining at an annual rate of approximately **42.7%** in the project area.

8. Estimated Ultimate Recovery (EUR) of proved oil reserves under Secondary WF EOR for the proposed Waskada Unit No. 20 has been calculated to be **510.5** e^3m^3 **(3,210.9** Mbbl), with **153.8** e^3m^3 (**966.1** Mbbl) remaining. An incremental **131.5** e^3m^3 **(827.3**Mbbl) of proved oil reserves, or **3.8%**, 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 Waskada Unit No. 20 is estimated to be **14.7%**.

10. Based on the waterflood response in the adjacent main portion of the Waskada field, the Lower Amaranth Formation in the proposed project area is believed to be a suitable reservoir for WF EOR operations.

11. Existing horizontal wells, with multi-stage hydraulic fractures will be converted to injection to provide waterflood support to existing horizontal/vertical producing wells (Figure 5) within the proposed Waskada Unit No. 20 to complete waterflood patterns.

Geology

Stratigraphy:

The Triassic aged Lower Amaranth formation is the oil producing reservoir that is the subject of this unit application. The stratigraphy of the reservoir section for the proposed unit is shown on the structural cross section attached as Appendix 1. The section runs N to S approximately through the mid-point of the proposed unit. The Lower Amaranth is bounded on top by the Amaranth Evaporite and by the Mississippian Unconformity at the base.

Stratigraphic nomenclature has been modeled after previous operator's (EOG Resources) conventions. The producing sequence in descending order consists of the Lower Amaranth A Unit, Lower Amaranth Green Sand, Lower Amaranth Blue Sand, Lower Amaranth Purple Sand, Lower Amaranth Brown Sand, Lower Amaranth Red Sand, and the Lower Amaranth Lower Sand. The reservoir units are primarily represented by the Green, Blue, Purple, Brown, and Red Sands. The Upper portion of the Lower Amaranth A unit is considered tight, and represents the top seal for the reservoir.

Sedimentology:

The Lower Amaranth reservoir units (top of Green through to base of Red Sand) comprise interlaminated shale, siltstone, and fine grained sandstone. The laminations tend to be range from > 1 cm up to 20 cm in thickness, often show signs of scouring at the base of each laminae, and tend to fine upwards. There are anhydrite beds capping each sub unit within the producing sequence; these anhydrite layers are generally correlatable over the entire Pierson / Waskada / Goodlands area. These anhydrite layers are the basis for the stratigraphic framework that is being used to describe the reservoir within the proposed unit.

The units within the producing sequence have very similar characteristics. Color tends to vary with grain size in that the finer grained material tends to be brick red, while the courser grained material generally tends to be grey to light brown. All of the sub units have a varying component of anhydrite cement, which will appear as mm sized nodules in heavily cemented areas. Finally, well rounded, floating, course, frosted quartz grains are common throughout the entire productive interval.

Lower Amaranth reservoir is interpreted as having been deposited in an arid tidal flat (Sabkha) setting. The stratigraphic divisions (Green, Blue, Purple, Brown, Red, and Lower Sands) are interpreted as representing individual evaporitic cycles, each exhibiting relatively higher depositional energy at the base, grading into very low energy towards the top.

Since each cycle is bound by an erosive surface on the top and bottom, there can be lateral variability in sediment preservation within each cycle. Occasional preservation of high angled cross stratification suggests periods of very high energy during deposition which are interpreted as channel deposits, which help support a tidal flat setting depositional model.

The Upper portion of the Upper Amaranth A unit is made up of brick red shale that is generally not bedded and does not tend to exhibit any sedimentary structures. It is a low permeability zone that represents the top seal to the Lower Amaranth reservoir.

The Lower Sand portion of the Lower Amaranth (immediately beneath the Red Sand), has a lot of the same characteristics as the productive interval, but tends to have much less effective porosity due to abundant anhydrite cement.

Structure:

Structure contour maps are provided for the top and base of the reservoir interval (Appendices 2 and 3). The reservoir units dip to the southwest, which is consistent with regional dip. Structural mapping based on well control does not indicate the presence of large scale structural features that would indicate an increased risk of faulting within the proposed unit boundary.

Reservoir Continuity:

There are limited barriers to reservoir continuity that are apparent from the data available. Available data from well logs do not show any apparent lateral facies changes within the proposed unit that would result in significant lateral permeability barriers. An Isopach map of the reservoir interval (Appendix 4) shows that the reservoir thickness remains consistent between about 10.5 meters and 12.0 meters.

Also, as mentioned above, there are no indications of any structural features that could set up any lateral permeability barriers within the proposed unit. The lack of lateral permeability barriers suggests this pool is well suited for secondary oil recovery.

Reservoir Quality:

Net pay determination within the proposed unit was done by using a sonic porosity cut off. There are a number of steps that were undertaken in order to determine net pay from sonic log data:

- Core data from the entire Waskada / Goodlands area (Appendix 5) was used to determine a relationship between porosity and permeability. Based on a best fit line through the available core analysis it was determined that a core porosity of 10% represents 0.5 md of permeability (Appendix 6).
- Sonic porosity was calculated for wells in which digital sonic data was available (Appendix 7) using the following formula:

$$Sonic\ Porosity = \frac{Dt - Dtmatrix}{Dtwater - Dtmatrix}$$

Where

Dt = Sonic travel time (ms/m)
Dt_{matrix} = Sonic travel time of the rock matrix (198 ms/m)
Dt_{water} = Sonic travel time of the formation water (681 ms/m)

- In order to translate this relationship to well logs, a comparison between sonic porosity and core porosity was undertaken. A total of 52 wells were found in the Waskada / Goodlands area that had digital sonic curves along with core analysis over the Lower Amaranth reservoir interval (Appendix 8). Sonic Porosity from logs was compared to core porosity from core analysis (Appendix 9), and the data suggests that there is a good relationship between porosity from core and porosity from Sonic data.

From this relationship, a sonic log porosity cut of 10% was used as a pay determination for each logged well. In this way, the porosity / permeability relationship as determined from core can be translated into wells where there is log data available. In turn, this increases the control points for OOIP determination, which increases the resolution of OOIP mapping.

OOIP Estimates

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

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

or

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

where

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

For the purposes of this unit application, Bo and Sw were held constant at 1.17 and 40% respectively. The initial oil formation volume factor was adopted from a PVT taken from the 8-26-1-26W1, thought to be representative of the fluid characteristics in the reservoir. Sw determination was set at 40% based analysis of capillary pressure data from six different locations in the Waskada / Goodlands area (6-21-1-25W1, 7-28-1-25W1, 13-10-1-24W1, 15-1-1-25W1, and 14-14-2-25W1).

Average sonic porosity for the proposed Unit area has been included as Appendix 10.

Phi * h maps were created from sonic porosity log data (Appendix 11). The average phi * h value within each LSD was calculated using IHS Petra software, this provided the final input into the OOIP calculation.

Total volumetric OOIP for the Lower Amaranth within the proposed unit has been calculated to be 3,482,066 m^3 (21,901,540 bbls).

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

Original Oil in Place (OOIP) calculations and geologic summary were prepared by Todd Neely and reviewed by Bill Ward, P. Geol. (VP Exploration at Tundra Oil and Gas).

Historical Production

A historical group production history plot for the proposed Waskada Unit No. 20 is shown as Figure 4. Oil production commenced from the proposed Unit area in August 1982 and peaked during September 2012 at 198.6 m^3 OPD. As of February 2016, production was 31.2 m^3 OPD, 345.4 m^3 of water per day (WPD) and a 91.7% watercut.

From peak production in September 2012 to date, oil production is declining at an annual rate of approximately **42.7%** 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 a real 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 Waskada Unit No. 20.

Unit Operator

Tundra Oil and Gas Partnership (Tundra) will be the Operator of record for Waskada Unit No. 20.

Unitized Zone

The Unitized zone(s) to be waterflooded in the Waskada Unit No. 20 will be the Lower Amaranth formation.

Unit Wells

The 43 horizontal wells and 23 vertical wells to be included in the proposed Waskada Unit No. 20 are outlined in Table 3.

Unit Lands

The Waskada Unit No. 20 will consist of 76 LSDs as follows:

> NE/4 Section 32 of Township 1, Range 25, W1M
> W/2 Section 33 of Township 1, Range 25, W1M
> All of Section 28 of Township 1, Range 25, W1M
> LSD 13, Section 21 of Township 1, Range 25, W1M

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

Tract Factors

The proposed Waskada Unit No. 20 will consist of 29 Tracts based on the 40 acre LSDs containing the existing 43 horizontal and 23 vertical wells.

The Tract Factor contribution for each of the LSD’s within the proposed Waskada Unit No. 20 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)
- Last twelve (12) months production to date for the LSD as distributed by the LSD specific PA % in the applicable producing horizontal or vertical well.
- Tract Factor by LSD = Fifty percent (50%) of the product of Remaining Gross OOIP by LSD as a % of total proposed Unit Remaining Gross OOIP, and fifty percent (50%) of the product of the Last 12 Months Production as a % of total proposed Unit Last 12 Months Production.

Tract Factor calculations for all individual LSDs based on the above methodology are outlined within Table 2. In the past, multiple methods of assigning tract participation factors have been used in the Waskada area. Tundra believes that the above given method provides the most equitable assignment of tract participation factors to all mineral owners, given the geological, reservoir and well completion risks associated with waterflooding horizontal to horizontal wellbores in Lower Amaranth formation.

Working Interest Owners

Table 1 outlines the working interest (WI) for each recommended Tract within the proposed Waskada Unit No. 20. 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 Waskada Unit No. 20.

WATERFLOOD EOR DEVELOPMENT

Technical Studies

The waterflood performance predictions for the proposed Waskada Unit No. 20 Lower Amaranth project are based on internal engineering assessments, as well as empirically observed waterflood performance in nearby Waskada Units 16 and 17, which employed a vertical to vertical waterflood. Utilizing project area specific reservoir and geological parameters, a Black oil simulation model using Exodus software was created by Tundra to evaluate the potential waterflood response using horizontal injectors to flood horizontal producers, which is the configuration that Tundra proposes in Waskada Unit No. 20. While the model was created using geological and historical production data from Waskada Unit 19, in section 34-1-25W1, the results observed in the model were similar to those observed empirically in Units 16 and 17, and deemed representative of what Tundra would expect in Waskada Unit 20.

Horizontal Injection Wells and EOR Development

Primary production from the original vertical/horizontal producing wells in the proposed Waskada Unit No. 20 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 of oil.

Tundra proposes to convert up to 17 horizontal oil producing well to water injection wells (WIW) as shown in Figure 5. This conversion scheme would allow for approximately 30 acre effective spacing between offsetting injection wells. Alternative injection configurations may be considered depending on results from offset pilot areas in the Lower Amaranth formation, within the Waskada field. These configurations could result in the conversion of more or less wells to injection than what is shown in Figure 5. Additionally, new horizontal injectors may be considered to be drilled if they are deemed to be essential to improving recovery in the unit.

If new injection wells are drilled in this area, Tundra believes an initial period of producing all new horizontal wells prior to placing them on permanent water injection is essential and all Unit mineral owners will benefit.

Tundra will continue to 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 Waskada Unit No. 20 are based on oil production decline curve analysis. The secondary predictions are based primarily on internal engineering analysis performed by the Tundra reservoir engineering group, utilizing an Exodus simulation model generated in Waskada Unit 19 (described previously), and simulating horizontal injectors offsetting horizontal producers for waterflood development. These results were then compared and contrasted to empirically observed data in Waskada Unit 16 and 17 to ensure proper calibration of data and results.

Primary Production Forecast

Cumulative production in the Waskada Unit No. 20 project area, to the end of February 2016 from 66 wells, was 356.7 e^3m^3 of oil and 928.6 e^3m^3 of water for a recovery factor of **10.2%** of the calculated Net OOIP.

Ultimate Primary Proved Producing oil reserves recovery for Waskada Unit No. 20 has been estimated to be **379.0** e^3m^3, or a **10.9**% Recovery Factor (RF) of OOIP. Remaining Producing Primary Reserves has been estimated to be **22.0** e^3m^3 to the end of February 2016.

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 proposes to begin converting existing horizontal producing wells to injection throughout 2017. Unit wide conversions will be implemented as production declines on existing horizontal producers allow, in order to sufficiently create voidage and maximize recovery factor. Observed waterflood response on adjacent waterflood patterns will also play a key factor in helping to determine the pace of injection conversions.

Criteria for Conversion to Water Injection Well

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.

- Measure reservoir pressures 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 Waskada Unit No. 20 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 reserves.

Secondary EOR Production Forecast

The proposed project oil production profile under Secondary Waterflood has been developed based on the response observed to date in Waskada Unit 16 and 17 as shown in 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 Waskada Unit No. 20 is estimated to be **510.5** e^3m^3 with **153.8** e^3m^3 remaining representing a total secondary recovery factor of **14.7%** for the proposed Unit area. An incremental **131.5** e^3m^3 of oil, or a **3.8%** 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 17.0 to 18.0 kPa/m true vertical depth (TVD).

WATERFLOOD OPERATING STRATEGY

Water Source

The injection water for the proposed Waskada Unit No. 20 will be supplied from the existing Waskada 15-9-2-25W1 Battery source and injection water system. All existing injection water is obtained from the Swan River formation in the 100/05-09-002-25W1 and 100/10-09-002-25W1 licensed water source wells. Swan River water from the two source wells is pumped to the main Waskada Units Water Plant at 15-9-2-25W1, filtered, and pumped up to injection system pressure. A diagram of the Waskada water injection system and new pipeline connection to the proposed Waskada Unit No. 20 project area injection wells is shown as Figure 11.

Based on past experience, Tundra does not believe that the produced water can be cleaned to the required specifications feasibly. Therefore, Tundra plans to use source water from a Swan River well as a source supply for Waskada Unit No. 20.

A mixture of produced waters from the Lower Amaranth has been extensively tested for compatibility with 100/05-09 source Swan River water, by a highly qualified third party, prior to implementation by Tundra. 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 Waskada injection water facility. Review and monitoring of the source water scale inhibition system is also part of an existing routine maintenance program.

Injection Wells

New water injection wells for the proposed Waskada Unit No. 20 will be cleaned out and configured downhole for injection as shown in Figures 12 and 13. The horizontal injection well will be 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 the pre-production period and 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 Waskada Unit No. 20 horizontal water injection well rate is forecasted to average 10 - 30 m^3 WPD, based on expected reservoir permeability and pressure.

Reservoir Pressure

No representative initial pressure surveys are available for the proposed Waskada Unit No. 20 project area in the Lower Amaranth producing zone. Tundra assumed operatorship of these properties in 2015, and has been unable to recover any pressure surveys from the original operators.

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

Waskada Unit No. 20 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 Waskada Unit No. 20 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 Waskada Unit No. 20.

On Going Reservoir Pressure Surveys

Any pressures taken during the operation of the proposed unit will be reported within the Annual Progress Reports for Waskada Unit No. 20 as per Section 73 of the Drilling and Production Regulation.

Economic Limits

Under the current Primary recovery method, existing wells within the proposed Waskada Unit No. 20 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 Waskada Unit No. 20 waterflood operation will utilize the existing Tundra operated source well supply and water plant (WP) facilities located at 15-9-2-25 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 14.

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 Waskada Unit No. 20. 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 Waskada Unit No. 20 Application.

Waskada Unit No. 20 Unitization, and execution of the formal Waskada Unit No. 20 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 Waskada Unit No. 20 Application.

Should the Petroleum Branch have further questions or require more information, please contact Robert [redacted] at 403.767.1248 or by email at robert.prefontaine@tundraoilandgas.com.

TUNDRA OIL & GAS PARTNERSHIP

Original Signed by Robert [redacted] May 31, 2016, in Calgary, AB

Proposed Waskada Unit No. 20

Application for Enhanced Oil Recovery Waterflood Project

List of Figures

Figure No. 1

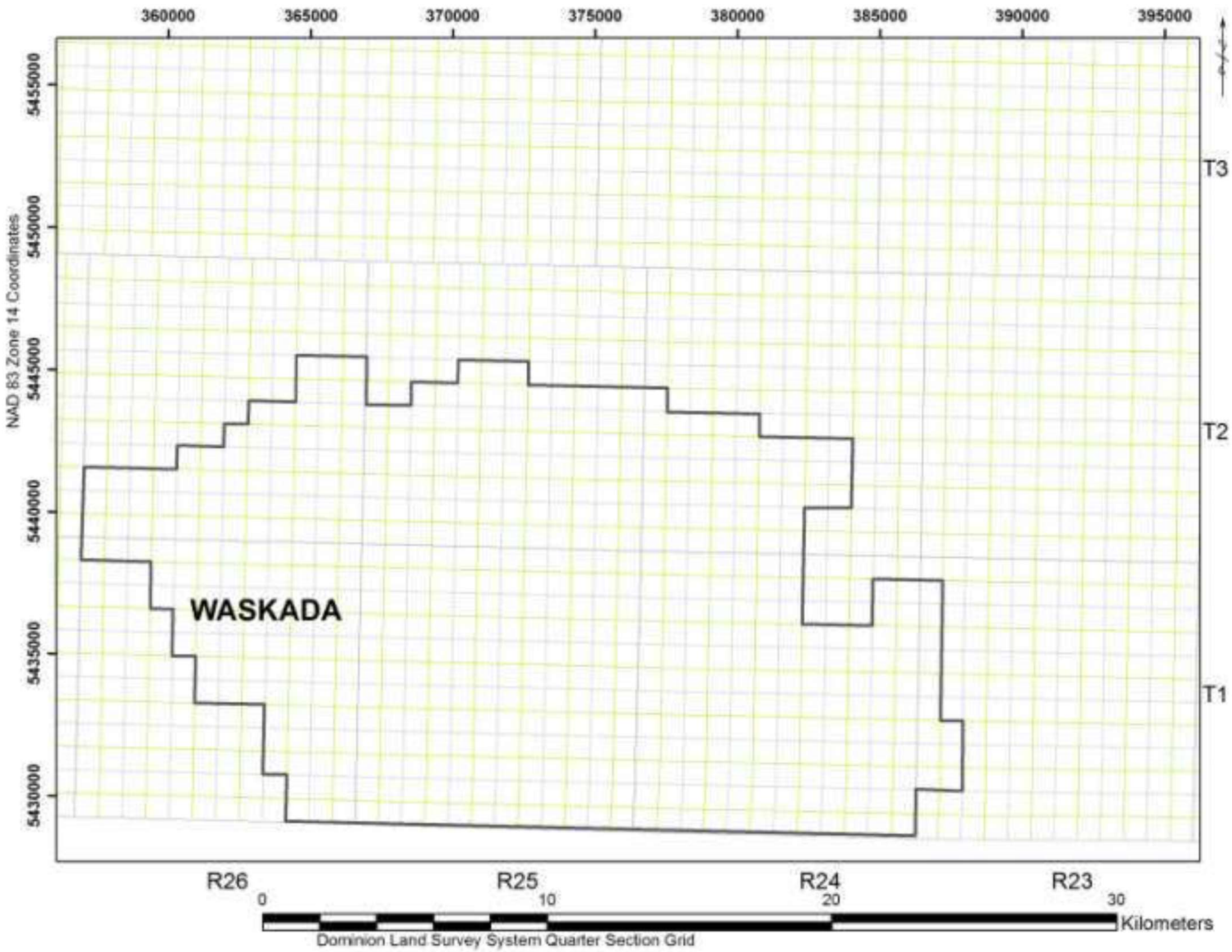
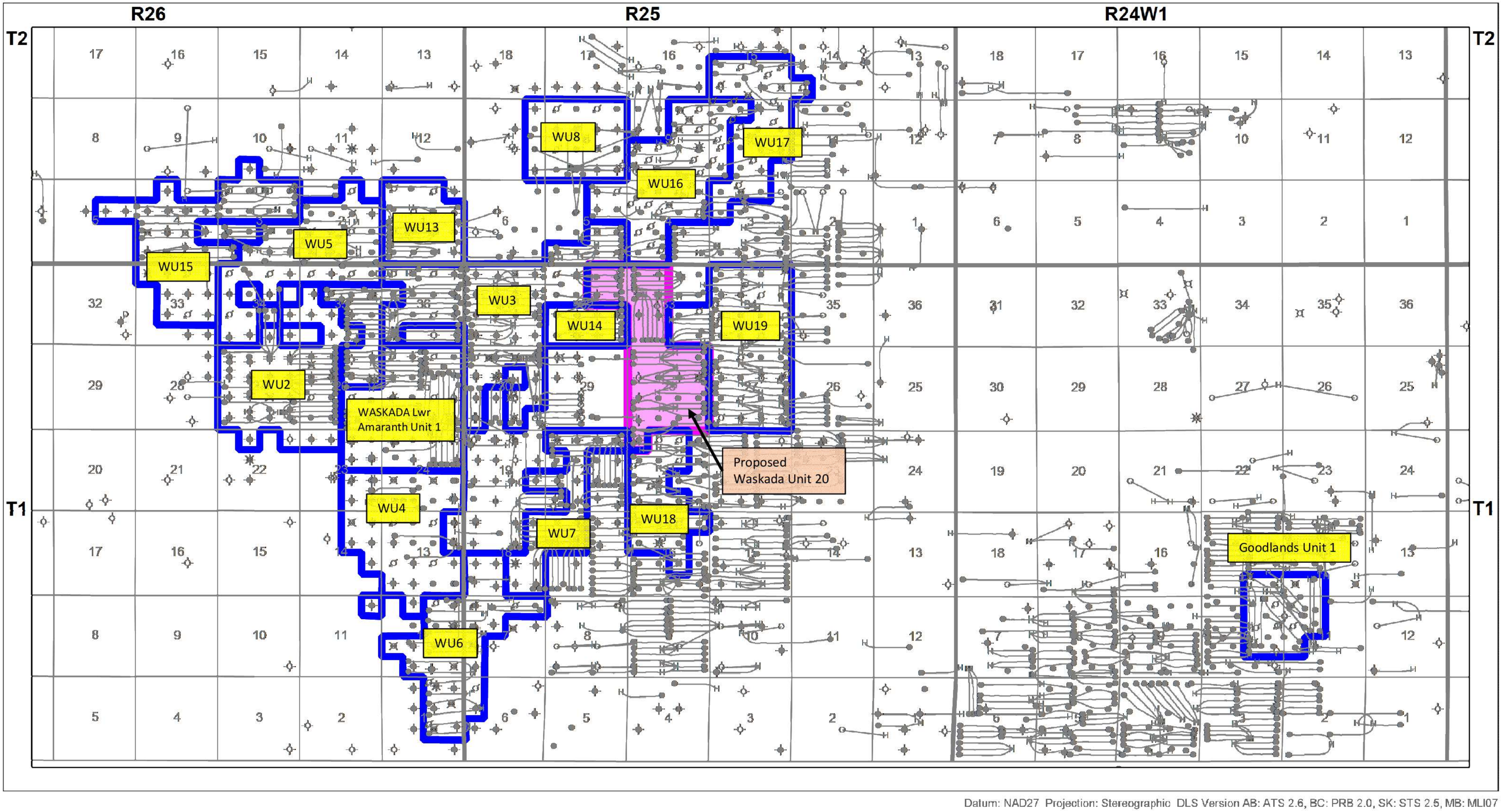


Figure 4 - Waskada Field (03)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Amaranth Unit 1
Proposed
Waskada Unit 20
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Figure No. 3

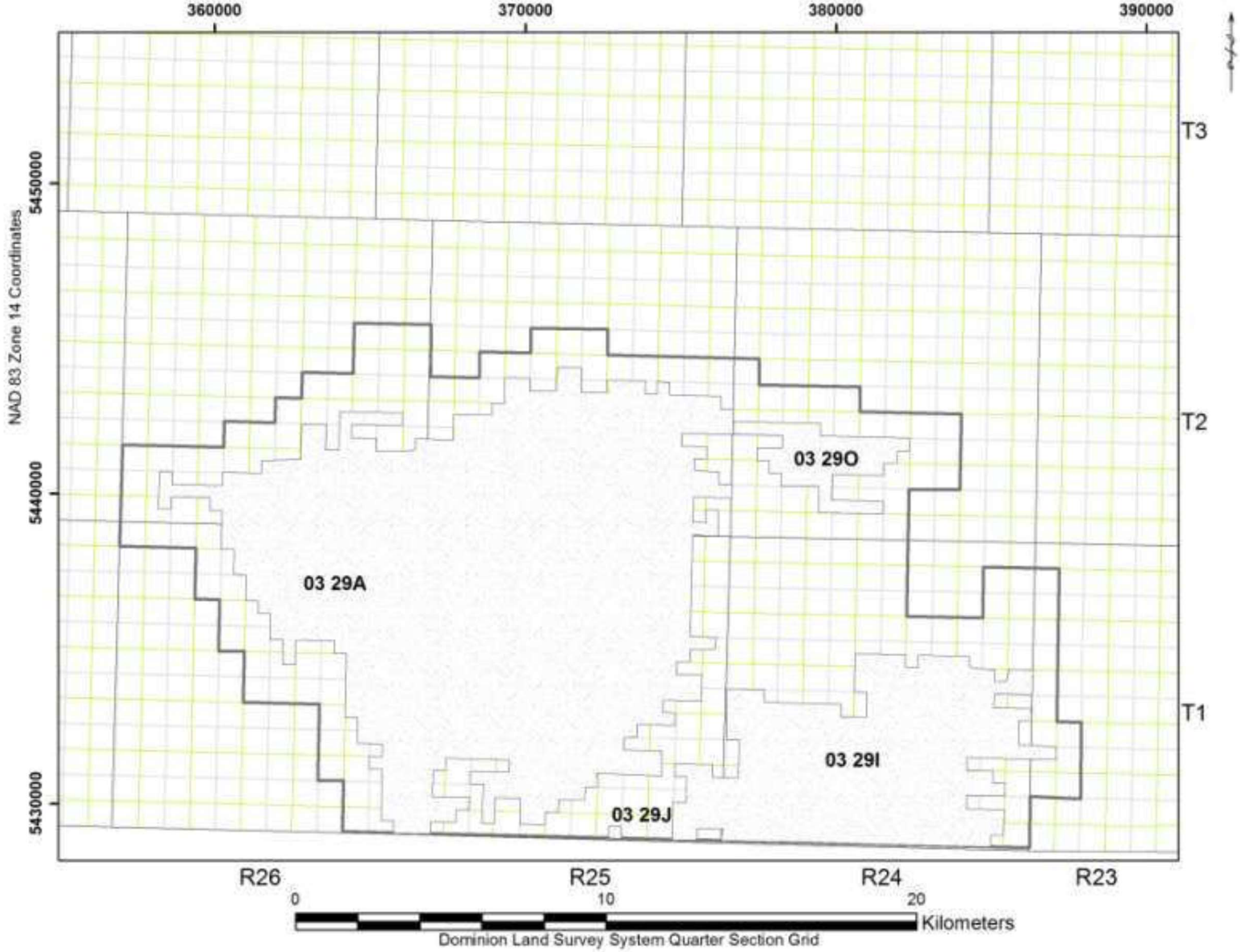
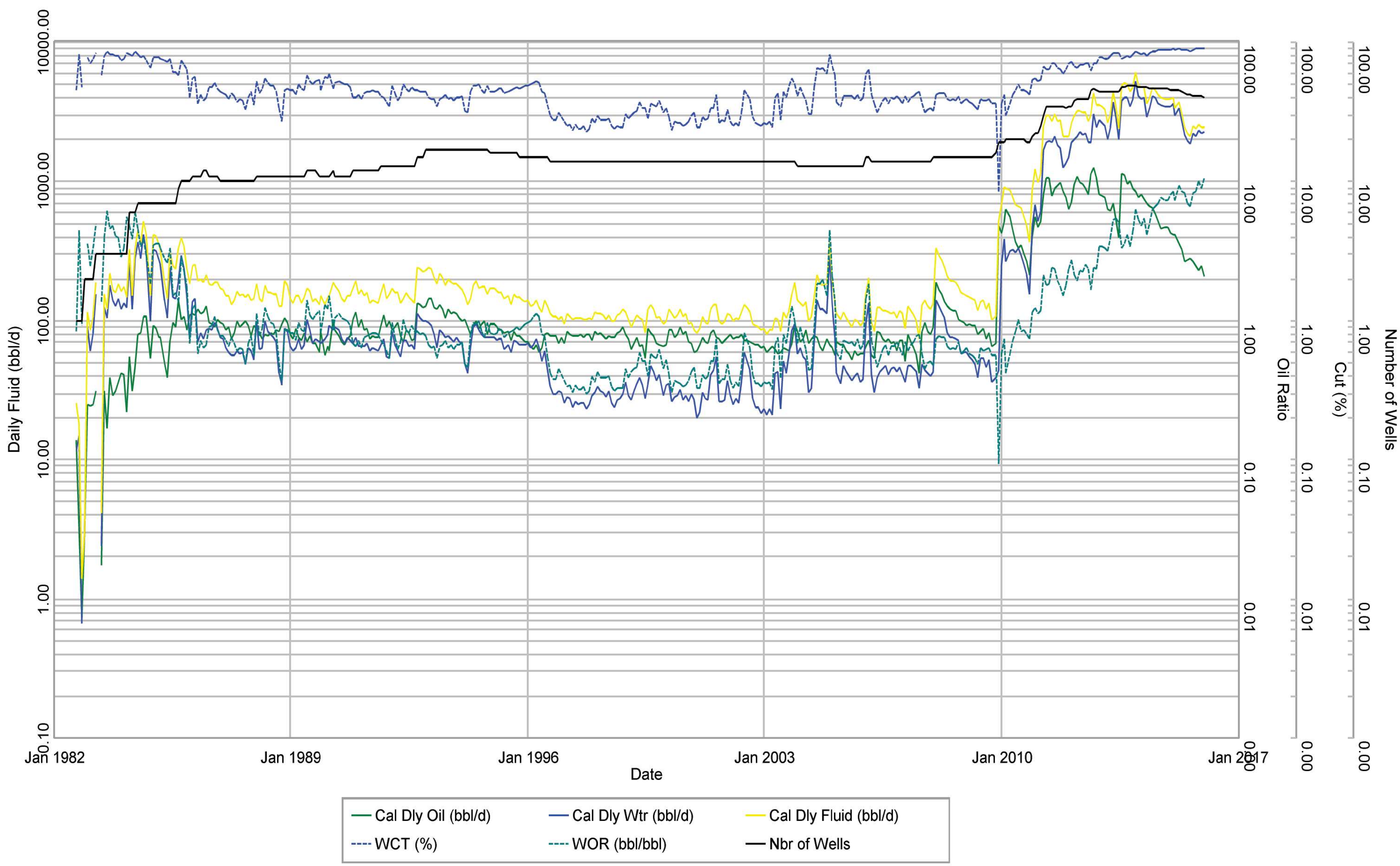


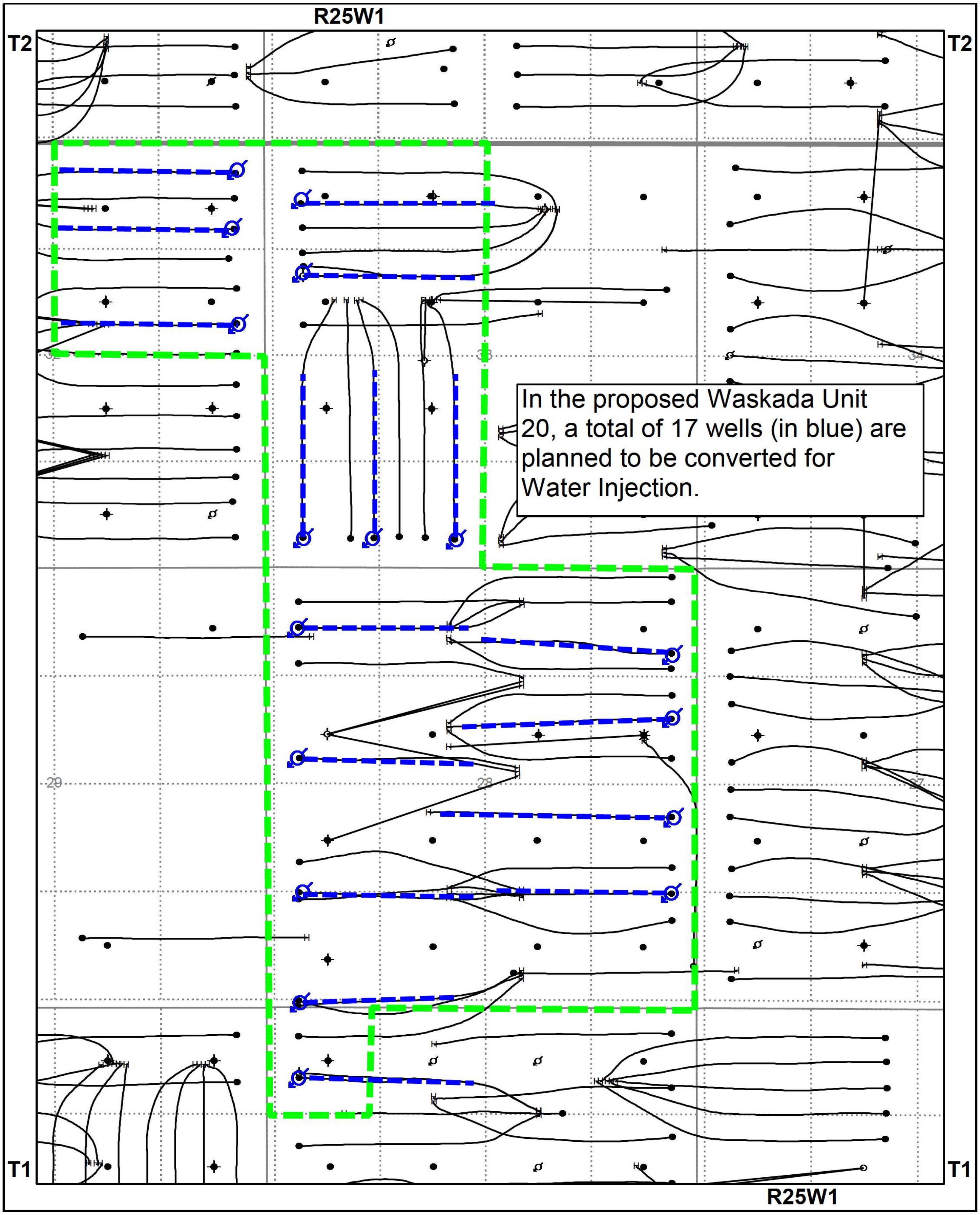
Figure 18 - Waskada Lower Amaranth Pools (03 29A, I, J, K & O)

Well Information as of 3/4/2016 - Group Well Report

Production Graph

Group:	proposed waskada unit 20.lwell	**Prod Form:**	AMRNTHL; [redacted]	**On Prod:**	1982-08 to 2015-12
# of Wells:	66	**Field:**	WASKADA (3)	**Cum Oil:**	2233022.3 bbl
Fluid:	Oil	**Pool Code:**	29A	**Cum Gas:**	308522.1 mcf
Mode:	Abandoned; Producing; Pumping; Comingled	**Unit Code:**	329A18	**Cum Wtr:**	5713121.4 bbl



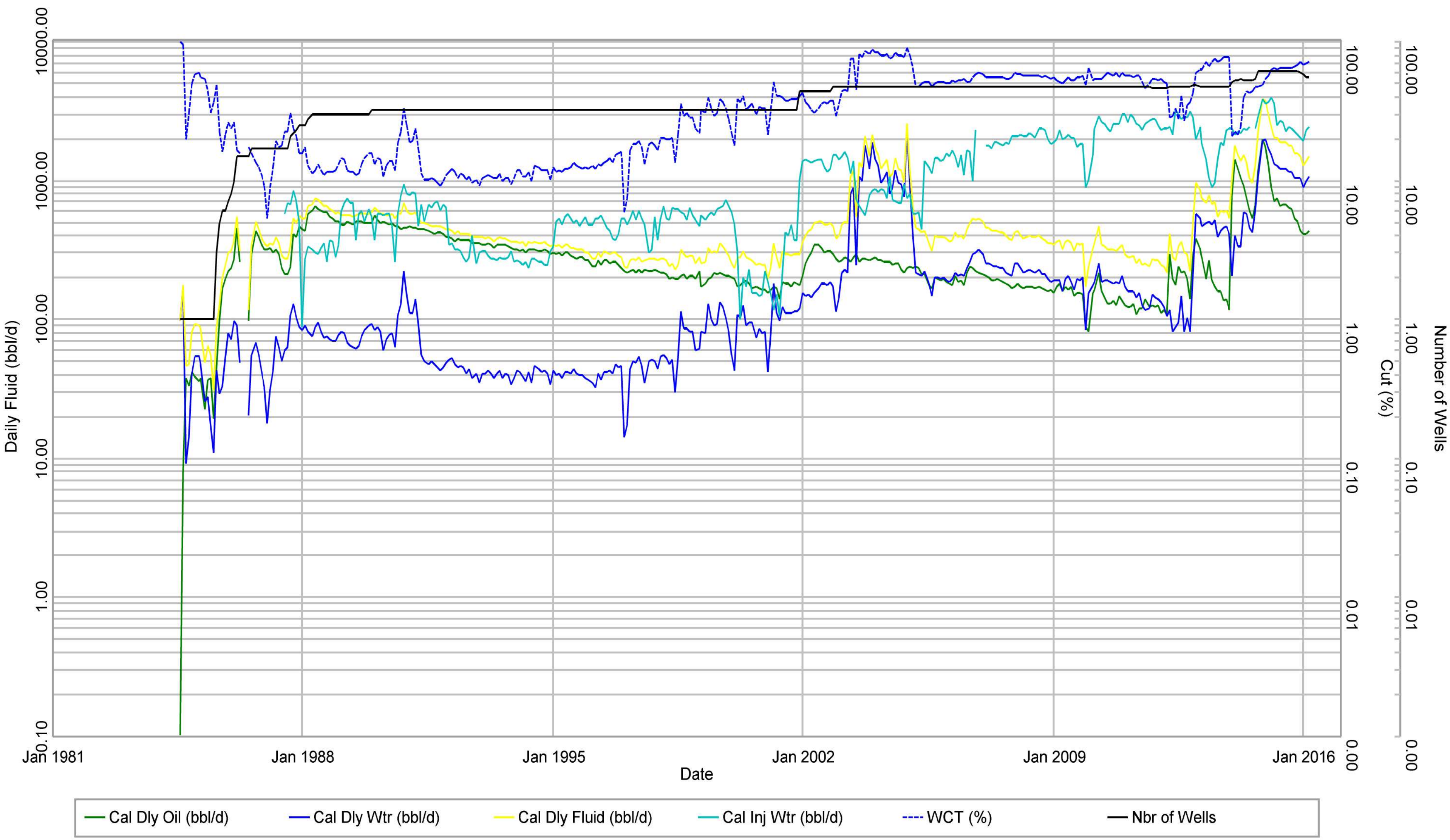


Datum: NAD27 Projection: Stereographic DLS Version AB: ATS 2.6, BC: PRB 2.0, SK: STS 2.5, MB: MLI07

Well Information as of 5/5/2016 - Group Well Report

Production Graph

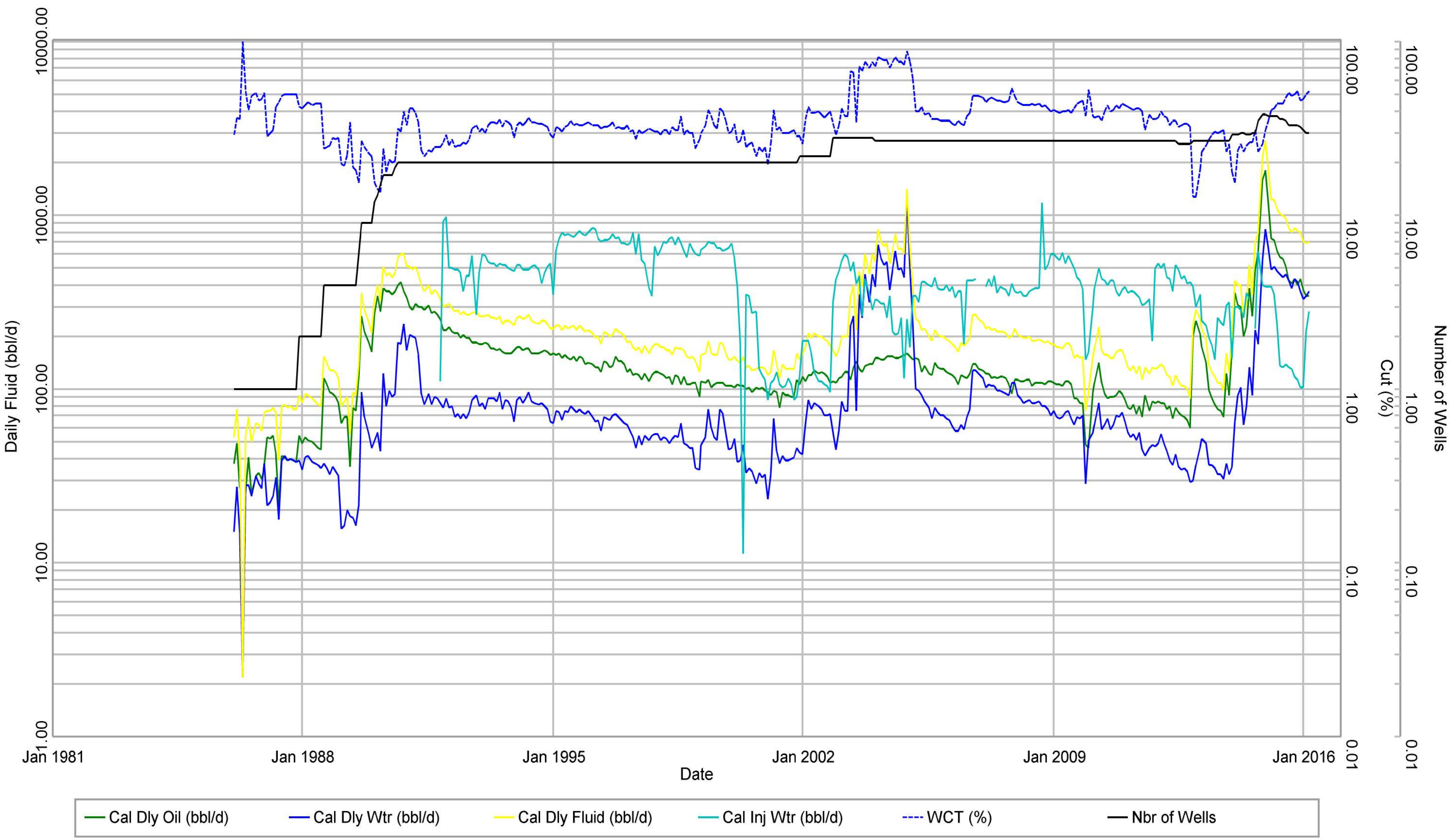
Group:	waskada unit 16.lwell	**On Prod:**	1984-07 to 2016-02	**Cum Oil:**	3465556.3 bbl
# of Wells:	69	**Prod Form:**	AMRNTHL; WINNPGS	**Cum Gas:**	82515.8 mcf
Fluid:	Oil; Water Injection; Salt Water	**Field:**	WASKADA (3)	**Cum Wtr:**	2757403.3 bbl
Mode:	Producing; Injection; Abandoned Zone; Pumping; Disposal	**Pool Code:**	29A; 76	**Cum Inj Oil:**	0.0 bbl
		Unit Code:	329A16; 329A17	**Cum Inj Gas:**	0.0 mcf
				Cum Inj Wtr:	12076238.9 bbl



Well Information as of 5/5/2016 - Group Well Report

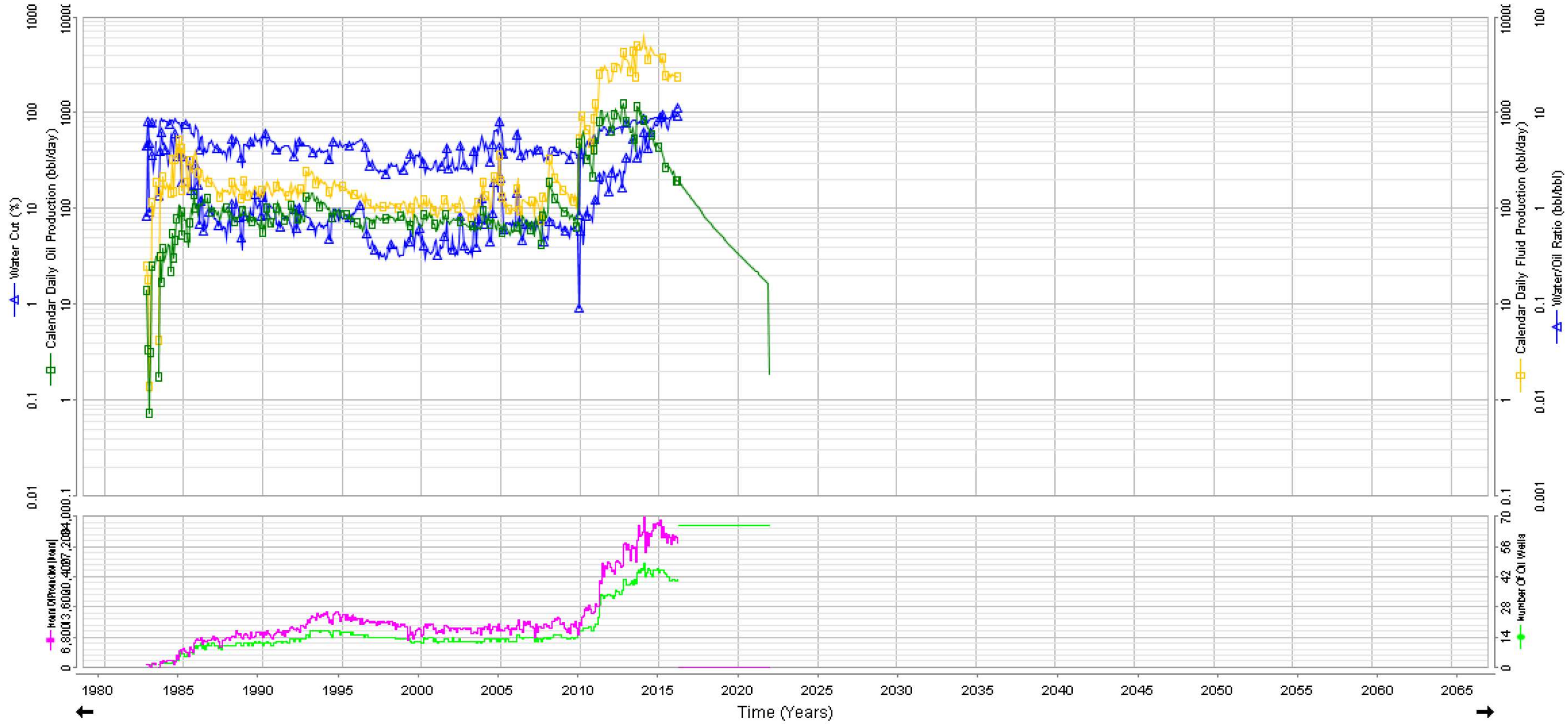
Production Graph

Group:	waskada unit 17.lwell	**On Prod:**	1986-01 to 2016-02	**Cum Oil:**	1773342.0 bbl
# of Wells:	41	**Prod Form:**	AMRNTHL	**Cum Gas:**	43298.8 mcf
Fluid:	Oil; Water Injection	**Field:**	WASKADA (3)	**Cum Wtr:**	1188394.0 bbl
Mode:	Producing; Pumping; Injection; Abandoned Zone	**Pool Code:**	29A	**Cum Inj Oil:**	0.0 bbl
		Unit Code:	329A17	**Cum Inj Gas:**	0.0 mcf
				Cum Inj Wtr:	3763584.7 bbl



CONSOLIDATED PRODUCTION AND FORECAST

Effective March 01, 2016
Selection: Current selection from current workbench list
Type:
Category: Base



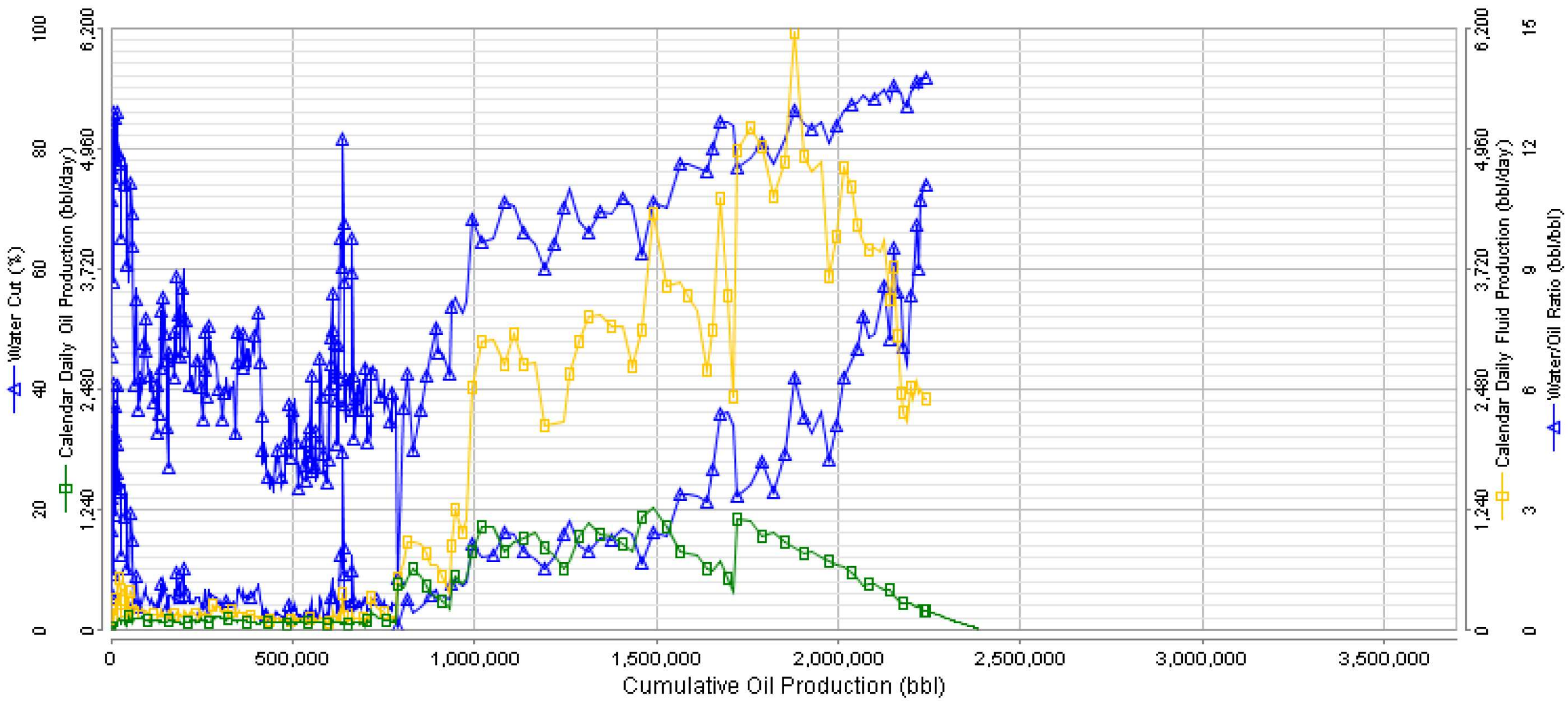
Cum Oil	(bbl)	2,239,133	Cum Gas	(Mcf)	308,522	Cum Water	(bbl)	5,778,230	Cum Cond (bbl)	0

Forecast Start		2016/03/01	Calculation Type			Est. Cum Prod	(bbl)	2,244,833	Decline Exponent	
Forecast End		2021/12/31	OVIP	(bbl)		Remaining	(bbl)	138,847	Intial Decline (%/yr)	90.1
Initial Rate	(bbl/day)	836,293.8	Recovery Factor			Surface Loss			Life Index	2.66
Final Rate	(bbl/day)	83,029.6	Ult. Recoverable	(bbl)	2,383,680	Total Sales	(Mcf)		Half Life (years)	1.44

Report Time: Tue, 31 May 2016 11:10
Economic Case: Tundra 2016 Strip Price /
Hierarchy: Reserves
DB: WORKING_AD : Mosaic10 Version: 2016.0

CONSOLIDATED PRODUCTION AND FORECAST

Effective March 01, 2016
Selection: Current selection from current workbench list
Type:
Category: Base

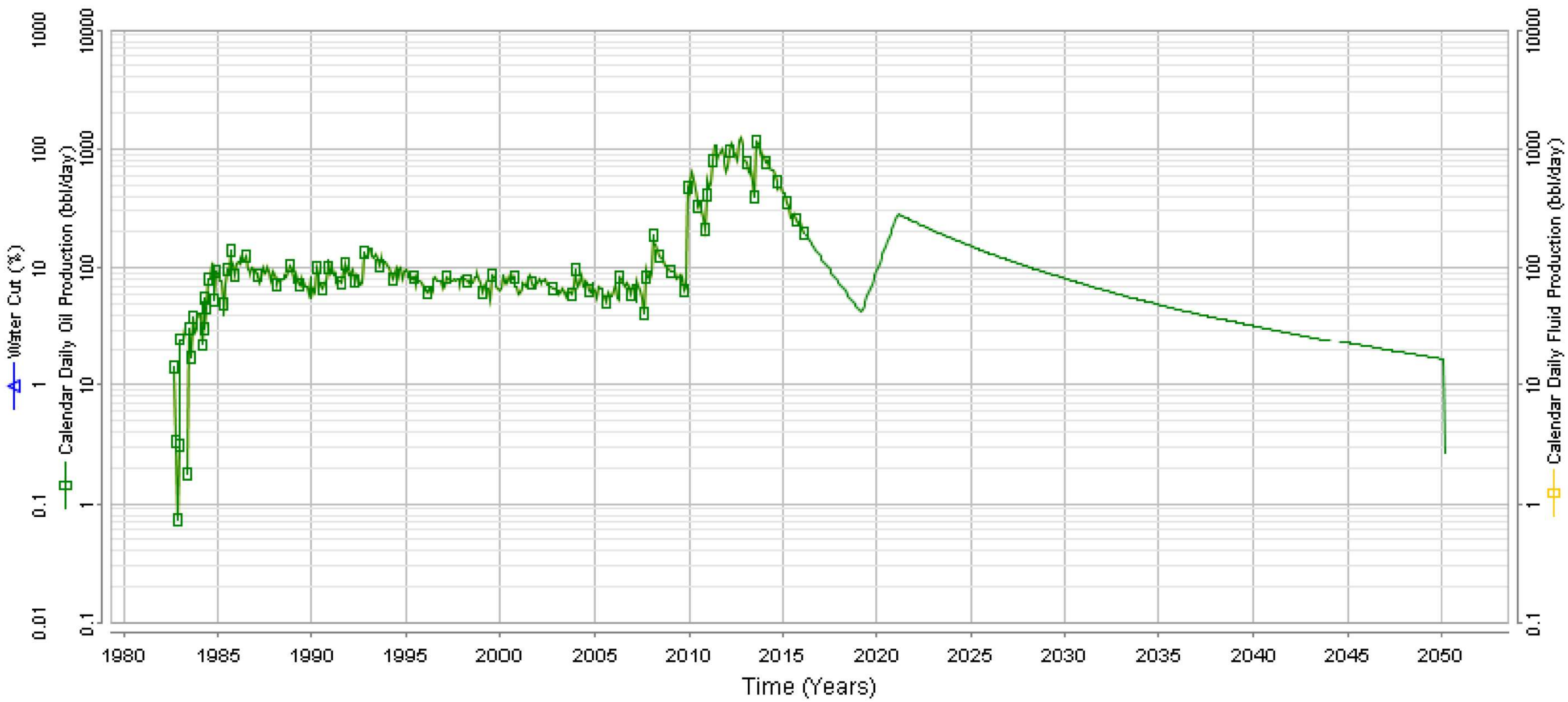


Cum Oil	(bbl)	2,239,133	Cum Gas	(Mcf)	308,522	Cum Water	(bbl)	5,778,230	Cum Cond	(bbl)	0

Forecast Start		2016/03/01	Calculation Type			Est. Cum Prod	(bbl)	2,244,833	Decline Exponent	
Forecast End		2021/12/31	OVIP	(bbl)		Remaining	(bbl)	138,847	Intial Decline (%/yr)	90.1
Initial Rate	(bbl/day)	836,293.8	Recovery Factor			Surface Loss			Life Index	2.66
Final Rate	(bbl/day)	83,029.6	Ult. Recoverable	(bbl)	2,383,680	Total Sales	(Mcf)		Half Life (years)	1.44

CONSOLIDATED PRODUCTION AND FORECAST

Effective January 01, 2016
Selection: Evaluation WB List
Type: Σ
Category: Base + Growth 1

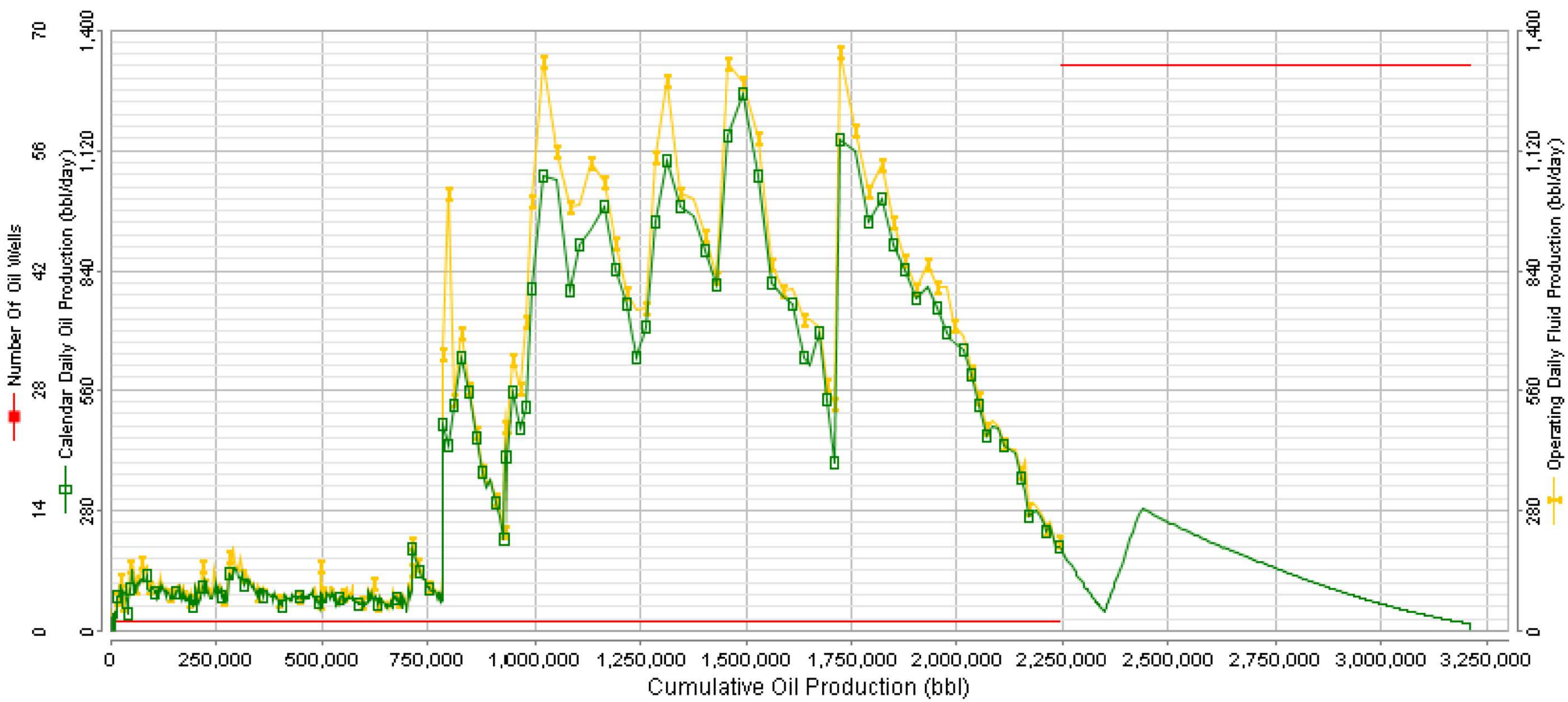


Cum Oil	(bbl)	2,239,078	Cum Gas	(Mcf)	0	Cum Water	(bbl)	0	Cum Cond (bbl)	0
Forecast Start		2016/03/01	Calculation Type			Est. Cum Prod	(bbl)	2,238,638	Decline Exponent	
Forecast End		2050/02/28	OVIP	(bbl)		Remaining	(bbl)	972,249	Intial Decline (%/yr)	91.9
Initial Rate	(bbl/day)	821,539.7	Recovery Factor			Surface Loss			Life Index	19.19
Final Rate	(bbl/day)	66,401.7	Ult. Recoverable	(bbl)	3,210,887	Total Sales	(Mcf)		Half Life (years)	8.72

Report Time: Fri, 10 Jun 2016 13:36
Economic Case: Copy of Tundra 2016 Stress Deck /
Hierarchy: Reserves
DB: WORKING_EG : Mosaic10 Version: 2016.0

CONSOLIDATED PRODUCTION AND FORECAST

Effective January 01, 2016
Selection: Evaluation WB List
Type: Σ
Category: Base + Growth 1



Cum Oil	(bbl)	2,239,078	Cum Gas	(Mcf)	0	Cum Water	(bbl)	0	Cum Cond	(bbl)	0

Forecast Start		2016/03/01	Calculation Type			Est. Cum Prod	(bbl)	2,238,638	Decline Exponent		
Forecast End		2050/02/28	OVIP	(bbl)		Remaining	(bbl)	972,249	Intial Decline (%/yr)		91.9
Initial Rate	(bbl/day)	821,539.7	Recovery Factor			Surface Loss			Life Index		19.19
Final Rate	(bbl/day)	66,401.7	Ult. Recoverable	(bbl)	3,210,887	Total Sales	(Mcf)		Half Life (years)		8.72

Report Time: Fri, 10 Jun 2016 13:36
Economic Case: Copy of Tundra 2016 Stress Deck /
Hierarchy: Reserves
DB: WORKING_EG : Mosaic10 Version: 2016.0

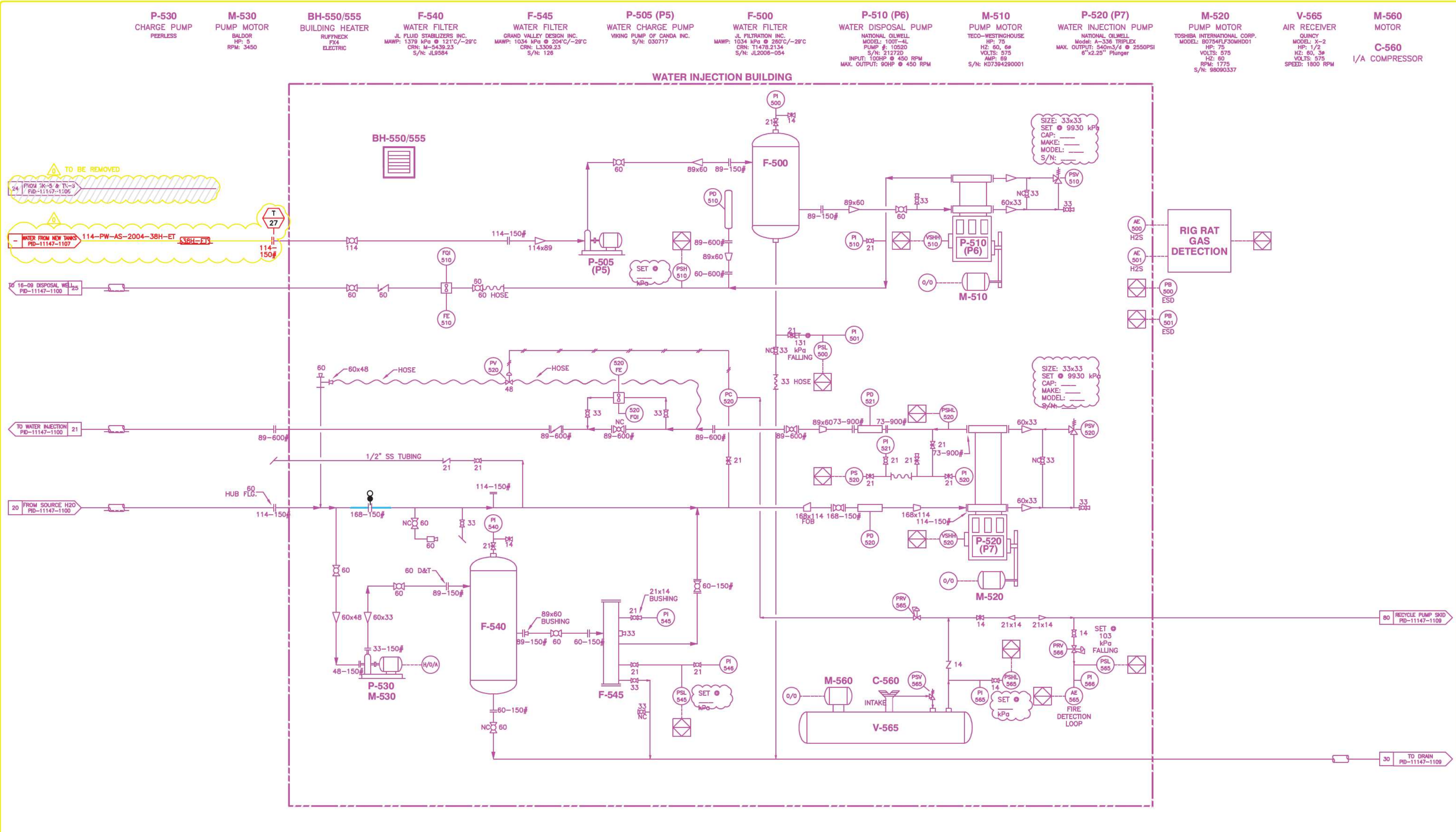


Figure No. 11

XREF: 11147PIDMSTR.DWG
Q:\11147\PID\11147-1108.DWG
PLOTTED: JUN 25, 2012 10:06 AM

No.	Revision	By	Date	Chk.	E.Chk	E.App	Client
0	2011 ADDITIONS – ISSUED FOR CONSTRUCTION (GLE # 11147)	AMP	12-02-28	CDK			
B	2011 ADDITIONS – ISSUED FOR REVIEW (GLE # 11147)	AMP	12-02-06	CDK			
A	2011 ADDITIONS – AS BUILT (GLE # 11147)	STK	11-10-14	MBG			

Stamps

Engineering Record		
RFE		
Client		
Approved		
Eng. Check		
Date		
Eng. By	IFC	AB

Geo Resources
GAS LIQUIDS ENGINEERING

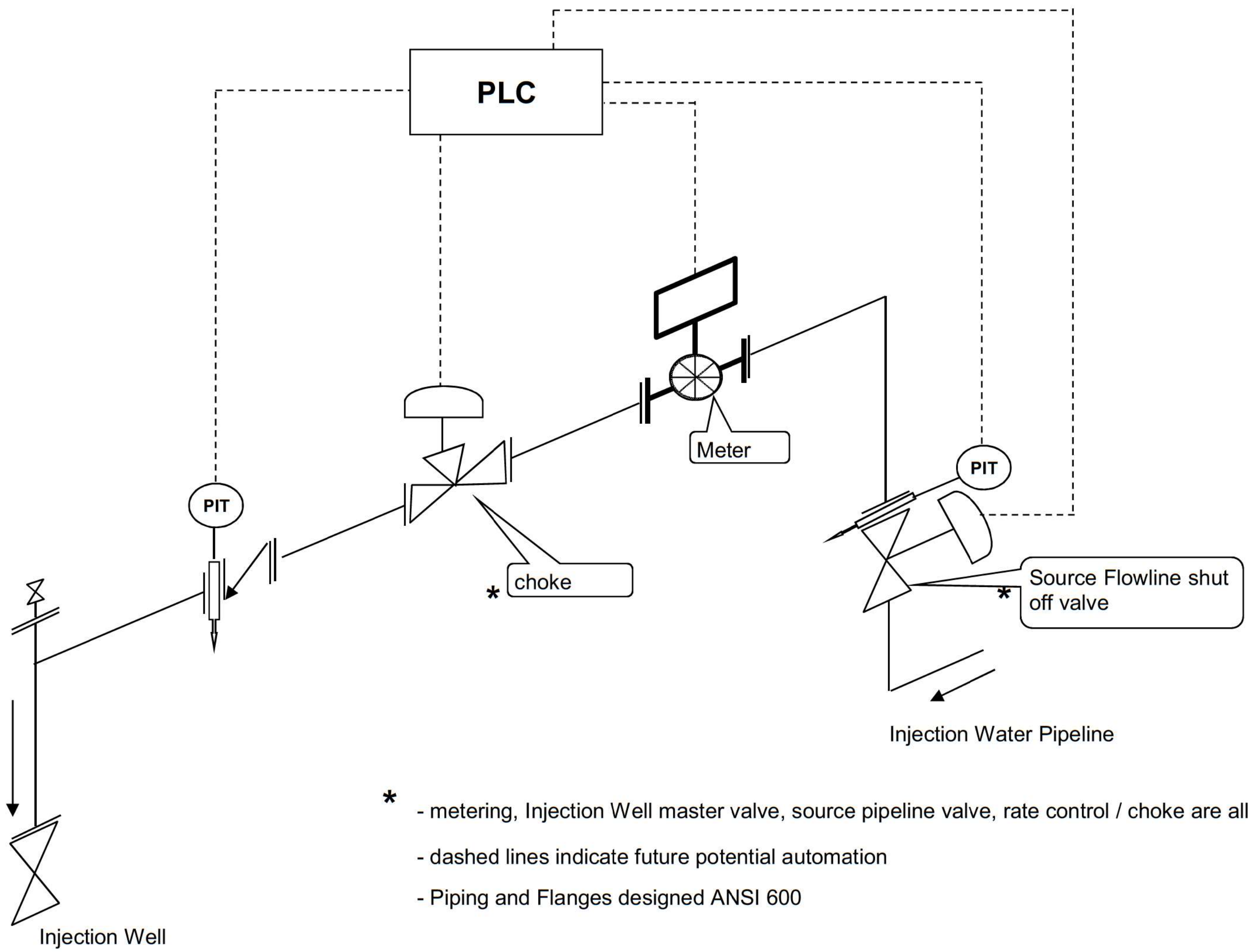
WASKADA 15-09 BATTERY

PROCESS & INSTRUMENTATION DIAGRAM
WATER INJECTION BUILDING
LSD 15-09-002-25 W1M

Scale	Size	Drawing Number	Rev.
NONE	D	PID-11147-1108	0

Waskada Unit No. 20

Proposed Injection Well Surface Piping P&ID

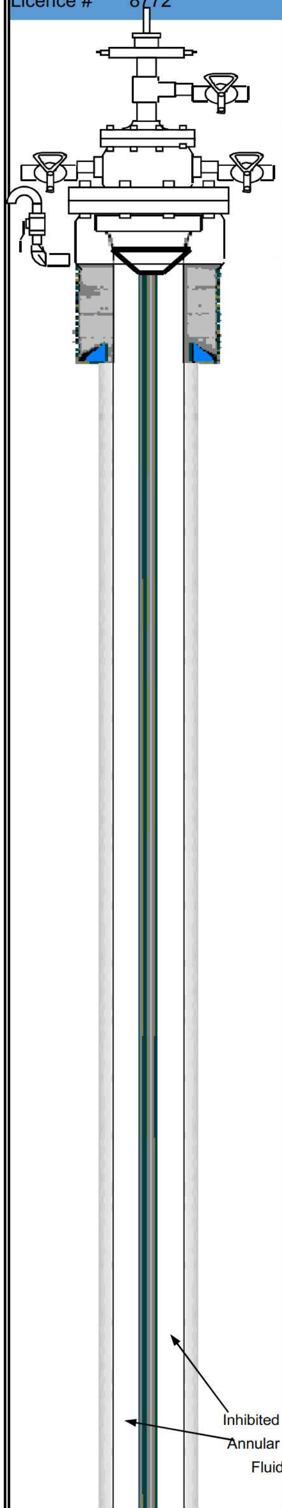


* - metering, Injection Well master valve, source pipeline valve, rate control / choke are all standard

- dashed lines indicate future potential automation

- Piping and Flanges designed ANSI 600

Licence # 8772



Tundra Oil & Gas

WELLBORE SCHEMATIC

WELL NAME: WASKADA UNIT 20 HZNTL Cemented Liner **DATE:**

LOCATION: **Prepared by:** GP

MEASUREMENTS ARE IN METERS / DEPTHS ARE MEASURED IN DEPTH KB UNLESS OTHERWISE NOTED

ELEVATIONS					WELLHEAD DESCRIPTION		
KB EL	GRD EL	KB to GRD	KB to SCF	KB to TH	Make / Type	Size / Rating	
470.46	466.80	3.7	3.77	2.7	Metra	11"x 8 5/8"	3000 psi

CASING	O.D. mm	WEIGHT kg/m	GRADE	I.D. mm	LANDED DEPTH	TVD	TOP
SURFACE	219.1	35.72	J-55	205.66	172.0	172.0	0
PRODUCTION	139.7	25.3	E-80	124.3	1717.0	909.5	0
LINER	N/A						

K.O.P.	591.0	REMARKS 5.5" Monobore well. Both strings cemented to surface.
PBTD	1700.0 Est	

FORMATION	PERFORATIONS INTERVAL	TVD	REMARKS
Lower Amarath	1151.9-1650.0	909.0	16 Stages - Baker Frac Ports
			16 x 5T Fracs x 1.0m3/min x 100-800 conc

WELLBORE EQUIPMENT

No. joints	DESCRIPTION	LENGTH	DEPTH KB
1	73mm ENC Re-Entry "Mule shoe"	0.13	3.04
1	73mm ENC Pup Joint	1.24	4.28
1	73mm ENC Tryton TX-8 "DG" mechanical set packer	2.17	6.45
1	73mm ENC Tryton RH-Release on-off barrel	0.55	7.00
Est 119 jnts	73mm TK-99 IC Tubing or 73mm Polycoer Lined Tubing	1138.7	1145.70
1	73mm ENC EUE tubing nipple	0.1	1145.80
1	73mm Weatherford split bushing coated tubing hanger	0.21	1146.01
			1146.01
	Subtract 1.0m from bottom of packer to COE	-1.00	1145.01
			1145.01
			1145.01
			1145.01
			1145.01
			1145.01
			1145.01

WEIGHT OF TBG STRING (daN)	9,321	TOTAL TUBING STRING	1142.1	
TENSION / COMPRESSION (+/- daN)	6,000	KB to THF	2.7	
LANDED STRING WEIGHT	15,321	STRETCH/ COMPRESSION m	0.21	1145.01

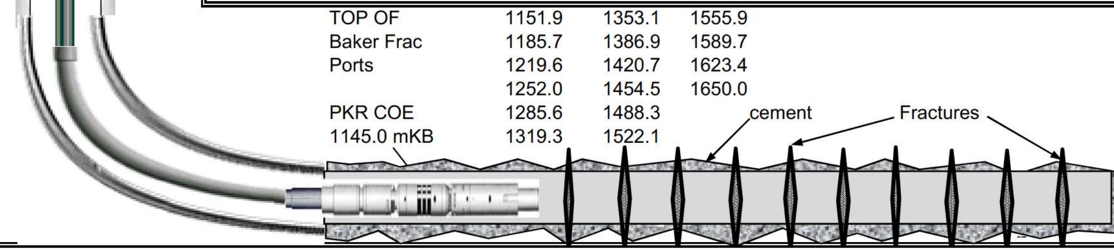
ROD STRING

No. RODS	SIZE	DESCRIPTION	GRADE	NEW / USED	LENGTH	DEPTH KB
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00
						0.00

BOTTOM HOLE PUMP

DESCRIPTION:				PUMP No.	
BARREL TYPE:		PLUNGER TYPE:		MAX. STROKE:	
BALLS/SEATS:		PULL ROD:		FISH NECK:	
COMMENTS:					

TOP OF	1151.9	1353.1	1555.9
Baker Frac	1185.7	1386.9	1589.7
Ports	1219.6	1420.7	1623.4
	1252.0	1454.5	1650.0
PKR COE	1285.6	1488.3	
1145.0 mKB	1319.3	1522.1	



Waskada Unit No. 20

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 15-9-2-25 Water Plant – Fiberglass
- New High Pressure Pipeline to Unit 20 injection wells – 2000 psi high pressure Fiberglass

Facilities

- 15-9-2-25 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 14

** subject to final design and engineering

Proposed Waskada Unit No. 20

Application for Enhanced Oil Recovery Waterflood Project

List of Tables

TABLE NO. 1: TRACT PARTICIPATION FOR PROPOSED WASKADA UNIT NO. 20

Working Interest				Royalty Interest		Tract Participation
Tract No.	**Land Description**	**Owner**	**Share (%)**	**Owner**	**Share (%)**	**Tract (%)**
1	13-21-001-25W1M	Tundra Oil & Gas	100%	6320309 Manitoba Ltd.	50%	2.731050404%
				6320317 Manitoba Ltd.	50%	
2	01-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	3.180320358%
3	02-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	2.909493263%
4	03-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	2.396087871%
5	04-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	2.421961433%
6	05-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	2.132097344%
7	06-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	2.094266066%
8	07-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	2.028371906%
9	08-28-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	2.285173093%
10	09-28-001-25W1M	Tundra Oil & Gas	100%	Nestibo Holdings Ltd.	100%	4.205474422%
11	10-28-001-25W1M	Tundra Oil & Gas	100%	Nestibo Holdings Ltd.	100%	4.489536024%
12	11-28-001-25W1M	Tundra Oil & Gas	100%	Heritage Royalty Partnership	50%	2.383547709%
				Kev-Mel Gardiner Minerals Ltd.	50%	
13	12-28-001-25W1M	Tundra Oil & Gas	100%	Heritage Royalty Partnership	50%	2.710540318%
				Kev-Mel Gardiner Minerals Ltd.	50%	
14	13-28-001-25W1M	Tundra Oil & Gas	100%	Heritage Royalty Partnership	50%	4.287222780%
				Kev-Mel Gardiner Minerals Ltd.	50%	
15	14-28-001-25W1M	Tundra Oil & Gas	100%	Heritage Royalty Partnership	50%	4.216504116%
				Kev-Mel Gardiner Minerals Ltd.	50%	
16	15-28-001-25W1M	Tundra Oil & Gas	100%	Nestibo Holdings Ltd.	100%	5.100930228%
17	16-28-001-25W1M	Tundra Oil & Gas	100%	Nestibo Holdings Ltd.	100%	5.156718531%
18	09-32-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	4.042524429%
19	10-32-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	3.569318757%
20	15-32-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	5.504426145%
21	16-32-001-25W1M	Tundra Oil & Gas	100%	Minister of Finance - Manitoba	100%	5.554486851%
22	03-33-001-25W1M	Tundra Oil & Gas	100%	5998531 Manitoba Ltd.	100%	3.060528973%
23	04-33-001-25W1M	Tundra Oil & Gas	100%	5998531 Manitoba Ltd.	100%	2.835519883%
24	05-33-001-25W1M	Tundra Oil & Gas	100%	5998531 Manitoba Ltd.	100%	2.988041770%
25	06-33-001-25W1M	Tundra Oil & Gas	100%	5998531 Manitoba Ltd.	100%	3.416493953%
26	11-33-001-25W1M	Tundra Oil & Gas	100%	M&V Oils Ltd.	100%	3.550256481%
27	12-33-001-25W1M	Tundra Oil & Gas	100%	M&V Oils Ltd.	100%	4.315971324%
28	13-33-001-25W1M	Tundra Oil & Gas	100%	M&V Oils Ltd.	100%	3.151150565%
29	14-33-001-25W1M	Tundra Oil & Gas	100%	M&V Oils Ltd.	100%	3.281985004%
						100.000000000%

TABLE NO. 2: TRACT FACTOR CALCULATIONS FOR WASKADA UNIT NO. 20

TRACT FACTORS BASED ON OIL-IN-PLACE (OOIP) - CUMULATIVE PRODUCTION & LAST 12 MONTHS OF PRODUCTION TO FEBRUARY 2016

LS-SE	Tract	OOIP (m3)	HZ Wells Cum Alloc Prod (m3)	Vert Wells Cum Prodn (m3)	Sum Hz + Vert Alloc Cum Prodn	OOIP - Cum	OOIP-Cum by LSD/Total OOIP	Last 12 Months Alloc Prod (m3)	Vt Wells Last 12 Months Prod (m3)	Sum Hz + Vert Alloc Last 12 Months Prod (m3)	Alloct Last 12 Months Prod by LSD/Total Prod	50% OOIP-Cum + 50% Last 12 Months Prod Tract Factor	Tract
13-21	13-21-001-25W1M	120,778	4,641.9	353.6	4,995.5	115,782	0.036910067	166.5	123.1	289.6	0.017710941	0.027310504	11-02-001-24W1M
01-28	01-28-001-25W1M	123,625	9,539.0	10,753.3	20,292.3	103,333	0.032941364	417.7	83.6	501.3	0.030665043	0.031803204	12-02-001-24W1M
02-28	02-28-001-25W1M	120,593	9,348.3	7,452.8	16,801.1	103,792	0.033087780	407.5	2.9	410.4	0.025102085	0.029094933	13-02-001-24W1M
03-28	03-28-001-25W1M	120,687	3,655.2	4,696.7	8,351.9	112,335	0.035811185	169.1	28.9	198.0	0.012110572	0.023960879	14-02-001-24W1M
04-28	04-28-001-25W1M	120,794	3,627.2	205.7	3,832.9	116,961	0.037285740	167.1	15.2	182.3	0.011153488	0.024219614	01-03-001-24W1M
05-28	05-28-001-25W1M	116,444	2,248.1	298.8	2,546.9	113,897	0.036309027	91.4	12.1	103.5	0.006332920	0.021320973	02-03-001-24W1M
06-28	06-28-001-25W1M	110,739	2,118.6	6,831.5	8,950.1	101,789	0.032449231	86.4	67.9	154.3	0.009436091	0.020942661	03-03-001-24W1M
07-28	07-28-001-25W1M	119,531	7,728.1	8,697.6	16,425.7	103,106	0.032868895	120.1	5.8	125.9	0.007698543	0.020283719	04-03-001-24W1M
08-28	08-28-001-25W1M	120,826	8,235.6	3,596.9	11,832.5	108,993	0.034745716	128.1	51.0	179.1	0.010957746	0.022851731	05-03-001-24W1M
09-28	09-28-001-25W1M	120,465	6,982.6	9.4	6,992.0	113,473	0.036173749	774.3	9.4	783.7	0.047935739	0.042054744	06-03-001-24W1M
10-28	10-28-001-25W1M	116,711	6,751.4	1,842.9	8,594.3	108,117	0.034466319	749.2	155.3	904.5	0.055324402	0.044895360	07-03-001-24W1M
11-28	11-28-001-25W1M	113,480	3,948.2	6,048.5	9,996.7	103,484	0.032989377	237.5	2.5	240.0	0.014681577	0.023835477	08-03-001-24W1M
12-28	12-28-001-25W1M	116,054	6,081.9	0.0	6,081.9	109,972	0.035057931	313.1	0.0	313.1	0.019152875	0.027105403	09-03-001-24W1M
13-28	13-28-001-25W1M	118,077	7,467.9	0.0	7,467.9	110,609	0.035260779	825.3	0.0	825.3	0.050483677	0.042872228	10-03-001-24W1M
14-28	14-28-001-25W1M	117,700	7,337.9	0.0	7,337.9	110,362	0.035182108	803.5	0.0	803.5	0.049147974	0.042165041	11-03-001-24W1M
15-28	15-28-001-25W1M	120,446	10,934.9	0.0	10,934.9	109,511	0.034910726	1,097.1	0.0	1,097.1	0.067107878	0.051009302	12-03-001-24W1M
16-28	16-28-001-25W1M	125,683	11,161.9	5,613.3	16,775.2	108,907	0.034718408	1,118.5	0.0	1,118.5	0.068415963	0.051567185	13-03-001-24W1M
09-32	09-32-001-25W1M	120,772	6,136.2	3,872.2	10,008.4	110,763	0.035309969	568.9	175.6	744.5	0.045540519	0.040425244	14-03-001-24W1M
10-32	10-32-001-25W1M	123,904	6,016.1	2,324.9	8,341.0	115,563	0.036839969	558.1	6.7	564.8	0.034546406	0.035693188	15-03-001-24W1M
15-32	15-32-001-25W1M	126,703	8,248.7	6,749.8	14,998.5	111,705	0.035610196	1,187.7	29.9	1,217.6	0.074478327	0.055044261	16-03-001-24W1M
16-32	16-32-001-25W1M	118,641	8,258.7	1,296.6	9,555.3	109,086	0.034775256	1,198.5	49.1	1,247.6	0.076314481	0.055544869	01-04-001-24W1M
03-33	03-33-001-25W1M	119,271	9,252.7	0.0	9,252.7	110,018	0.035072448	427.3	0.0	427.3	0.026138131	0.030605290	02-04-001-24W1M
04-33	04-33-001-25W1M	121,207	8,967.7	0.0	8,967.7	112,239	0.035780625	342.2	0.0	342.2	0.020929773	0.028355199	03-04-001-24W1M
05-33	05-33-001-25W1M	120,430	8,967.7	5,521.6	14,489.3	105,940	0.033772563	342.2	82.7	424.9	0.025988272	0.029880418	04-04-001-24W1M
06-33	06-33-001-25W1M	118,673	9,252.7	689.4	9,942.1	108,731	0.034662106	427.3	123.1	550.4	0.033667773	0.034164940	05-04-001-24W1M
11-33	11-33-001-25W1M	126,263	5,484.0	1,899.9	7,383.9	118,879	0.037897247	504.0	37.3	541.3	0.033107882	0.035502565	06-04-001-24W1M
12-33	12-33-001-25W1M	119,460	5,582.9	37,883.2	43,466.1	75,994	0.024225926	510.3	504.8	1,015.1	0.062093500	0.043159713	07-04-001-24W1M
13-33	13-33-001-25W1M	118,093	11,726.3	11,592.1	23,318.4	94,774	0.030212903	501.4	35.0	536.4	0.032810109	0.031511506	08-04-001-24W1M
14-33	14-33-001-25W1M	126,018	11,555.9	5,699.1	17,255.0	108,763	0.034672388	494.2	12.1	506.3	0.030967312	0.032819850	09-04-001-24W1M
		3,482,066	**211,257.7**	**133,929.8**	**345,187.5**	**3,136,879**	**1.000000000**			**16,349**	**1.000000000**	**1.000000000**	

Table No. 3: Waskada Unit No. 20

Short UWI	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)	Cal Dly Gas (E3m3/d)	Monthly Gas (E3m3)	Cum Prd Gas (E3m3)	WCT (%)	Last 12 Months Oil Prod (m3)
13-21	100/13-21-001-25W1/0	003061	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	6/1/1984	Jun-1986	0.0	0.8	353.6	0.0	0.8	1595.1		0.0	0.0	50.00	123.1
102/13-21	102/13-21-001-25W1/2	007576	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	12/1/2010	Feb-2016	0.7	19.3	3,568.9	0.1	3.9	1749.9	0.0	0.9	170.9	16.81	167.3
103/13-21	103/13-21-001-25W1/0	007577	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	3/1/2011	Dec-2013	0.1	4.0	4,213.0	55.8	1728.4	45312.0		0.0	430.4	99.77	67.4
104/13-21	104/13-21-001-25W1/0	007674	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	3/1/2011	Nov-2015	0.0	0.5	2,913.8	0.3	7.7	6769.9	0.0	0.8	147.5	93.90	193.8
01-28	100/01-28-001-25W1/0	004311	Vertical	LOWER AMARANTH A	AMRNTHL	Pumping	9/1/1992	Feb-2016	0.1	2.9	10,753.3	0.8	23.6	2387.5	0.0	0.9	244.0	89.06	83.6
102/01-28	102/01-28-001-25W1/0	007041	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	11/1/2009	Feb-2016	0.0	0.9	3,731.0	1.3	37.0	12648.9	0.0	0.9	1049.6	97.63	213.6
103/01-28	103/01-28-001-25W1/0	009525	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	9/1/2013	Feb-2016	1.2	35.5	4,294.4	0.9	26.2	2541.3		0.0	0.0	42.46	553.4
02-28	100/02-28-001-25W1/0	004232	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	10/1/1990	Nov-2014	0.0	1.0	7,452.8	0.0	0.6	2150.2	0.0	0.3	8.7	37.50	2.9
102/02-28	102/02-28-001-25W1/0	007025	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	10/1/2009	Feb-2016	0.5	14.0	9,433.1	0.1	2.1	2256.8	0.0	0.9	486.0	13.04	224.6
03-28	100/03-28-001-25W1/0	004295	Vertical	LOWER AMARANTH A	AMRNTHL	Pumping	8/1/1991	Jun-2013	0.0	0.4	4,696.7		0.0	1047.1		0.0	2.3	0.00	28.9
04-28	100/04-28-001-25W1/0	002789	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	8/1/1982	Oct-1986	0.0	0.6	205.7	0.2	5.4	781.3		0.0	0.0	90.00	15.2
102/04-28	102/04-28-001-25W1/0	007675	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	3/1/2011	Feb-2016	0.3	8.2	2,095.1	0.3	10.1	4511.4	0.0	0.9	136.7	55.19	59.5
103/04-28	103/04-28-001-25W1/0	007676	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	2/1/2011	Feb-2016	0.1	3.0	2,216.7	2.9	83.5	11111.4	0.0	0.8	360.1	96.53	118.7
05-28	100/05-28-001-25W1/0	005594	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	12/1/2005	Aug-2010	0.1	2.1	298.8	0.2	7.3	1090.3		0.0	0.0	77.66	12.1
102/05-28	102/05-28-001-25W1/0	007458	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	2/1/2011	Feb-2016	0.2	4.8	2,353.9	0.4	11.6	4021.3	0.0	0.9	477.9	70.73	90.9
103/05-28	103/05-28-001-25W1/0	007459	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	2/1/2011	Feb-2016	0.2	6.8	3,332.1	0.8	22.6	4449.5	0.0	0.8	427.8	76.87	137.9
06-28	100/06-28-001-25W1/0	004312	Vertical	LOWER AMARANTH A	AMRNTHL	Pumping	9/1/1992	Feb-2016	0.2	4.6	6,831.5	1.5	43.8	19473.6	0.0	0.9	81.5	90.50	67.9
07-28	100/07-28-001-25W1/0	003650	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	9/1/1985	Oct-2013	0.2	5.6	8,697.6	0.0	0.3	1111.7		0.0	0.8	5.08	5.8
08-28	100/08-28-001-25W1/0	004326	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	12/1/1992	Feb-2016	0.1	2.7	3,596.9	1.0	29.7	4877.4	0.0	0.9	731.2	91.67	51
102/08-28	102/08-28-001-25W1/0	006406	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	12/1/2007	Feb-2016	0.2	5.1	7,166.9	1.1	31.6	7477.1	0.0	0.9	45.5	86.10	117.3
103/08-28	103/08-28-001-25W1/0	007042	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	11/1/2009	Feb-2016	0.2	4.8	6,511.8	1.3	37.9	6237.6	0.0	0.8	455.7	88.76	106.9
104/08-28	104/08-28-001-25W1/0	007043	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	11/1/2009	Feb-2016	0.0	0.9	5,400.5	0.8	22.2	5783.2	0.0	0.8	166.6	96.10	75
09-28	100/09-28-001-25W1/0	005692	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	12/1/2005	Jan-2006	0.2	7.4	9.4	12.2	377.2	586.6		0.0	0.0	98.08	9.4
102/09-28	102/09-28-001-25W1/0	008504	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	3/1/2012	Feb-2016	2.0	57.3	9,096.9	0.9	27.3	4803.5	0.0	0.9	388.1	32.27	807.1
103/09-28	103/09-28-001-25W1/0	008505	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	7/1/2013	Apr-2015	0.0	1.0	1,609.6	32.0	959.3	34107.1		0.0	158.0	99.90	383.6
104/09-28	104/09-28-001-25W1/0	008506	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	7/1/2013	Feb-2016	0.8	22.4	2,327.4	1.5	43.0	5348.3	0.0	0.8	117.6	65.75	257.9
10-28	100/10-28-001-25W1/0	002972	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	3/1/1983	Mar-1990	0.2	6.0	1,842.9	0.4	12.8	12407.2		0.0	0.0	68.09	155.3
11-28	100/11-28-001-25W1/0	004328	Vertical	LOWER AMARANTH A	AMRNTHL	Pumping	12/1/1992	Jun-2013	0.1	1.5	6,048.5	0.0	0.1	1519.0		0.0	15.0	6.25	2.5
102/12-28	102/12-28-001-25W1/0	007462	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	11/1/2010	Feb-2016	0.4	11.2	4,267.4	1.9	56.5	7547.6	0.0	0.8	305.6	83.46	151.2
100/13-28	100/13-28-001-25W1/0	007463	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	11/1/2010	Feb-2016	1.0	29.6	15,792.7	25.1	727.2	46466.7	0.0	0.9	600.0	96.09	950.1
102/13-28	102/13-28-001-25W1/0	008415	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	7/1/2013	Feb-2016	1.7	49.6	3,988.0	3.5	101.0	5420.2	0.0	0.8	127.1	67.07	740.3
103/13-28	103/13-28-001-25W1/0	008416	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	7/1/2013	Feb-2016	1.2	35.5	2,921.4	23.3	674.3	25278.7	0.0	0.8	125.6	95.00	413.5
16-28	100/16-28-001-25W1/0	003774	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	1/1/1986	Jun-2013		0.0	5,613.3	0.1	3.0	4506.0		0.0	0.0	100.00	0
102/16-28	102/16-28-001-25W1/0	008521	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	7/1/2013	Feb-2016	1.8	52.4	5,479.2	21.3	617.9	24373.5	0.0	0.9	285.6	92.18	595.5
103/16-28	103/16-28-001-25W1/0	008522	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	7/1/2013	Feb-2016	0.6	17.2	7,895.2	17.4	504.2	22524.8	0.0	0.8	450.7	96.70	491
104/16-28	104/16-28-001-25W1/0	008523	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	7/1/2013	Feb-2016	1.5	43.2	6,312.2	2.4	70.4	2965.7	0.0	0.8	348.1	61.97	678.9
105/16-28	105/16-28-001-25W1/0	009580	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	11/1/2013	Feb-2016	2.1	60.9	5,225.9	11.9	344.5	17799.9	0.0	0.8	28.2	84.98	882.3
09-32	100/09-32-001-25W1/0	003841	Vertical	LOWER AMARANTH A	AMRNTHL	Comingled	5/1/1986	Sep-2012	0.0	0.1	3,872.2		0.0	5372.6		0.0	0.0	0.00	175.6
102/09-32	102/09-32-001-25W1/0	008534	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	8/1/2012	Feb-2016	0.2	6.5	3,591.9	0.2	6.7	4530.6		0.0	16.5	50.76	228.5
103/09-32	103/09-32-001-25W1/0	008535	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	8/1/2012	Feb-2016	0.3	8.7	2,630.5	0.5	15.2	3471.9		0.0	17.6	63.60	290.2
104/09-32	104/09-32-001-25W1/0	008565	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	8/1/2012	Feb-2016	0.5	13.4	2,554.6	0.6	17.2	3706.6		0.0	23.4	56.21	324.2
105/09-32	105/09-32-001-25W1/0	008566	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	8/1/2012	Feb-2016	1.1	30.6	6,042.4	1.5	42.2	6922.9		0.0	36.4	57.97	561.4
10-32	100/10-32-001-25W1/0	004111	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	6/1/1989	Nov-2003		0.0	2,324.9	5.1	152.0	3002.0		0.0	0.0	100.00	6.7
15-32	100/15-32-001-25W1/0	004169	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	3/1/1990	Oct-2012	0.8	25.0	6,749.8	0.8	25.0	4091.8		0.0	0.0	50.00	29.9
16-32	100/16-32-001-25W1/0	004014	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	12/1/1987	Oct-1994	0.1	3.5	1,296.6	0.4	12.1	2209.9		0.0	0.0	77.56	49.1
102/16-32	102/16-32-001-25W1/0	008562	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	8/1/2012	Feb-2016	1.4	41.4	8,749.7	0.7	19.0	7851.2		0.0	28.7	31.46	620.3
103/16-32	103/16-32-001-25W1/0	008563	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	9/1/2012	Feb-2016	2.2	64.5	3,128.0	135.6	3932.1	171900.3		0.0	44.2	98.39	1251.4
104/16-32	104/16-32-001-25W1/0	008564	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	8/1/2012	Feb-2016	0.6	16.8	3,162.8	0.7	20.7	13333.7		0.0	14.3	55.20	389.6
100/03-33	100/03-33-001-25W1/0	007797	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	4/1/2011	Feb-2016	0.6	18.7	1,955.3	22.6	654.3	54670.6		0.0	14.9	97.22	279.7
102/03-33	102/03-33-001-25W1/2	007798	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	4/1/2011	May-2015	0.2	5.5	3,173.2	5.7	176.0	74618.8		0.0	0.0	96.97	334.5
103/03-33	103/03-33-001-25W1/0	007799	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	4/1/2011	Feb-2016	0.4	11.0	10,308.3	4.2	122.4	13584.9		0.0	23.4	91.75	179.3
100/04-33	100/04-33-001-25W1/0	007101	Horizontal	LOWER AMARANTH A	AMRNTH	Producing	2/1/2010	Feb-2016	0.2	4.7	9,599.2	1.7	48.0	18643.8		0.0	22.9	91.08	107.9
102/04-33	102/04-33-001-25W1/0	007800	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	4/1/2011	Mar-2015	0.2	5.9	3,312.3	1.0	31.2	10503.6		0.0	0.0	84.10	235.6
103/04-33	103/04-33-001-25W1/0	007801	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	4/1/2011	Apr-2014	0.0	1.0	8,092.3	0.0	1.3	9394.9		0.0	0.0	56.52	402
05-33	100/05-33-001-25W1/0	003245	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	3/1/1984	Jul-1996	0.3	8.4	5,521.6	1.2	37.9	23687.1		0.0	0.0	81.86	82.7
06-33	100/06-33-001-25W1/2	002892	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	3/1/1984	Sep-1989	0.4	12.9	689.4	0.1	3.8	3308.7		0.0	0.0	22.75	123.1

Short UWI	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)	Cal Dly Gas (E3m3/d)	Monthly Gas (E3m3)	Cum Prd Gas (E3m3)	WCT (%)	Last 12 Months Oil Prod (m3)
11-33	100/11-33-001-25W1/0	003260	Vertical	LOWER AMARANTH A	AMRNTHL	Abandoned	3/1/1984	Aug-1995	0.1	3.5	1,899.9	0.1	2.1	1670.9		0.0	0.0	37.50	37.3
12-33	100/12-33-001-25W1/0	002894	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	11/1/1982	Feb-2016	1.3	38.9	37,883.2	2.1	61.1	27804.5		0.0	0.0	61.10	504.8
102/12-33	102/12-33-001-25W1/2	007654	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	3/1/2011	Feb-2016	1.0	27.8	6,114.6	1.5	43.2	4143.5		0.0	8.2	60.85	484.2
103/12-33	103/12-33-001-25W1/0	007989	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	2/1/2012	Feb-2016	0.7	21.2	5,051.3	9.3	271.0	15806.2		0.0	26.5	92.74	329.5
104/12-33	104/12-33-001-25W1/0	007990	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	12/1/2011	Feb-2016	1.1	32.8	4,800.6	34.6	1003.7	59989.9		0.0	24.2	96.84	564.8
13-33	100/13-33-001-25W1/0	003612	Vertical	LOWER AMARANTH A	AMRNTH	Producing	8/1/1985	May-2014	0.0	0.6	11,592.1	0.0	1.0	2466.5		0.0	0.0	62.50	35
102/13-33	102/13-33-001-25W1/0	007655	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	3/1/2011	Feb-2016	1.6	47.8	7,410.4	1.5	44.1	2399.5		0.0	25.6	47.99	68
103/13-33	103/13-33-001-25W1/0	007991	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	2/1/2012	Feb-2016	0.4	12.6	5,519.2	0.8	21.8	2974.2		0.0	3.9	63.37	230.8
104/13-33	104/13-33-001-25W1/0	008410	Horizontal	LOWER AMARANTH A	AMRNTHL	Producing	2/1/2012	Feb-2016	0.5	15.6	5,452.9	4.9	142.6	9745.5		0.0	8.4	90.14	332.6
14-33	102/14-33-001-25W1/0	003613	Vertical	LOWER AMARANTH A	AMRNTHL	Producing	8/1/1985	Oct-2011		0.0	5,699.1	0.0	0.1	1794.4		0.0	0.0	100.00	12.1
											356,726.4			**928,640.3**					

Table No. 4: OOIP Calculation

Polygon Name	Total Area (MTR x MTR)	Data Area (MTR x MTR)	ROIP (MBO)	ROIP (BBL)	ROIP (m^3)	Phih
13-21-1-25W1	161,763.13	161,763.13	759.67	759,670	120,778	1.4559
1-28-1-25W1	161,560.80	161,560.80	777.58	777,580	123,625	1.4921
2-28-1-25W1	161,590.63	161,590.63	758.51	758,510	120,593	1.4553
3-28-1-25W1	161,619.51	161,619.51	759.10	759,100	120,687	1.4561
4-28-1-25W1	161,648.85	161,648.85	759.77	759,770	120,794	1.4572
5-28-1-25W1	161,723.66	161,723.66	732.41	732,410	116,444	1.4040
6-28-1-25W1	161,694.10	161,694.10	696.53	696,530	110,739	1.3355
7-28-1-25W1	161,664.70	161,664.70	751.83	751,830	119,531	1.4418
8-28-1-25W1	161,635.25	161,635.25	759.97	759,970	120,826	1.4577
9-28-1-25W1	161,711.39	161,711.39	757.70	757,700	120,465	1.4526
10-28-1-25W1	161,740.70	161,740.70	734.09	734,090	116,711	1.4071
11-28-1-25W1	161,770.09	161,770.09	713.77	713,770	113,480	1.3679
12-28-1-25W1	161,799.79	161,799.79	729.96	729,960	116,054	1.3987
13-28-1-25W1	161,873.98	161,873.98	742.68	742680	118,077	1.4224
14-28-1-25W1	161,844.36	161,844.36	740.31	740310	117,700	1.4181
15-28-1-25W1	161,815.41	161,815.41	757.58	757,580	120,446	1.4515
16-28-1-25W1	161,785.74	161,785.74	790.52	790,520	125,683	1.5148
9-32-1-25W1	161,909.95	161,909.95	759.63	759,630	120,772	1.4545
10-32-1-25W1	162,085.40	162,085.40	779.33	779,330	123,904	1.4906
15-32-1-25W1	162,083.82	162,083.82	796.94	796940	126,703	1.5243
16-32-1-25W1	161,908.40	161,908.40	746.23	746230	118,641	1.4289
3-33-1-25W1	161,938.56	161,938.56	750.19	750,190	119,271	1.4362
4-33-1-25W1	161,882.68	161,882.68	762.37	762,370	121,207	1.46
5-33-1-25W1	161,987.37	161,987.37	757.48	757480	120,430	1.4497
6-33-1-25W1	162,043.47	162,043.47	746.43	746430	118,673	1.4281
11-33-1-25W1	162,149.70	162,149.70	794.17	794170	126,263	1.5184
12-33-1-25W1	162,093.70	162,093.70	751.38	751380	119,460	1.4371
13-33-1-25W1	162,198.66	162,198.66	742.78	742780	118,093	1.4197
14-33-1-25W1	162,254.66	162,254.66	792.63	792630	126,018	1.5145
				21,901,540	**3,482,066**	

SW = 40%
Porosity Cut off = 10%
BO = 1.17

Table No. 5

Proposed Waskada Unit 20

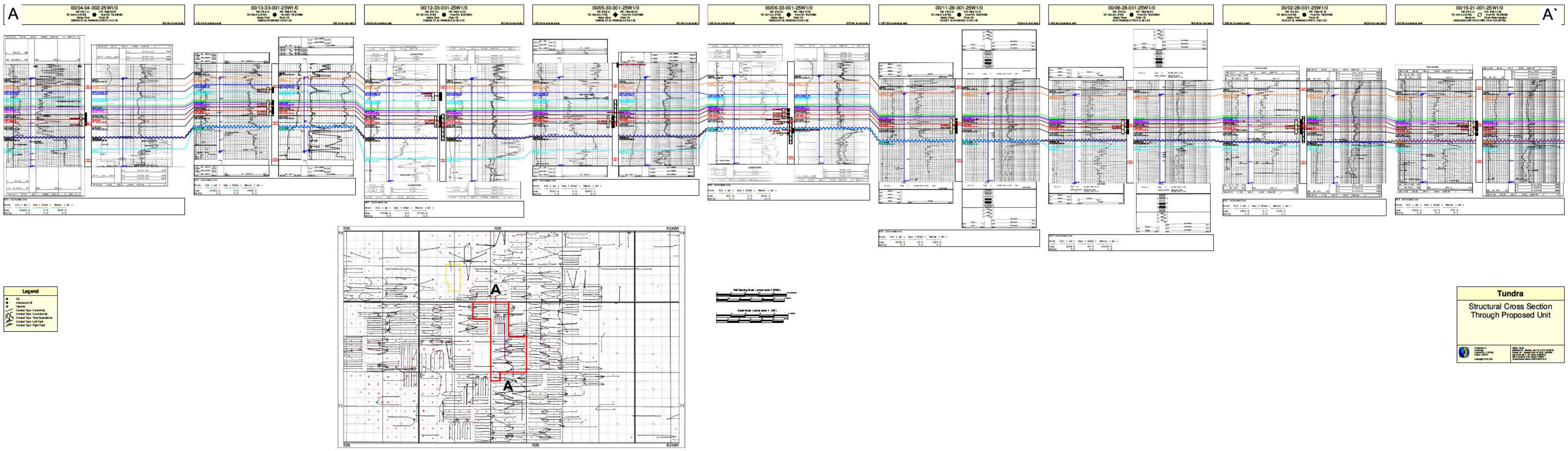
LOWER AMARANTH FORMATION ROCK & FLUID PARAMETERS

Formation Pressure	8500 kPa	Initial Average Reservoir Pressure
Formation Temperature	45 C	
Saturation Pressure	4220 kPa	Bubble Point
GOR	20 - 50 m3/m3	Gas Oil Ratio
API Oil Gravity	37.2	
Swi (fraction)	0.40	Initial Water Saturation
Produced Water Specific Gravity	1.08	
Produced Water pH	7.1 - 7.3	
Produced Water TDS	180,000	
Wettability	Moderately oil-wet	

Proposed Waskada Unit No. 20

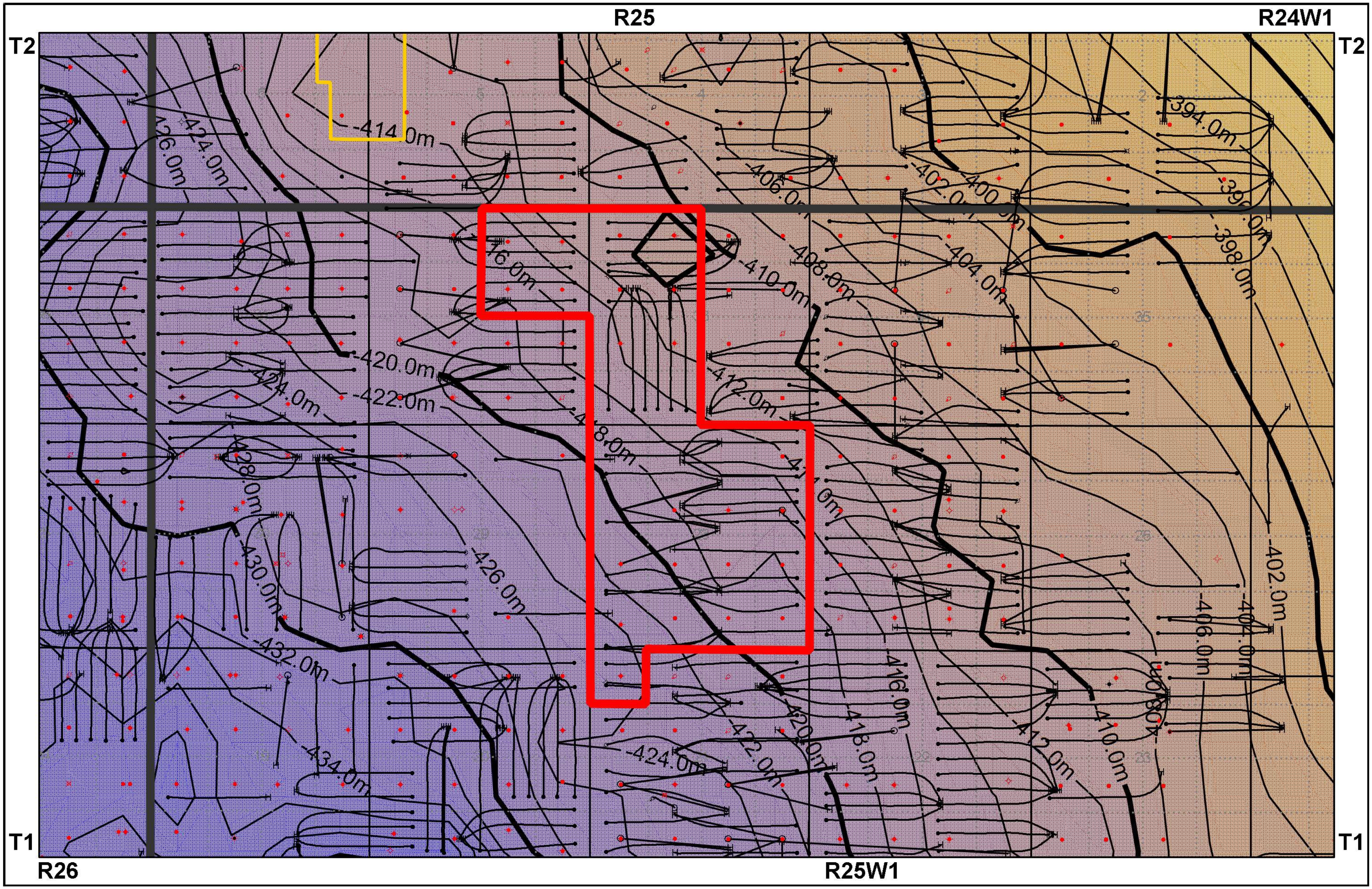
Application for Enhanced Oil Recovery Waterflood Project

List of Appendices

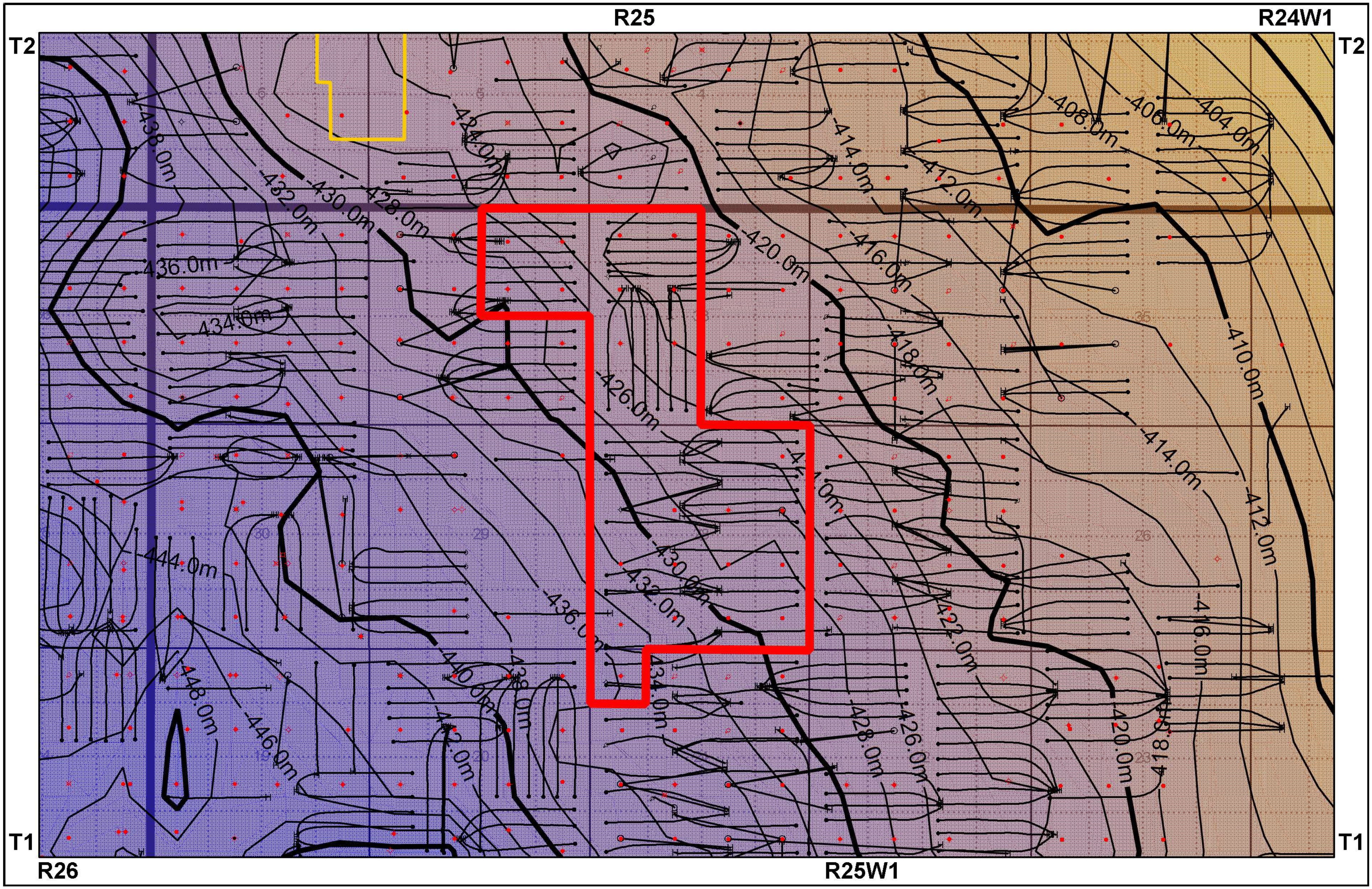


Tundra

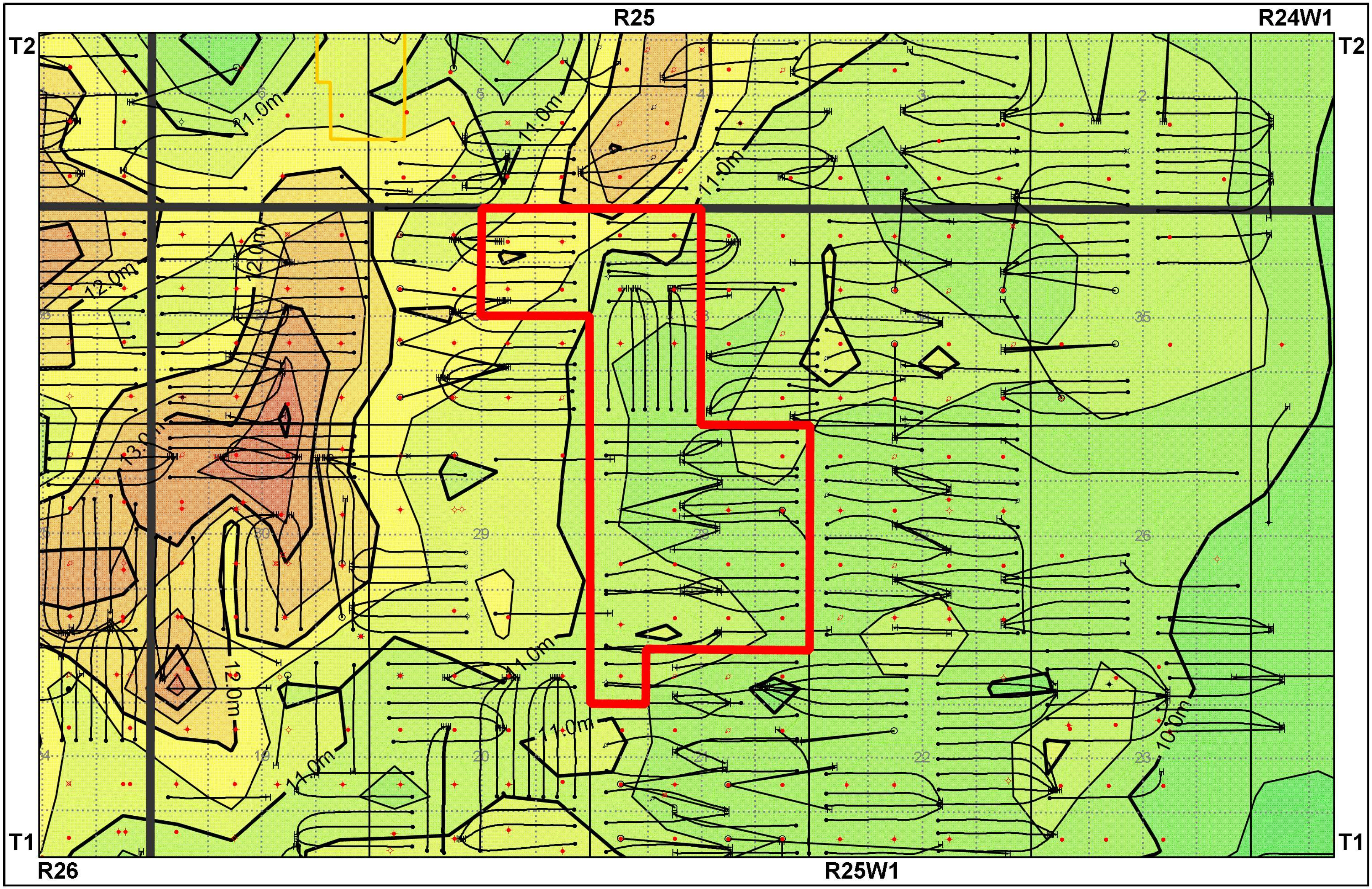
Structural Cross Section
Through Proposed Unit



Waskada Unit 20 Application
Green Sand Structure (Top of Reservoir)
June 07, 2016



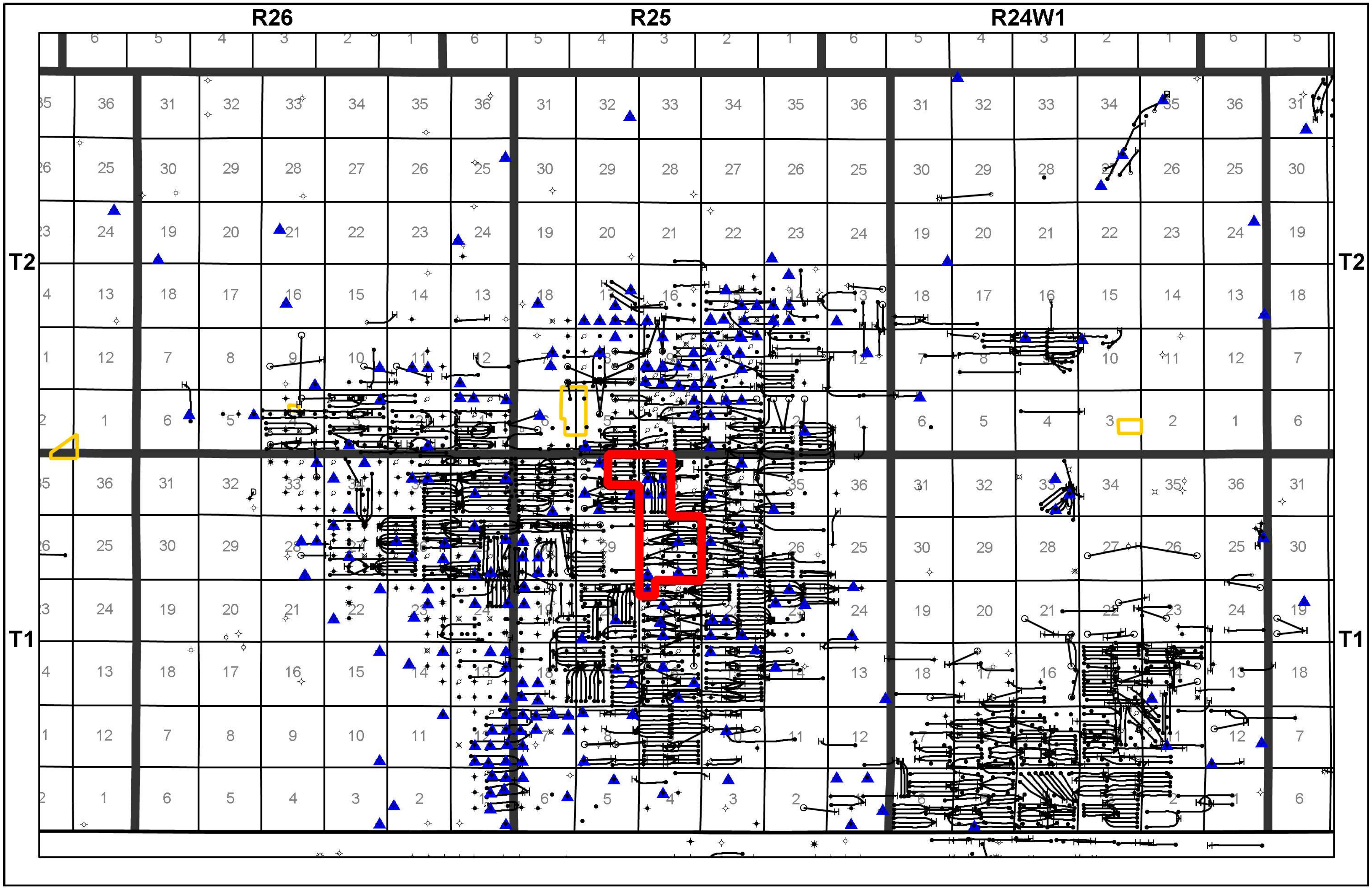
Waskada Unit 20 Application
Lower Sand Structure (Base of Reservoir)
June 07, 2016



Waskada Unit 20 Application

Reservoir Isopach
(Green to Lower Sand Isopach)

June 07, 2016

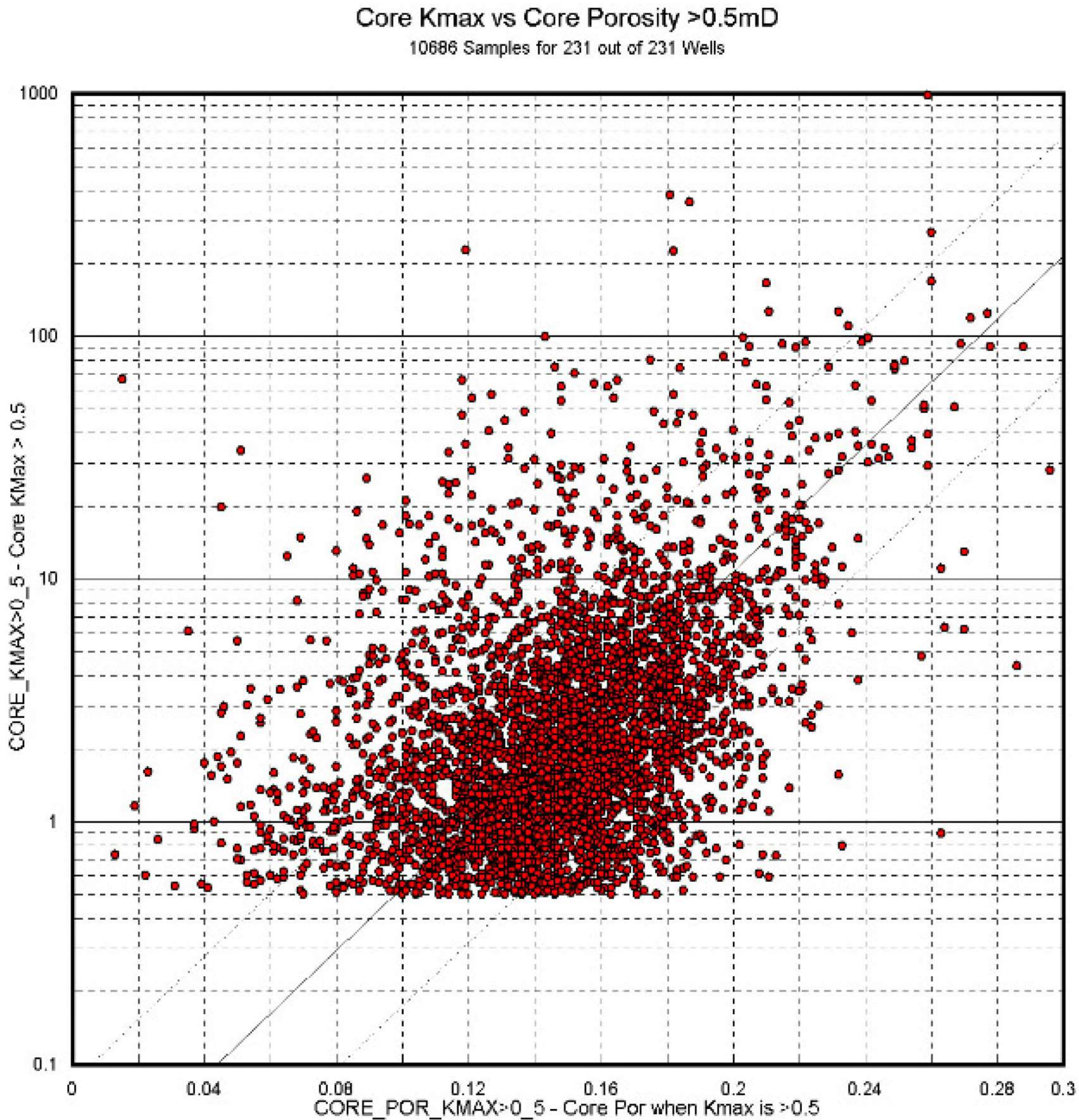


Waskada Unit 20 Application

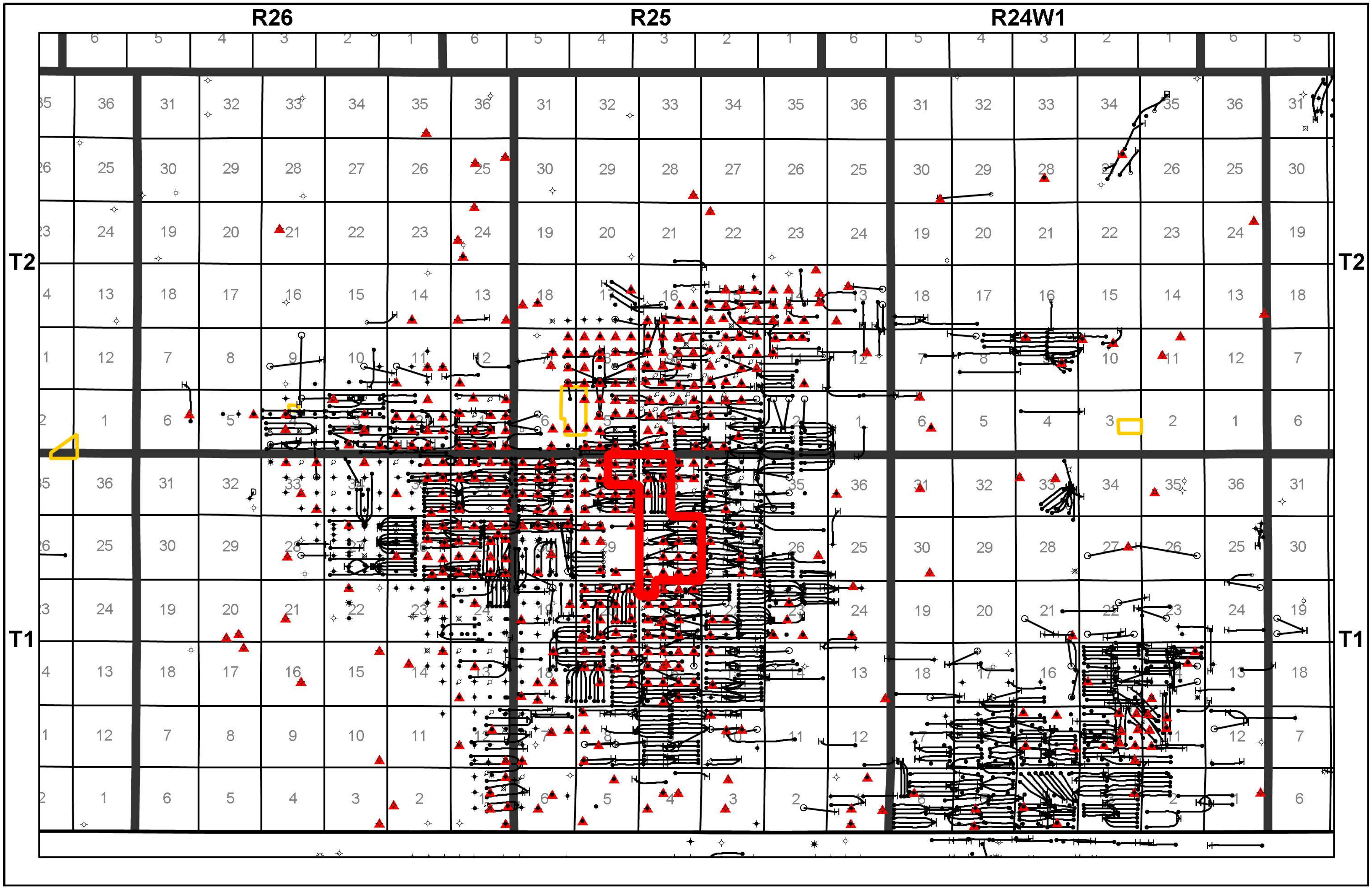
Wells with Core Analysis Used to Create Core Perm vs Core Porosity Cross Plot

June 07, 2016

Tundra Pierson Waskada Project



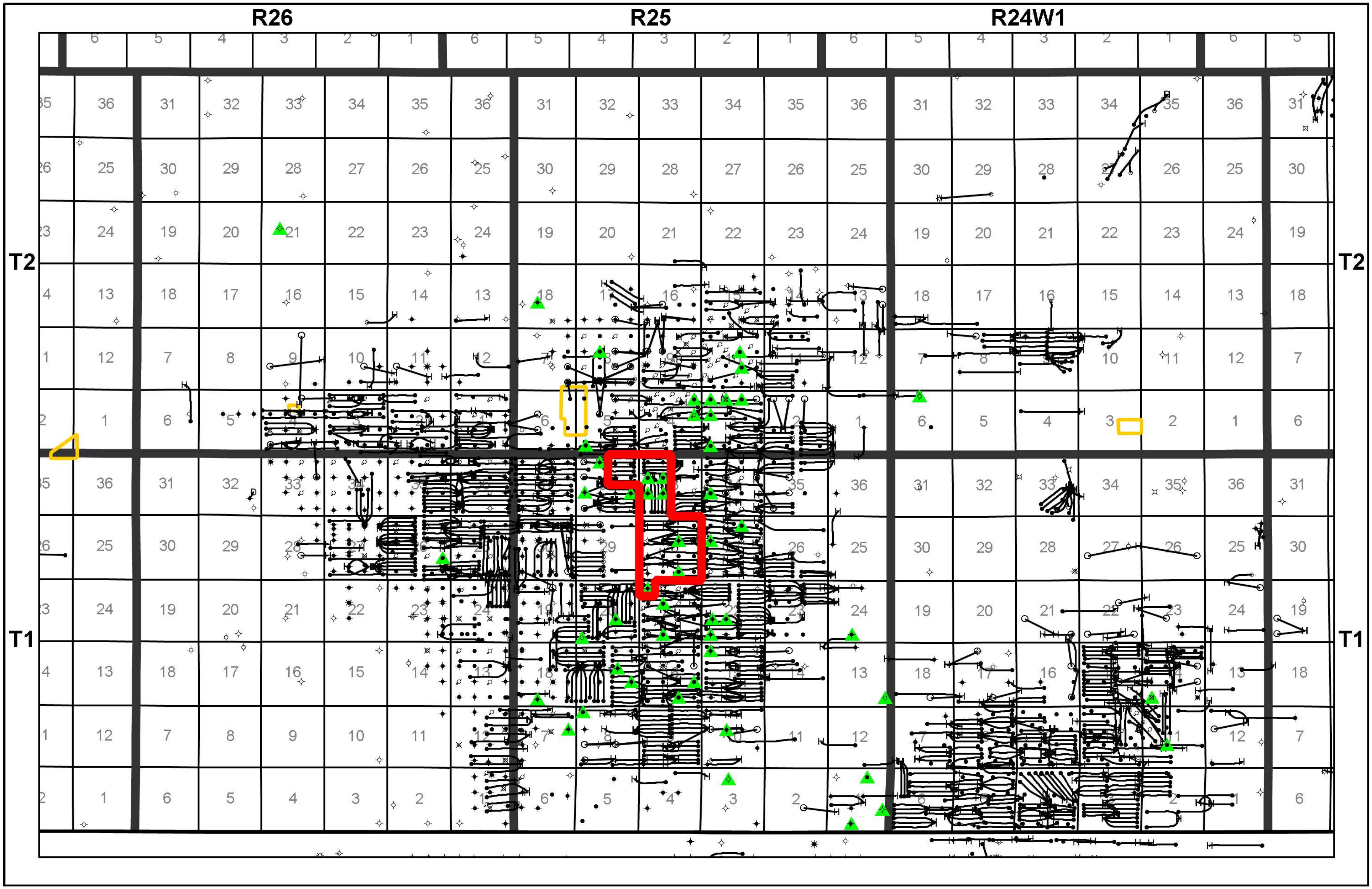
LOG(CORE_KMAX>0_5) = 12.99873743*CORE_POR_KMAX>0_5 - 1.5681 Corr=0.422 StdErr=0.4908



Waskada Unit 20 Application

Wells with Digital Sonic Logs

June 07, 2016



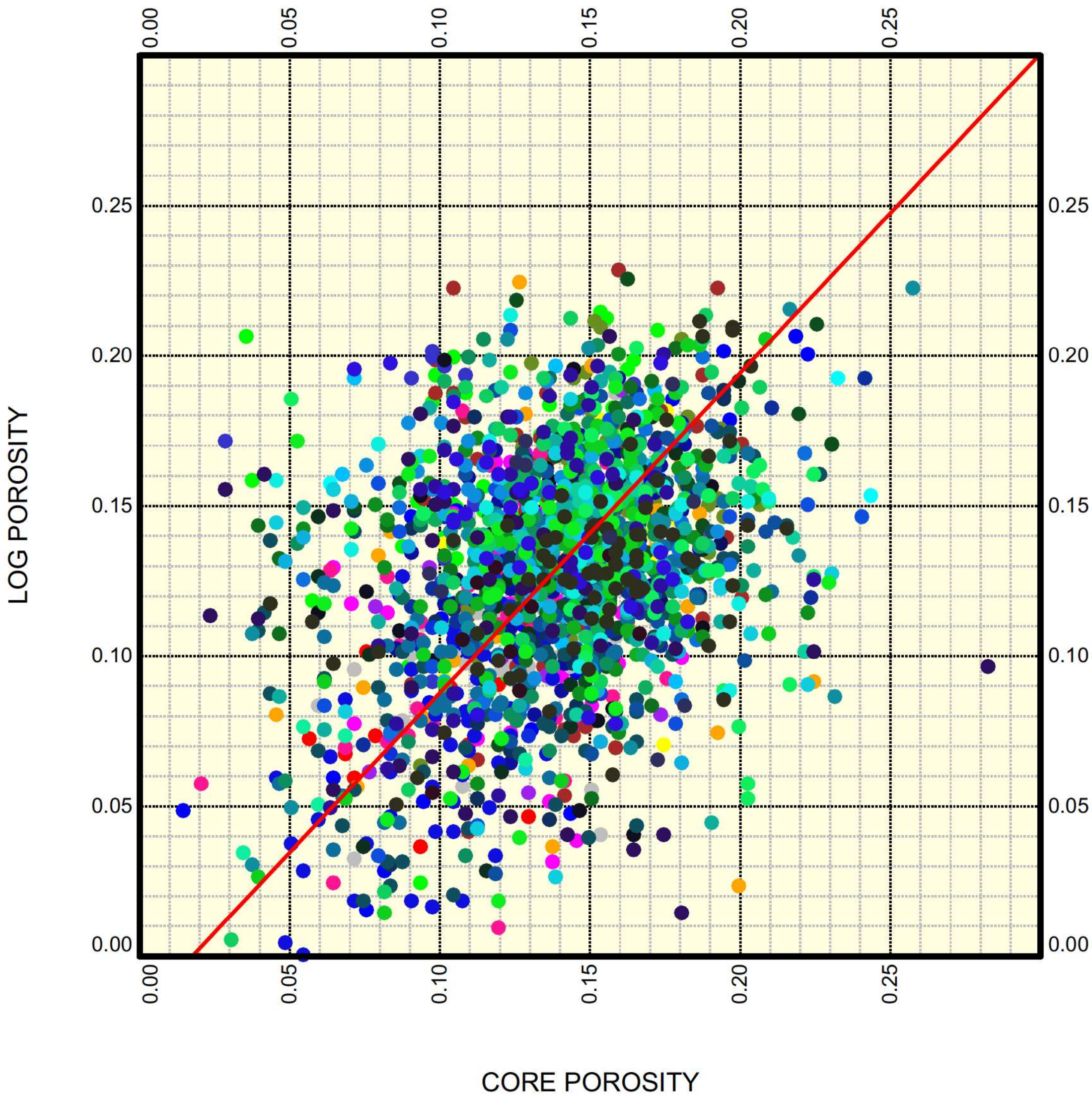
Waskada Unit 20 Application

Wells with Digital Sonic Logs and Core Analysis over the Lower Amaranth Reservoir Interval

June 07, 2016

Log Porosity vs Core Porosity Crossplot

Well: 52 Wells



Wells:

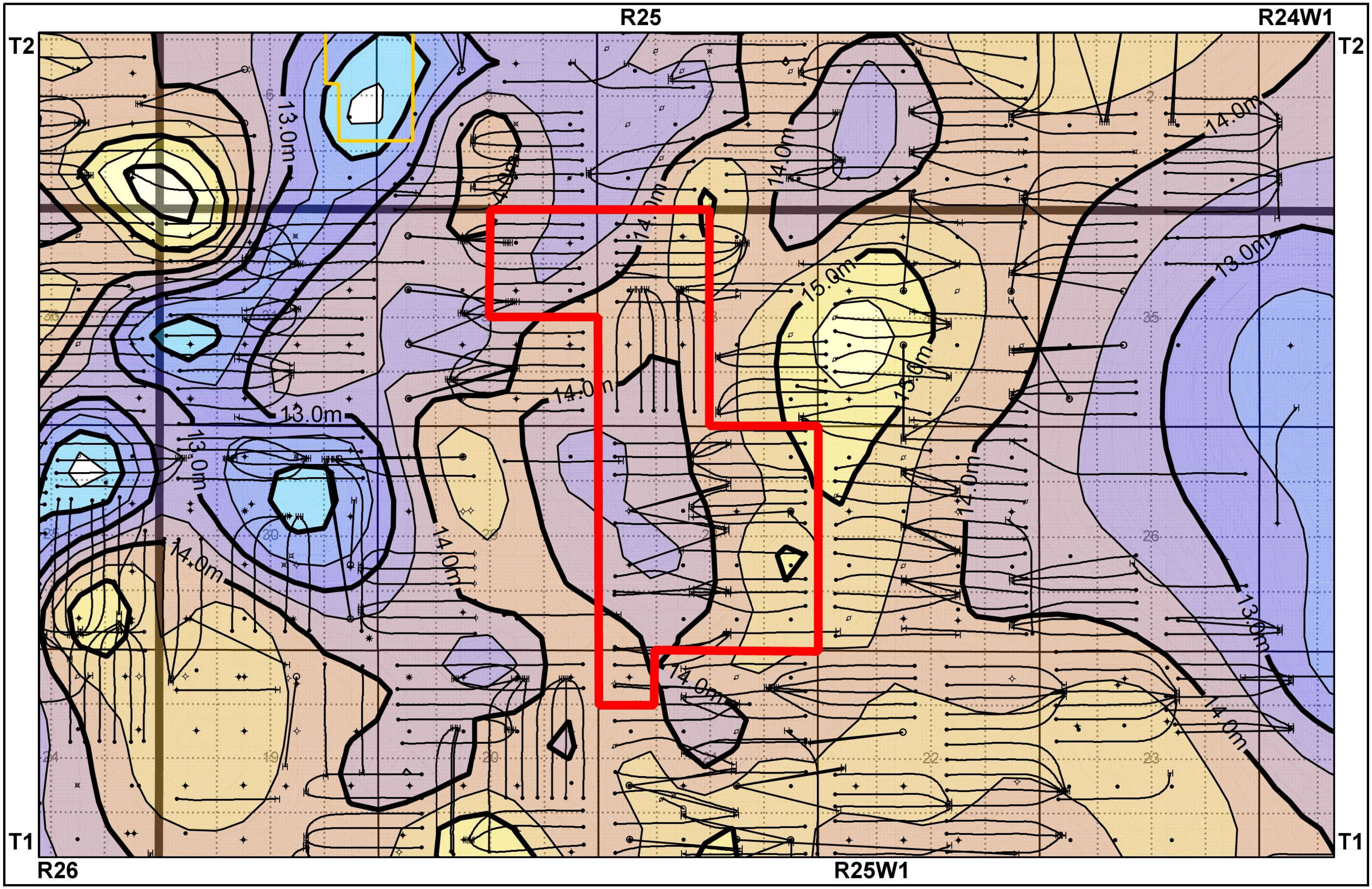
100011300125W100	100021600125W100	100022800125W100	100030100125W100	100031800125W100
100032100125W100	100032400125W100	100040300225W100	100040500225W100	100041400124W100
100042000125W100	100042200125W100	100052200125W100	100053200125W100	100053300125W100
100053400125W100	100061100124W100	100061800225W100	100062200125W100	100063300125W100
100071000225W100	100072000125W100	100080100125W100	100081600125W100	100081700125W100
100082600126W100	100083200125W100	100090400225W100	100090700125W100	100101000225W100
100101700125W100	100102800125W100	100110800225W100	100111000125W100	100112100125W100
100112100226W100	100113300125W100	100120300225W100	100122700125W100	100123300125W100
100130300225W100	100130800125W100	100131500125W100	100132100125W100	100140300125W100
100140300225W100	100140600224W100	100143200125W100	100150100125W100	100150300225W100
100152700125W100	100160400225W100			

Intervals: U-GREEN_SAND U-BLUE_SAND U-PURPLE_SAND U-BROWN_SAND U-RED_SAND U-LWR_SAND

Functions:

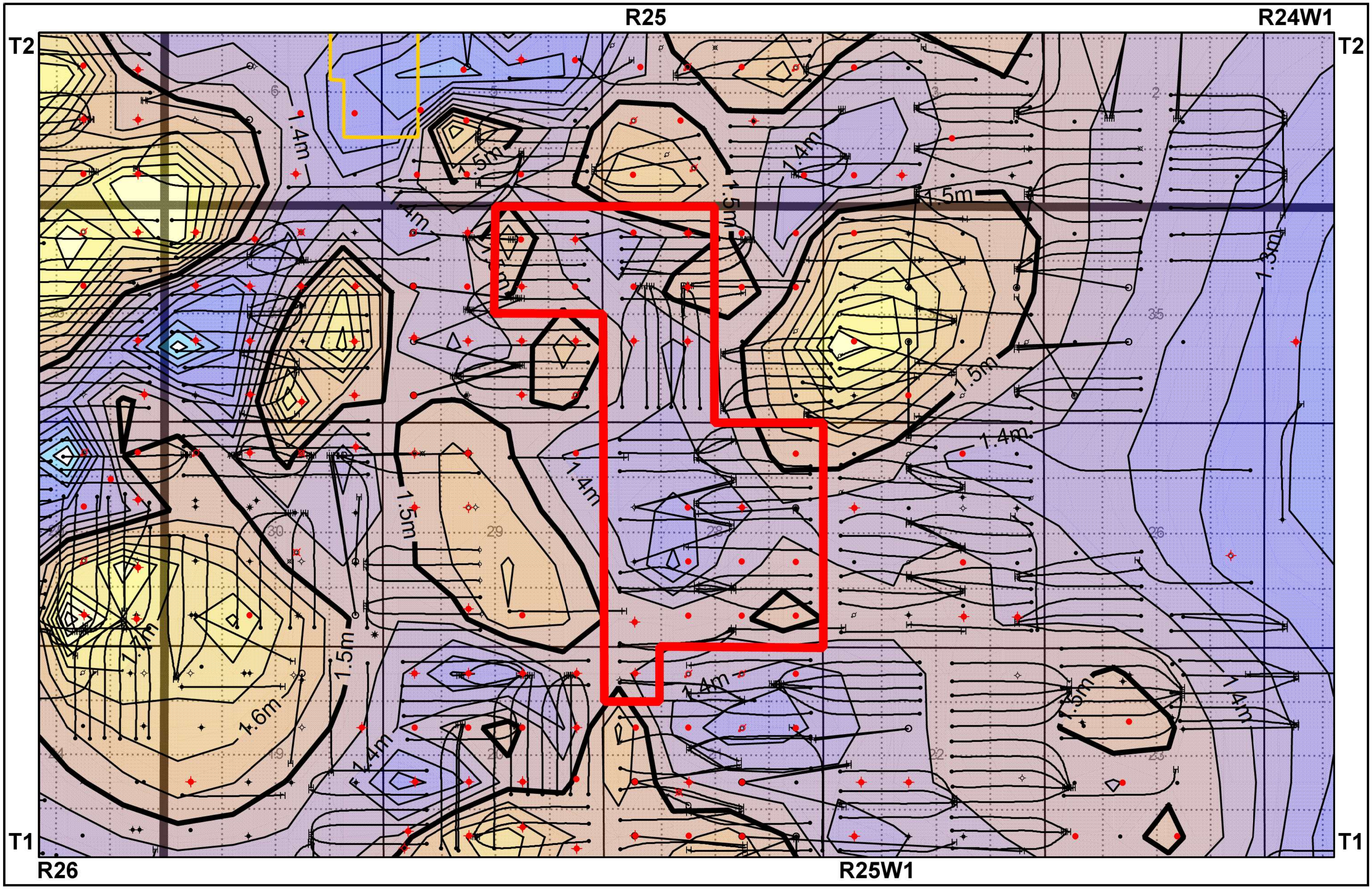
test: Regression Logs: CORE.POROSITY, PHIE, CC: 0.329356

PHIE = (-0.0186548 + 1.06436*(POROSITY))



Waskada Unit 20 Application

Mean Porosity from Sonic logs
Control points in Red
Values in Percentages
July 12, 2016



Waskada Unit 20 Application

Phi*h at 10% cut off
Top Green to Base Red Sand (Total Reservoir)

July 12, 2016