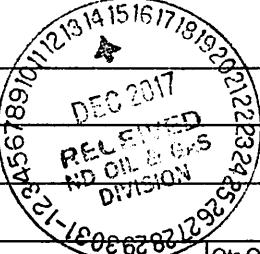
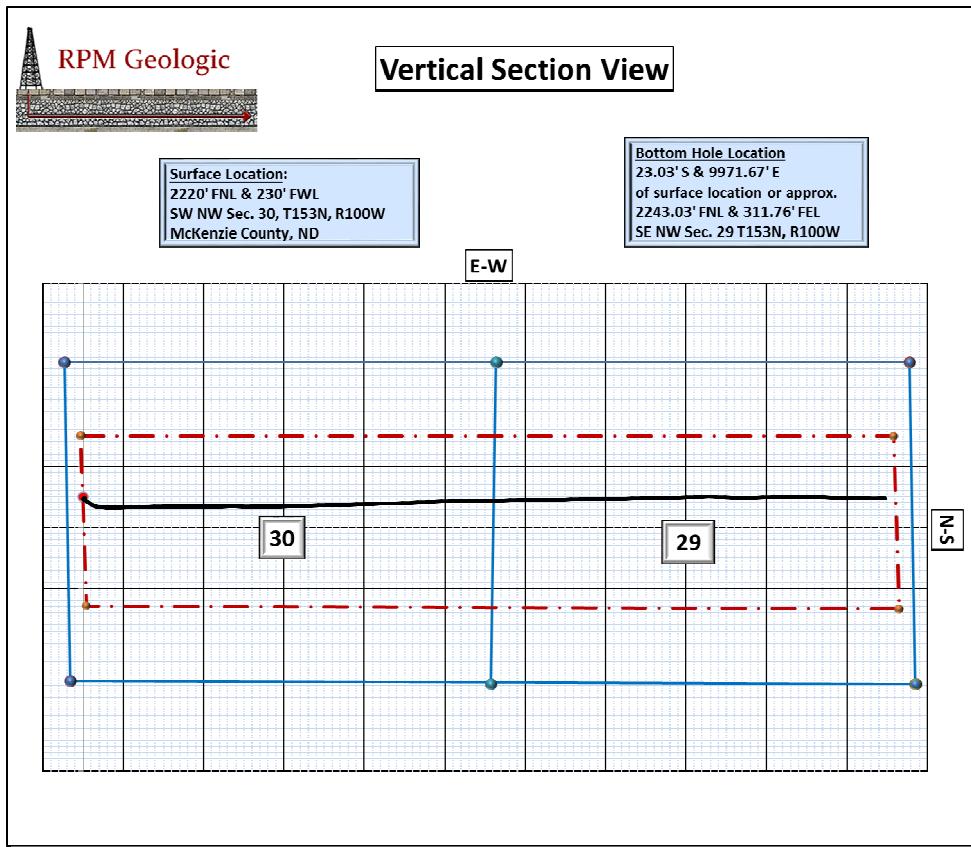


# North Dakota Industrial Commission Follow-up Spill Report

API Number 33 - 053 - 03413								Well File or Facility No. 20197
<p>Operator <b>Oasis Petroleum North America, LLC</b></p> <p>Address <b>6205 16th Avenue West</b></p> <p>Well Name and Number or Facility Name <b>Wade Federal 5300 21-30H</b></p>								Telephone Number <b>(701)557-17-37</b>
		City <b>Williston</b> State <b>ND</b> Zip Code <b>58801</b>						
		Field <b>Baker</b>						
Location of Well or Facility	Footages	F	L	Qtr-Qtr	Section	Township	Range	County
				<b>NW SW</b>	<b>30</b>	<b>153 N</b>	<b>100 W</b>	<b>McKenzie</b>
Description of Spill Location if not on Well or Facility Site and/or Distance and Direction from Well or Facility								
Directions to Site <b>South on HWY85 to CR29, east 2 miles, north 2 3/4 miles, Drive through location at the bottom of hill. Then 1/4</b>								
Release Discovered By <b>Oasis Employee</b>		Date Release Discovered <b>August 31, 2017</b>	Time Release Discovered <b>10 : 45 AM</b>		Date Release Controlled <b>August 31, 2017</b>		Time Release Controlled <b>10 : 45 AM</b>	
Company Personnel Notified <b>Dustin Anderson</b>		How Notified <b>Verbally</b>			Date Notified <b>September 1, 2017</b>		Time Notified <b>11 : 08 AM</b>	
Type of Incident <b>Stuffing Box Leak</b>		Root Cause of Release <b>Equipment Failure/Malfunction</b>				Date Clean up Activities Concluded <b>September 1, 2017</b>		
Distance to Nearest Residence or Occupied Building <b>2 Miles</b>			Distance to Nearest Fresh Water Well <b>2 Miles</b>					
Piping Specifics (If Applicable)	Size (Decimal Format) "	Type					Location of Piping	
Volume of Release	Oil <b>0.50 Barrels</b>	Saltwater <b>0.50 Barrels</b>					Other	
Volume of Release Recovered	Oil	Saltwater <b>Barrels</b>					Other	
Was Release Contained Within Dike <b>No</b>	If No, Was Release Contained on Well Site			If No, Was Release Contained on Facility Site or Pipeline ROW				
Areal Extent of Release if not Within Dike <b>100' by 150'</b>			Affected Medium <b>Well/Facility Soil</b>			General Land Use <b>Well/Facility Site</b>		
Describe Cause of Release or Fire and Other Type of Incidents, Root Causes of Release, Land Uses, and Released Substances <b>Polish rod parted below the safety clamp leaving an open wellhead causing mist of oil to hit the ground.</b>								
Action Taken to Control Release and Clean Up Action Undertaken <b>Removed stuffing box and plugged the open wellhead.</b>								
Potential Environmental Impacts <b>Slight impact to vegetation near well pad.</b>								
Planned Future Action and/or Action Taken to Prevent Reoccurrence <b>More frequent polish rod inspections.</b>								
Where Were Recovered Liquids Disposed					Where Were Recovered Solids Disposed			
Weather Conditions	Wind Speed MPH	Wind Direction	Temperature ° F	Skies	Estimated Cleanup Cost \$		Damage Value \$	
Regulatory Agencies/Others Notified <b>NDIC/NDDH</b>		Person Notified		Date Notified		Time Notified	Notified By	
<b>Fee Surface Owner</b>						:		
Federal Agency Lease Number <b>BLM</b>						:		
<b>USFS</b>						:		
Report Originator <b>DAVID AREND</b>			Title <b>EHS Representative</b>			Date		<b>11-10-17</b>
Signature 						Date <b>11-10-17</b>		

# Oasis Petroleum North America LLC

## Wade Federal 5300 21-30H



### Services Performed For:

Mike Box, Bob Candito  
Oasis Petroleum North America LLC  
1001 Fannin Suite 202  
Houston Texas 77002

### Onsite Geology Performed by:

Joseph Large, Mike Grams  
RPM Consulting  
[geology@rpmconsultinginc.com](mailto:geology@rpmconsultinginc.com)  
(303) 595-7625

# Well Evaluation



*Oasis Petroleum Corp. USA  
Wade Federal 5300 21-30H*

*SW NW Sec. 30, T153N - R100WWade  
McKenzie County, North Dakota*

## Synopsis

*Wade Federal 5300 21-30H [SW NW Section 21, T153N, R100W]* is a lateral well drilled into the middle member of the **Bakken Formation**. It is a wildcat well positioned east of the Indian Hill Field of Williston Basin. *Wade Federal 5300 21-30H* is located approximately 7 miles south of the town of Williston, North Dakota in McKenzie County.

The prognosis proposed a single lateral leg trending 90° to be drilled from the SE NW corner of Section 30 to the SE NE of Section 29. The lateral portion of *Wade Federal 5300 21-30H* targeted the porous silty sandstone of the middle member of the **Bakken Formation**, approximately 12' below the top of the Upper Bakken Shale.

## Control Wells

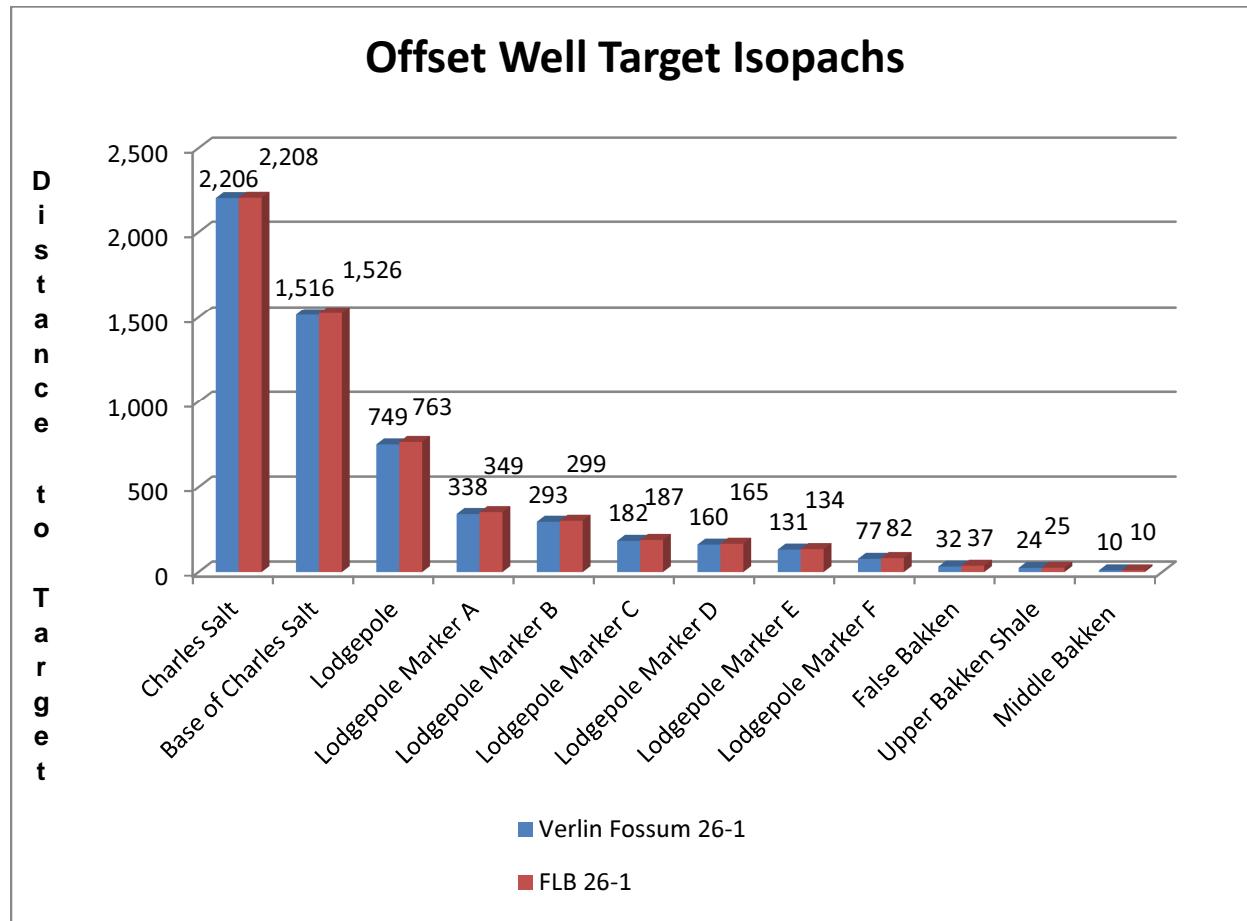
Two completed wells were used as control offsets for the *Wade Federal 5300 21-30H*.

The *Verlin Fossum Et Al 26-1* [NW SE Sec. 26 T153N R101W] is a vertical well owned by Harper Oil Company. The *Verlin Fossum Et Al 26-1* is located approximately 1.4 miles west of *Wade Federal 21-30H*. The initial pilot well for the *Verlin Fossum Et Al 26-1* was spud on 31 December 1979. The *Verlin Fossum Et Al 26-1* was drilled to the **Red River Formation**.

The *Federal Land Bank 1-26* [NE NW Sec. 26 T153N R101W] is a dry vertical well drilled to the **Red River Formation** by Mosbacher-Pruet Oil CO. The *Federal Land Bank 1-26* is located approximately 1.4 miles northwest of the *Wade Federal 5300 21-30H*. *Federal Land Bank 1-26* was spud 16 July 1978.

During the curve, the gamma-ray data and e-log data from *Verlin Fossum Et Al 26-1* were utilized to help determine proper landing depth for *Wade Federal 5300 21-30H*.

A graph was constructed to determine which markers and formation tops could be accurately used in landing the curve. Markers with more than 5 feet difference between the offsets were watched but not utilized in decision for moving the TVD target of the curve.



*Graph 1. Distance from formation tops in control wells were utilized to determine the initial drilling target.*

# Geologic Assessment

## Methods

Geologic supervision of *Wade Federal 5300 21-30H* was provided by two experienced RPM well site geologists. Gas and chromatograph levels were measured using iBall Instruments Bloodhound (Bloodhound) real time gas detector and chromatograph system. The Bloodhound gas detection system uses non-dispersive infrared and chemical sensor gas detection to evaluate gases liberated from the formation by the drill bit and carried to the surface by the drilling fluid.

The Bloodhound was interfaced with a Canrig electronic data recorder system. Canrig provided rate of penetration, on-off bottom and pump strokes to the Bloodhound and received total gas information from the Bloodhound for viewing on location and remotely.

Under the direction of RPM well site geologist, rig crews were instructed to catch lagged drill cutting samples at 30' intervals from 8,250 to the kick off point (KOP) at 10,172'. Samples were continuously logged at 30' intervals during the curve and throughout the lateral section.

Sampled drill cuttings were examined wet and dry under a binocular microscope using plain (broad spectrum) and transmitted light. Cuttings were evaluated for hydrocarbon "cut" by immersion in carbo-sol (trichloroethylene) and inspection under a UV fluoroscope. 10% hydrochloric acid and alizarin red were used to determine the calcareous and dolomitic content of rocks and cementing.

# Vertical Operations

## Overview

The *Wade Federal 5300 21-30H* was spud on 5 April 2011 using Nabors 149 drilling rig. Prior to Rig up of RPM mud logging services, a 9 5/8" hole was drilled with fresh water to depth of 2,018' and isolated with 9 5/8" 36# J-55 casing cemented to surface. The vertical borehole was drilled with bit #1 in 9 hours with an average ROP equal to 213.3 ft/hr. Bit #2 (8 3/4" Smith PDC) was used to drill from 2,018' to KOP at 10,172' yielding an average ROP of 95.8 ft/hr.

RPM well site geologists arrived at site on 10 April 2011 and began logging the vertical section at 8,250'.

Diesel invert drilling fluid with a mud weight of ranging from 9.7-10.0 ppg was used during remainder of the vertical hole and in the curve builds sections.

Schlumberger performed openhole electronic logging operations on 13 April 2011.

## Lithology

The top of the **Kibbey Lime** [Mississippian Madison Group] was logged at 8,320' (-6,008'), 83' low to the *Verlin Fossum 26-1*. Samples from this interval (Figure 1) were described as:

LIMESTONE: wackestone, off white, cream, light brown, firm to hard, microcrystalline, crystalline texture, common fossils fragment, good visible porosity

The top of the **Charles Salt** [Mississippian Madison Group] was logged at 8,486' (-6,448'), 93' low to the *Verlin Fossum 26-1*. The **Base Last Salt** was drilled at 9,655' (-6,264'), 66' low to the *Verlin Fossum 26-1*. Samples from this interval (Figure 1) were described as:

ANHYDRITE: white, dark gray, soft, cryptocrystalline, amorphous texture

LIMESTONE: mudstone, light to medium gray, soft, microcrystalline texture, trace fossils fragment, very lite disseminated pyrite, no visible porosity; interbedded white anhydrite in part

Salt: clear, milky, translucent, crystalline, hard, euhedral to subhedral, crystalline texture



Figure 1: Photograph of limestone, salt and anhydrite seen in sample from the **Charles Formation**.

The top of the **Mission Canyon Formation** of the Madison Group [Mississippian] was penetrated at 9,356' (-7,318), 70' low to the *Verlin Fossum 26-1* (Figure 2). Samples from this interval were described as:

LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace sparry calcite, trace fossils fragment, no visible porosity, no visible oil stain; Trace ANHYDRITE



Figure 2: Photograph of limestone and anhydrite from the **Mission Canyon Formation**.

The top of the **Lodgepole Formation** of the Madison Group (Mississippian) was logged at 9,934' (-7,896'), 79' low to *Verlin Fossum 26-1* (Figure 3). Samples collected from the **Lodgepole Formation** were described as:

**LIMESTONE:** mudstone, medium to light brown, cryptocrystalline to microcrystalline, firm to friable, crystalline to earthy texture, trace sparry calcite, argillaceous in part, no visible oil stain, no visible porosity



Figure 3: Photograph of limestone from **Lodgepole Formation**

## **Directional Operations**

RPM provided equipment and personnel for directional services. Ryan Energy Technologies (Ryan) provided equipment and personnel for MWD services. RPM geologists worked closely with RPM directional and Ryan MWD teams to formulate steering decisions to maximize exposure of borehole in the pay zone. RPM well site geologists closely observed MWD gamma-ray information and penetration rates to aid in steering decisions and dip degree estimations.

## **Curve Build**

### **Overview**

Bit #3 and was used in front of a 2.3° fixed mud motor to drill the curve from measured depth 10,172' to 11,023'. Bit #3, an 8 ¾" Security PDC was used to drill from 11,172' to 11,023' in 31.5 hours generating an average ROP of 27 ft/hr.

During the curve progression, isopach data of gamma-ray signatures from *Verlin Fossum 26-1* was compared to gamma-ray readings from the MWD tool from the **Base Charles Salt** (Table 1). Prospective markers were entered into Table 2 to determine the target landing point. Based on the marker pick for the **Base Charles Salt**, the target TVD for the curve was raised 10 feet to 11,655' but was lowered back down to 10,670' as the curve progressed. The curve was completed at a measured depth of 11,020' and TVD of ~ 11,669'.

Formation point	Verlin Fossum et al. 26-1	Dist. To Target	Marker Pick	Target
Base of Charles Salt	8,422'	1,516	9138	10,654'
Lodgepole	9112	749	9934	10,683'
Lodgepole Marker A	9,879'	338	10315	10,653'
Lodgepole Marker B	10,290'	293	10365	10,658'
Lodgepole Marker C	10,335'	182	10478	10,660'
Lodgepole Marker D	10,446'	160	10501	10,661'
Lodgepole Marker E	10,468'	131	10533	10,664'
Lodgepole Marker F	10,497'	77	10587	10,664'
False Bakken	10,551'	32	10636	10,668'
Upper Bakken Shale	10,596'	24	10648	10,672'
Middle Bakken	10,604'	10	10662	10,672'
Target	10,618'			

**Table 1:** Comparing distances from certain gamma markers on offset wells to establish final landing target.

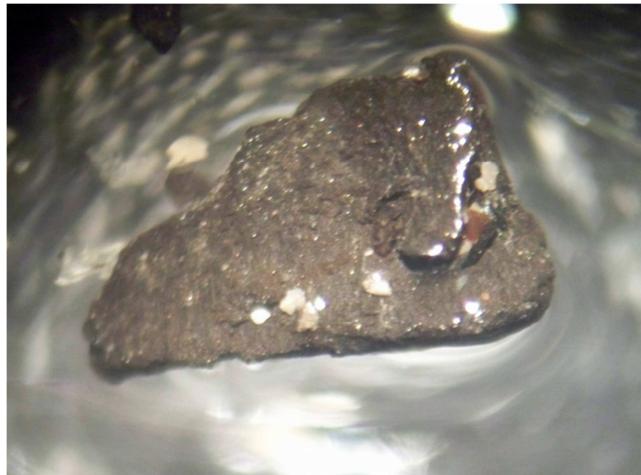
The curve was landed in the middle member of the **Bakken Formation** ~ 8' below the Upper Bakken Shale. Intermediate casing (7") was set at measured depth 10,009' and a TVD of ~10,669'.

### Lithology

The top of the “**False Bakken**” was penetrated at a measured depth of 10,840’ (TVD 10,636’) (-8,598) suggesting a target depth of 10,668’ TVD. Gas levels remained constant through the False Bakken.

The *Upper Shale* of the **Bakken Formation** [Missippian – Devonian] was drilled at 10,876’ (TVD 10,648’) (-8,610’) with sample returns of typical black, carbonaceous and petroliferous shale (Figure 5) characterized by gamma-ray values in excess of 250 API counts. Gas levels elevated to a peak of 1468 units above the average background gas of ~70 units. Samples were described as:

SHALE: very dark brown, subblocky, friable, waxy texture, very slightly calcareous, visible oil stain, possible fracture porosity



*Figure 5: Photograph sample from the Upper Bakken Shale.*

The Middle Member of the **Bakken Formation** was penetrated at 10,944' MD, (10,662' TVD). The upper zone of the middle member contained a tight grey siltstone with little or no oil stain or visible porosity (Figure 6). This “Zone” of the Middle Bakken Formation is annotated by “A” on Diagram 1. Samples from the top of the Middle member were described as:

SILTSTONE: white to off white, light gray, very fine grained, firm to friable, sub rounded to sub angular, vitreous, slightly to n calcareous, well sorted, poor cemented, trace disseminated pyrite, trace patchy oil stain, trace intergranular porosity



Figure 6: Photograph representative of the siltstone in the upper zone of the Middle Bakken

## Lateral

### Overview

Drilling fluid consisting of an open system salt water brine (9.4 – 9.5 ppg) was substituted for diesel invert while drilling the lateral section. one 6" PDC bits was used to drill the lateral.

Bit #4 (6" Smith FX64D), A PDC bit in front of a 1.5° mud motor was used to drill the entire lateral from 11,023' to 20,481' (TD). Bit #4 drilled 9458' in 236.5 hours with a mean ROP of 82.6 ft/hr.

Drilling operations were concluded at 0115 hours on 23 April 2011 at a bottom hole location of 23.03' S & 9971.67' E of surface location or approximately 2243.03' FNL & 311.76' FEL NW SE NW Sec. 29 T153N, R100W

### Lithology

To aid in communications while drilling the lateral, a type log was created using the gamma signature from The *Verlin Fossum 26-1* (Diagram 1). The target zone was an area marked roughly between the “B” and “D” markers on chart 1. The attempt was made to keep the well bore in this region for as much of the drilling operations as possible.

The Middle Member of the **Bakken Formation** seen in drilling samples consisted of 2 primary facies. The upper most was the gray siltstone seen while landing the curve and described above. The second was described as sandstone interbedded with a light brown silty sandstone. This silty

sandstone consisted of a siltstone that was flaky and grey in color interbedded with a light brown sandstone (Figure 7). There was a substantial amount of oil stain present in the sandstone and hydrocarbon cuts produced a weak diffuse cut with few streaming cuts Samples from the top of the Middle Bakken member were described as:

SLTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut



Figure 7: Photograph of silty sandstone seen in the upper part of the target zone between “B” and “C”

As the bit approached “D” in the middle member, silty sandstone was seen in sample (Figure 8). This silty sandstone was darker grey in color, contained much less sandstone and held together with a weaker calcite cementing. Hydrocarbon cuts produced a weaker diffuse cut than the sandstone above, but still few streamers. This silty sandstone comprised the primary target zone that we were attempting to keep the well bore in (Diagram 1).



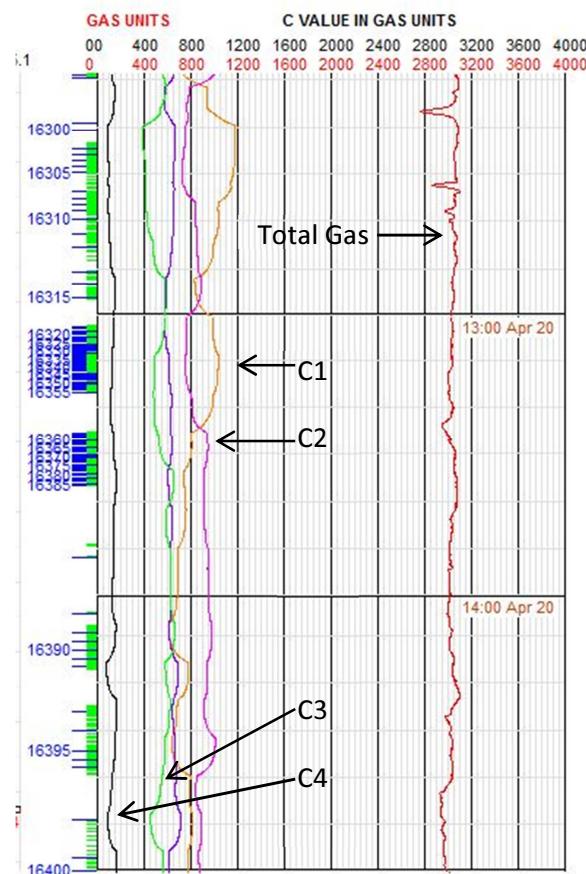
Figure 8: Photograph of silty sandstone from lower “Target Zone” in the Middle Bakken Formation

## Gas and Hydrocarbon Shows

Total gas levels were recorded with an average background of ~ 150 units while drilling the curve through the **Lodgepole Formation**. At a measured depth of 10,520' gas levels rose quickly to a peak of near 1900 units and maintained a background of ~ 700 units. Gas levels elevated sharply at the **Upper Bakken Shale** with a peak of 1450 units and an average background gas of ~ 1000 units. Gas levels changed little after the penetration of the middle member of the **Bakken Formation** until reaching intermediate casing point at 11,023' MD.

Upon exiting the show gas levels immediately rose to over 2200 units. The gas remained between 2000 and 2200 units until after a measured depth of 11,420 when levels rose to over 3000 units and remained at this level till the bit reach TD at a measured depth of 20,482'. The Bloodhound gas chromatograph showed components of all C1-C4 present through the entire lateral (Figure 10)

Hydrocarbon cuts using trichloroethylene were moderate though the entire lateral. The target zone and above was characterized by weak white diffuse cuts and very few slow white streaming cuts. No correlation was found between the strength of the hydrocarbon cuts and the position of the bit in the **Middle Bakken Formation**



*Figure 9: Screen shot of Bloodhound Chromatograph showing C1-C4 present in formation gas of over 3000 units*



Figure 10 Photograph of flare that was produced while drilling

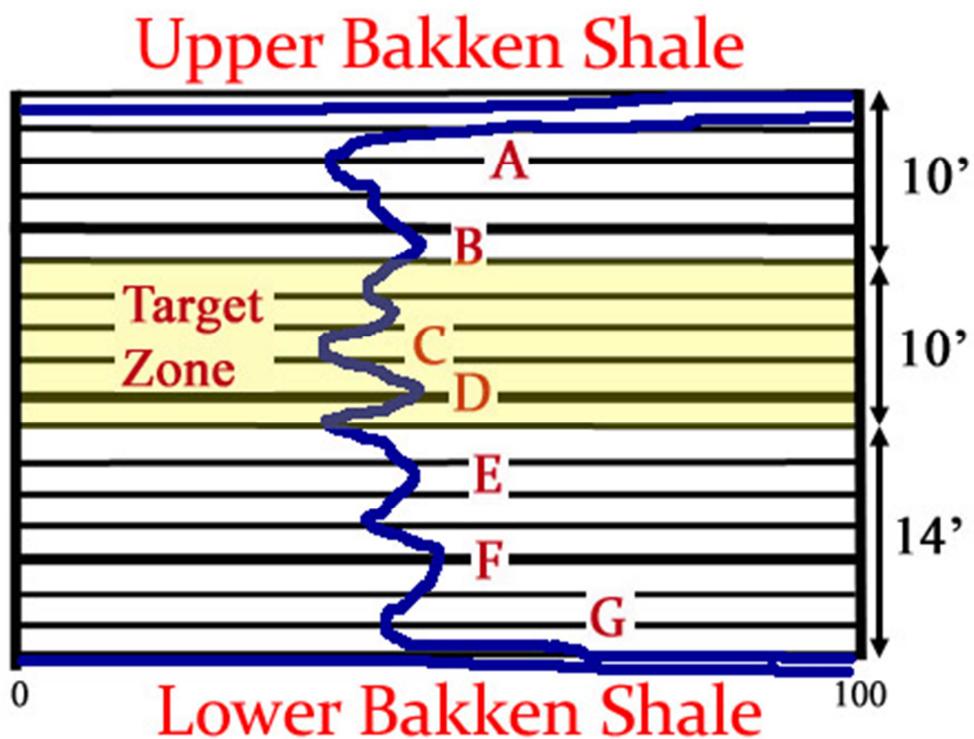


Diagram 1: Typelog created from gamma log of Verlin Fossum 26-1. Note "Target Zone" is between 10 and 20 feet below the Upper Bakken Shale.

## Summary

- 1) The *Wade 5300 21-30H* was spud 5 April 2010 east of the Indian Hill Field of McKenzie County, North Dakota. The vertical hole was drilled to a total depth (KOP) of 10,172'.
- 2) A mud program consisting of diesel invert (9.7 – 9.9 ppg) after surface casing and through the curve build sections. The drilling mud was successful in maintaining stable hole conditions and minimizing washout through the salt intervals. Brine water with a weight of 9.4-9.5 ppg was used during lateral drilling operations to maintain hydrostatic balance.
- 3) One 9 5/8" PDC bit was used to drill to surface casing at a depth of 2,025' in 9 hours. One 8 3/4" PDC bit was used to drill the vertical hole from surface casing to KOP of 10,172' in a total of 5.8 hours. One 8 3/4" bits was used to drill through the curve, landing at a measured depth of 11,023' in 27 hours. The entire 9,458' lateral was drilled in 82.6 hours with one 6" PDC bits.
- 4) The lateral was targeting a 10' thick section of the middle member of the **Bakken Formation** situated twenty feet below the upper shale.
- 5) Gas levels of between 2000 and 3500 units were maintained through most of the drilling operations. A 4-7 foot flare was maintained though most of the drilling operations
- 6) The Middle Bakken consisted of 2 gross lithologies. Directly below the upper Bakken Shale, RPM geologists observed a dark gray/brown siltstone. Below this siltstone, a light grey siltstone interbedded with light brown oil stained sandstone. The target zone consisted of light gray/brown porous silty sandstone.
- 7) Hydrocarbon cuts were moderate through the entire lateral. Few slow streaming cuts were present in target zone.
- 8) Drilling operations were concluded at 0115 hours on 23 APR 11 at a bottom hole location of 23.03' S & 9971.67' E of surface location or approximately 2243.03' FNL & 311.76' FEL SE NW Sec. 29 T153N, R100W
- 9) Oasis Petroleum *Wade 5300 21-30H* awaits completion operations to determine ultimate production potential.

Respectfully submitted,  
*Joseph H Large*  
RPM Consulting, Inc.

# Well Information

<u>Operator:</u>	Oasis Petroleum	<u>API #:</u>	33-053-03413-00-00
<u>Address:</u>	1001 Fannin Suite 202 Houston, TX 77002	<u>ND Well File #:</u>	20193
<u>Well Name:</u>	<b>Wade Federal 5300 21-30H</b>	<u>Surface Location:</u>	SW NW Sec. 30, T153N - R100W
<u>Field/ Prospect:</u>	Wildcat	<u>Footages:</u>	2220' FSL & 230' FWL
<u>Elevation:</u>	GL: 2,013' KB: 2,038'	<u>County, State:</u>	McKenzie County, North Dakota
<u>Spud Date:</u>	5-Apr-11	<u>Basin:</u>	Williston
		<u>Well Type:</u>	Horizontal Middle Bakken

<u>Contractor:</u>	Nabors #149	<u>Chemical Company</u>	Dynamic Drilling Fluids
<u>Toolpushers:</u>	Dwight Knutson / Larry Erie	<u>Mud Engineer</u>	Brent Blair
<u>Field Supervisors:</u>	Mark Lawler, Eli Pucket	<u>H2S MONITORING:</u>	NA
<u>Directional Drilling</u>	RPM Mark Lawlar, Eli Pucket, Rudy Salivar	<u>MWD</u>	Ryan Energy Jace Pitre, Chris Riggin

<u>Wellsite Geologist</u>	Joe Large Mike Grams	<u>Rock Sampling:</u>	30' from 8,250 to 10,710 10' from 10,710' to 11,020' 30' from 11,020' to 20,481'
<u>Prospect Geologist</u>	Mike Box	<u>Gas Detector</u>	Bloodhound Gas Detection
<u>Sample Examination:</u>	Binocular microscope & fluoroscope	<u>Sample Cuts:</u>	Trichloroethylene
<u>Horizontal Target</u>	Middle Bakken Porosity		

**Key Offset Wells:**

Harper Oil Company	Verlin Fossum Et Al 26-1	NW SE Sec. 26 T153N R101W	McKenzie County, ND
Harper Oil Company	Federal Land Bank 1-26	NE NW Sec. 26 T153N R101W	McKenzie County, ND

<u>Pumps:</u>	#1 & #2: National 10P-1300 - 5.5" liners Output: 0.0690 bbl/stk		
<u>Mud Type:</u>	Diesel invert mud 2,018 - 11,023'; Saltwater 11,023' - 20,4481' (TD)		
<u>Casing:</u>	Surface: 9 5/8" 36# J-55 @ 2,018' Intermediate: 7" 207 Jts 29# P-110, 32 Jts 32# P-110; float collar & casing shoe set to 11,008'		
<u>Hole Size:</u>	13 1/2" from conductor pipe at 60' to 2,025'	8 3/4" to 11,023'	6" to 20,481' (TD)
<u>Total Drilling Days:</u>	18 days		

<u>Horizontal Target:</u>	<i>Middle Bakken Porosity</i>	<u>BOTTOM HOLE LOCATION:</u>
<u>Kick-Off Point / Date:</u>	<i>10,172' 14 April 2011</i>	23.03' S & 9971.67' E of surface location or approximately 2243.03' FNL & 311.76' FEL
<u>Total Depth/ Date:</u>	<i>20,481 at 0115 hrs on 23 April 2011</i>	SE NW Sec. 29 T153N, R100W
<u>Ending Vertical Section</u>	<i>9971.67</i>	
<u>Ending Azimuth</u>	<i>89.90 °</i>	
<u>Status of Well:</u>	<i>Awaiting Completion</i>	
<u>Exposure to Formation:</u>	<i>100%</i>	

## Daily Activity

<b>Day</b>	<b>Date 2011</b>	<b>Depth 0600 Hrs</b>	<b>24 Hr Footage</b>	<b>Bit #</b>	<b>WOB (Klbs) Rotate</b>	<b>WOB (Klbs) Slide</b>	<b>RPM (RT)</b>	<b>Pump Pressure</b>	<b>SPM 1</b>	<b>SPM 2</b>	<b>GPM</b>	<b>24 Hr Activity</b>	<b>Formation</b>
1	6-Apr	1,729'	1624	1	30	-	180	900	110	110	644	Rig up to spud. Pre-drill spud safety meeting. Drill surface 105'-501'. Drill surface to 1729. Clean out mud ring.	Pierre Shale
2	7-Apr	2,025'	296	1	30	-	180	900	110	110	644	Circulate hole clean. Rig service, wiper trip, rig up ace and run casing to bottom.	Pierre Shale
3	8-Apr	2,025'	0	2	0	-	0	150	75	0	219	Circulate and wait on cementers. Rig up Haliburton. Cement casing and rig cementers down.	Spearfish
4	9-Apr	4,000'	1975	2	20	-	60	2400	75	75	439	Nipple up BOP, transfer invert, pressure test BOP, test MWD (good test) Rotate.	Spearfish
5	10-Apr	7,360'	3360	2	20	-	40	2400	70	70	410	Rotate, rig service and rotate. Surveys and connections.	Lodgepole
6	11-Apr	8,662'	1302	2	25	-	40	1700	65	65	381	Rotate from 7360' to 8662'. Rig service. Surveys and connections.	Charles Salt
7	12-Apr	9,200'	972	2	25	-	40	1700	65	65	381	Rotate from 8662 to 9171. Rig service. Rotate 9171 to 9649.	Mission Canyon
8	13-Apr	10,172'	198	2	25	-	40	1700	65	65	381	Rotate from 9649 to 10126. Rig service. Rotate from 10126 10172. TOOH for e logs.	Lodgepole
9	14-Apr	10,370'	653	3	35	-	40	1700	70	70	410	Weatherford running open hole logs. Rig down Weatherford. Pick up BHA and TIH. Ream and wash to bottom.	Lodgepole
10	15-Apr	11,023'	0	3	28	57	40	1700	70	70	410	Sliding from 10375 to 10522. Rig service. Sliding from 10522 to 11023. Circulate and TOOH for casing.	Middle Bakken

## Daily Activity

<b>Day</b>	<b>Date 2011</b>	<b>Depth 0600 Hrs</b>	<b>24 Hr Footage</b>	<b>Bit #</b>	<b>WOB (Klbs) Rotate</b>	<b>WOB (Klbs) Slide</b>	<b>RPM (RT)</b>	<b>Pump Pressure</b>	<b>SPM 1</b>	<b>SPM 2</b>	<b>GPM</b>	<b>24 Hr Activity</b>	<b>Formation</b>
11	16-Apr	11,023'	0	3	-	-	-	-	-	-	-	Rig up 3rd pary tools, circulate. Rig up to run casing. Run casing, make up shoe and float. Rig up Haliburton and run cement.	Middle Bakken
12	17-Apr	11,023'	1277	4	28	57	40	1700	70	70	410	Circulate and condition. Primary cementing 7" intermediate casing. Rig down Haliburton. Change rams, test BOP and test plug. Pick up 4" drill pipe and TIH. TOOH for MWD.	Middle Bakken
13	18-Apr	12,300'	1056	4	18	35	30	1500	90	0	263	TIH test MWD. Pick up drill pipe. Reaming and washing through cement. Rotating from 11023-11139. Rig service. Rotating from 11139 to 12290	Middle Bakken
14	19-Apr	13,356'	1236	4	22	35	40	2100	90	0	263	Drill 12,300-13,030, Short Trip 12 Stands, circulate & condition, wireline out MWD tool, replace MWD tool, TIH, Drill 13,030'-13,536'	Middle Bakken
15	20-Apr	15,675'	2139	4	15	30	40	1700	90	0	263	Drilling from 13450-14847. Rig service. Drilling from 14847 to 15,675'	Middle Bakken
16	21-Apr	17,389'	1714	4	20	27	42	2000	0	95	278	Drilling from 15675 to 16435. Rig service. Directional surveys and connections. Drilling from 16435 to 17,450'-17389	Middle Bakken
17	22-Apr	19,075'	1686	4	20	27	42	2000	108	0	317	Drilling from 17389 to 18218. Rig service. Directional surveys and connections. Drilling from 18218 to 19,075'	Middle Bakken

## Daily Activity

<i>Day</i>	<i>Date 2011</i>	<i>Depth 0600 Hrs</i>	<i>24 Hr Footage</i>	<i>Bit #</i>	<i>WOB (Klbs) Rotate</i>	<i>WOB (Klbs) Slide</i>	<i>RPM (RT)</i>	<i>Pump Pressure</i>	<i>SPM 1</i>	<i>SPM 2</i>	<i>GPM</i>	<i>24 Hr Activity</i>	<i>Formation</i>
18	23-Apr	20,481'	1406	4	15	50	40	2400	0	95	278	Drilling from 19080 to 19685. Rig service. Directional surveys and connections. Drilling from 19685 to 20,481', circulate bottoms up, TOOH	Middle Bakken



# Oasis Petroleum

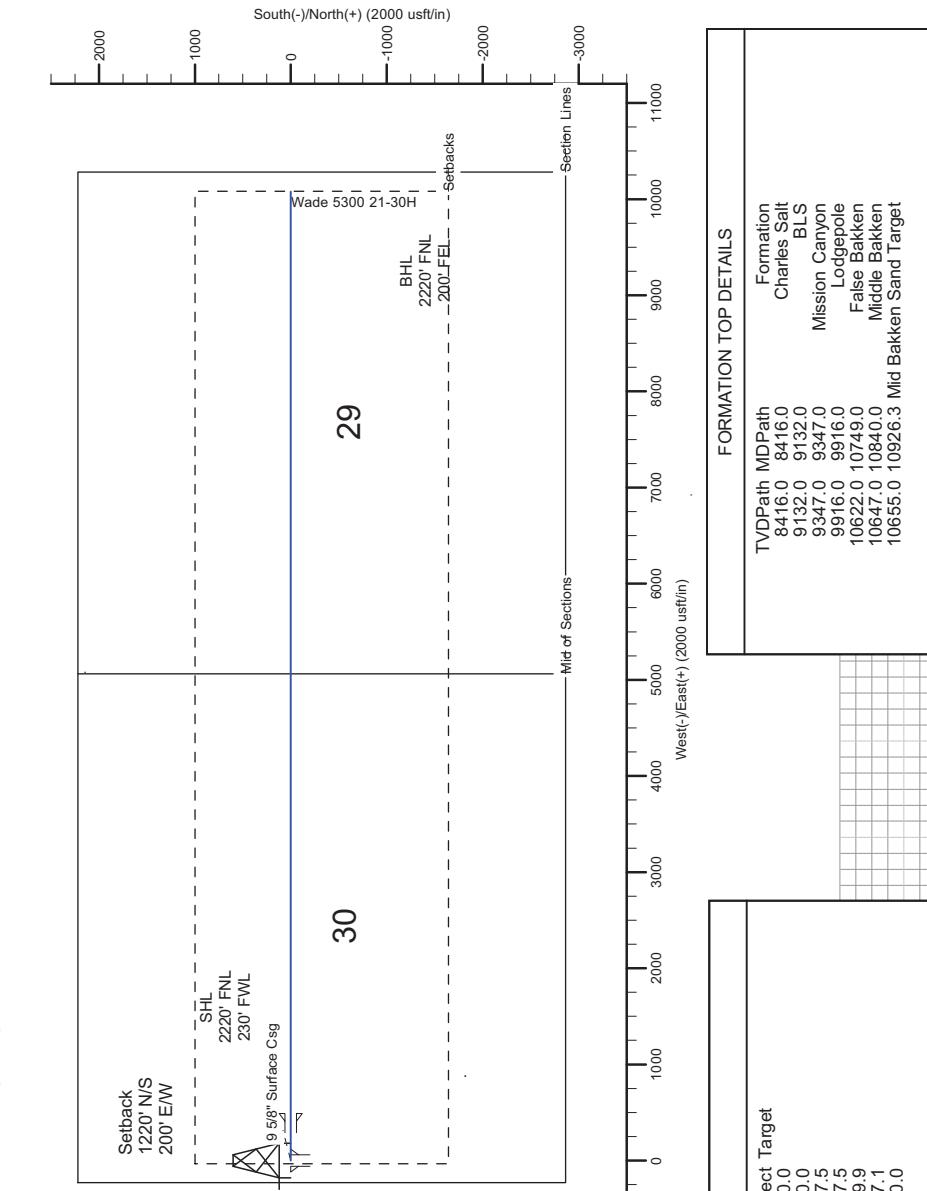
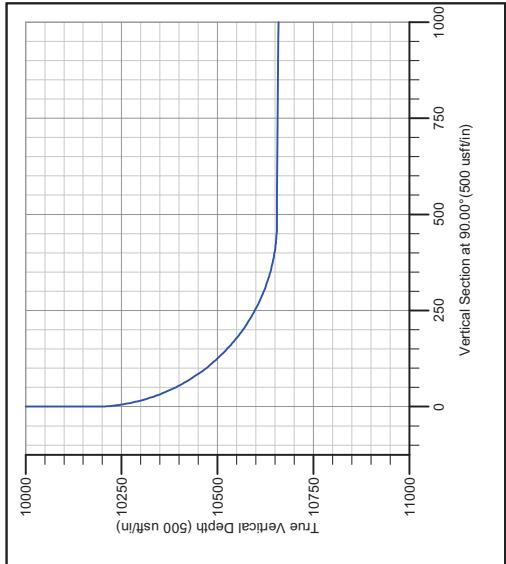
## SITE DETAILS

Azimuths to True North: 8.82°  
 Magnetic Field Strength: 56796.65nT  
 Dip Angle: 73.14°  
 Date: 12/9/2010  
 Model: IGRF2010

County: McKenzie County, ND  
 Well: Wade 5300 21-30H  
 Wellbore: Wade 5300 21-30H  
 Design: Plan 1 (12-9-10)  
 Rig: Original Well Elev

Legal Location: Sec 30 T153N R100W

Site Centre Latitude: 48°2'49.420 N  
 Longitude: 103°36'11.540 W  
 Ref. Datum: WELL @ 2035.0usft (Original Well Elev)  
 Positional Uncertainty: 0.0  
 Convergence: 2.31



## SECTION DETAILS

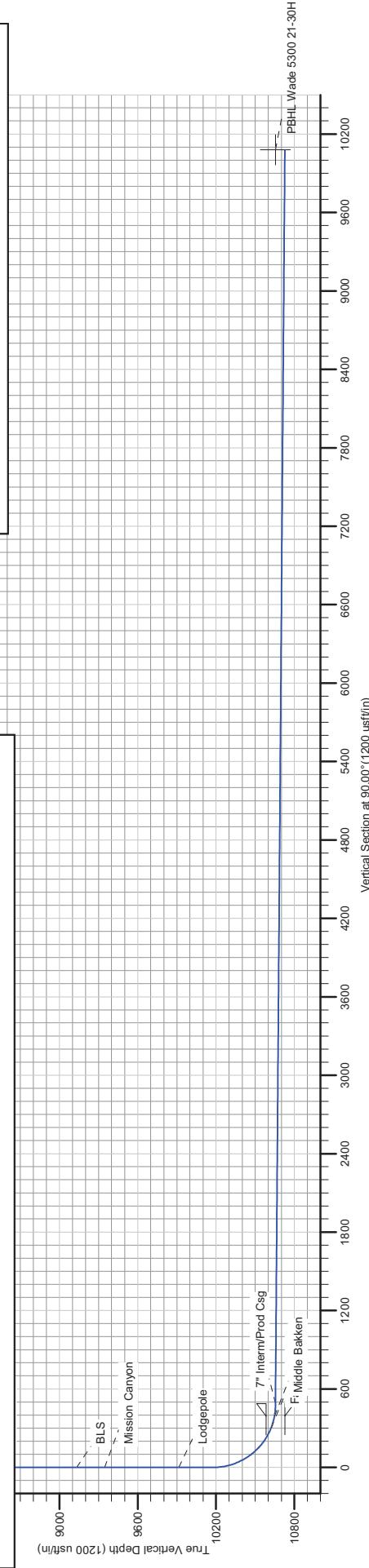
TVD	MD	Name
2010.0	2010.0	9 5/8" Surface Csg
10655.0	10940.0	7" Internl/Prod Csg

## CASING DETAILS

MD	Inc	Azi	TVD	+N/S	+E/W	DegTFace	V Sect Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.0
10177.5	0.00	0.00	177.5	0.0	0.0	0.00	0.0
10927.5	90.00	90.00	0.0655.0	0.0	477.5	12.00	90.00
10927.6	90.00	90.00	0.0655.0	0.0	477.5	0.00	477.5
10940.0	90.00	90.00	0.0655.0	0.0	489.9	0.00	489.9
10947.2	89.57	90.00	0.0655.0	0.0	497.1	6.00	80.00
20530.3	89.57	90.00	0.0727.0	0.010080.0	0.00	0.000080.0	0.0

## FORMATION TOP DETAILS

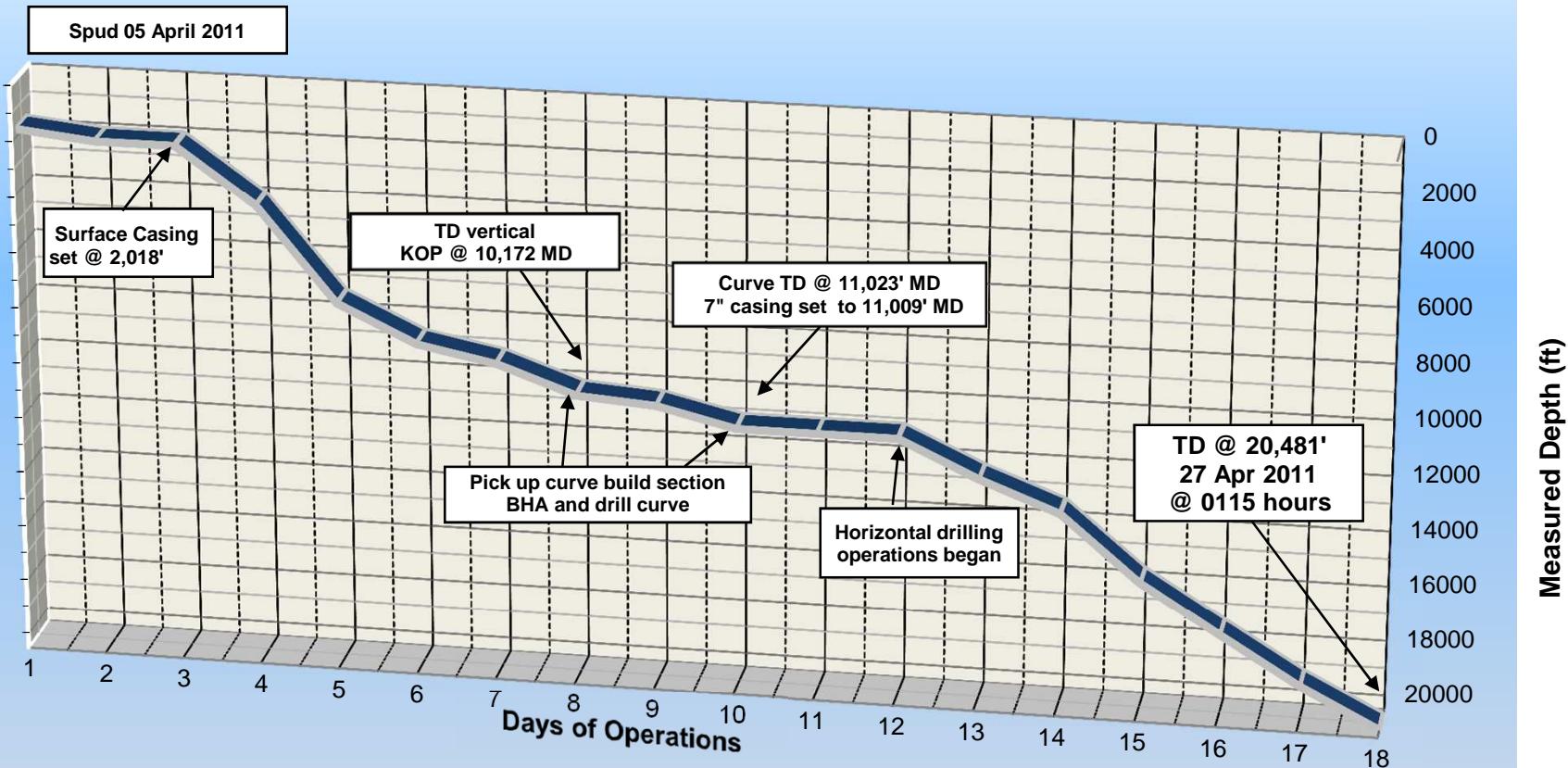
Formation	MD Path	TD Path
Charles Salt	8416.0	8416.0
BLS	9132.0	9132.0
Mission Canyon	9347.0	9347.0
Lodgepole	9916.0	9916.0
False Bakken	10622.0	10749.0
Middle Bakken	10647.0	10840.0
Mid Bakken Sand Target	10655.0	10926.3





## Daily Progress

Oasis Petroleum North America, LLC  
Wade Federal 5300 21-30H



## ***Bit Record***

<b><i>Bit #</i></b>	<b><i>Size</i></b>	<b><i>Make</i></b>	<b><i>Model</i></b>	<b><i>Serial #</i></b>	<b><i>Jets</i></b>	<b><i>Depth In</i></b>	<b><i>Depth Out</i></b>	<b><i>Footage</i></b>	<b><i>Hours</i></b>	<b><i>Mean ROP (ft/hr)</i></b>	<b><i>Accum. Hours</i></b>
1	13 1/2	Varel	RT	H08461	3x18/1x20	105'	2,025'	1920	9	213.3	9.0
2	8 3/4	Smith	MDS16168PX	JELL08	6x12	2,025'	10,172'	8147	85	95.8	94.0
3	8 3/4	SEC	FXD55M	11673346	5 x 18	10,172'	11,023'	851	31.5	27.0	125.5
4	6	Smith	FX64D	11035885	3 x 16, 3 x 12	11,023'	20,481'	9458	114.5	82.6	236.50

## Daily Mud Data

<b>Day</b>	<b>Date 2011</b>	<b>Depth (0600 Hrs)</b>	<b>Mud WT (ppg)</b>	<b>VIS (sec)</b>	<b>PV (cP)</b>	<b>YP (lbs/ 100 ft<sup>2</sup>)</b>	<b>Gels (lbs/ 100 ft<sup>2</sup>)</b>	<b>600/300</b>	<b>HTHP (cc/30min)</b>	<b>NAP/ H<sub>2</sub>O (ratio)</b>	<b>Cake (APT/ HT)</b>	<b>Solid S (%)</b>	<b>pH</b>	<b>Alk</b>	<b>Cl- (mg/l)</b>	<b>ES (v)</b>	<b>Loss (Bbl/s)</b>
1	6-Apr	2,277'	9.8	29	2	1	1/1	-	-	-	-	-	-	2.0	145K	-	-
2	7-Apr	6,465'	9.6	28	5	1	3/6	-	-	-	-	-	-	2.1	-	-	-
3	8-Apr	2,026'	9.9	81	18	7	7/12/	43/25	6	82/18	/4	12.00	-	1.6	40K	525	0
4	9-Apr	4,423'	9.6	53	19	7	8/15/	45/26	5.6	79.5/20.5	/4	12.00	-	2.4	42K	668	47
5	10-Apr	7,548'	9.8	57	23	11	9/18/	57/34	5.6	77/23	/4	13.00	-	3.4	48K	690	70
6	11-Apr	8,838'	9.7	56	19	7	6/12/	45/26	4.4	80/20	/4	13.00	-	3.8	50K	815	116
7	12-Apr	10,726'	9.9	29	29	11	7/11/	69/39	4.6	81/17	-/2	10.00	-	1	48K	651	28
8	13-Apr	10,841'	9.9	29	29	11	7/11/	69/40	4.7	81/18	-/3	11.00	-	2	48K	651	28
9	14-Apr	10,490'	9.9	29	29	11	7/11/	69/41	4.8	81/19	-/4	12.00	-	3	48K	651	28
10	15-Apr	11,085'	9.7	29	1	1	-	3/2	-	/98	-	2.00	8.5	-	162K	-	-
11	16-Apr	11,299'	Switch from diesel invert to salt water drilling fluid at intermediate casing.														
12	17-Apr	11,023'															
13	18-Apr	12,471'	9.4	29	1	1	-	3/2	-	/98	-	2.00	8.4	-	135K	-	-
14	19-Apr	13,600'	9.5	29	-	1	-	3/2	-	/97	-	2.00	8.4	-	115K	-	-
15	20-Apr	15,042'	9.5	29	-	1	-	3/2	-	/97	-	3.00	8.4	-	115K	-	-
16	21-Apr	16,510'	9.5	29	-	1	-	3/2	-	/97	-	3.00	8.4	-	110K	-	-
17	22-Apr	17,760'	9.5	29	-	1	-	3/2	-	/97	-	3.00	8.4	-	110K	-	-
18	23-Apr	18,104'	9.5	29	-	1	-	3/2	-	/97	-	3.00	8.4	-	110K	-	-
19	24-Apr	20,404'	9.5	26	-	1	-	3/2	-	/97	-	3.00	8.5	-	115K	-	-

Note: SERVICE COMPANIES, please distribute reports to all partners and government agencies as indicated

**DISTRIBUTION LIST:**

Wade 5300 21-30H

Date: March 28, 2011

**DRILLING CONTRACTOR:**

Township153 North, Range 100 West

Section 29-30

Indian Hills Area, McKenzie County  
NORTH DAKOTA

**Operator: Oasis Petroleum**

**TIGHT HOLE YES X NO**

"CONFIDENTIAL INFORMATION"

NAME/ADDRESSES	NOTIFICATION (Note Operations Requiring Partner Notification)	Drilling Order - Title Opinion	WELL PERMIT, SURVEY PLAT- EMAIL	SUNDY NOTICES, STATE/ FEDERAL FORMS-EMAIL	DAILY DRLG REPORT E-MAIL	DIRECTIONAL PLAN - SURVEYS & MWD	OPEN/CASED WIRELINE LOGS		MUD LOG			DRILLING & COMPLETION PROCEDURE	DST/CORE/S IDEWALL ANALYSES	GEOLOGIC REPORT	PRODUCTION REPORTS, OIL WATER ANALYSIS	OTHER
							PAPER PRINTS	DIGITAL DATA	DAILY	FINAL	DRY SAMPLE					
<b>Brigham Oil &amp; Gas LP</b> Primary Contact: Lance Langford 6300 Bridge Point Pkwy Building 2,Suite 500 Austin, TX 78730 Office:512-427-3300 Ext.3300/Cell:512-431-8992 Home:512-794-8992 reports@bexp3d.com Digital Logs Email: lasdata@bexp3d.com	1		1	1	1		3	1	1	2		1	2	1	1	Notify of all spudding,logging,coring,formation tests, P&A or notice of sign. Oil or gas shows in suff. Time to have rep at wellsite
<b>Brigham Oil &amp; Gas LP</b> Secondary Contact: Jeff Larson 6300 Bridge Point Pkwy Building 2,Suite 500 Austin, TX 78730 Office:512-427-3300Ext.3310/Cell:512-626-4536 Home:512-218-9560 reports@bexp3d.com	1															Notify of all spudding,logging,coring,formation tests, P&A or notice of sign. Oil or gas shows in suff. Time to have rep at wellsite
<b>Hess Corporation</b> Attn: Sharon Thomas One Allen Center 500 Dallas Street Houston,TX 77002 713-609-4178/Fax:713-609-5670 Email:shthomas@hess.com			1		1	1	1	1	1	1			1	1	1	
sbelik@hess.com	Shannon Belik	Donna				1	1		1							
<b>Hess Corporation</b> King doking@hess.com Carrie Cazes ccazes@hess.com									1							
<b>Hess Corporation</b> Marilys Olson One Allen Center 500 Dallas Street Houston,TX 77002 molson@hess.com	1															Upon first production, please notify Marlys Olson and provide a well completion report to company address when it is filed with the NDIC
<b>Hess Corporation</b> Josh Karim One Allen Center 500 Dallas Street Houston,TX 77002 jkarim@hess.com		1														Drilling and Division order Title Opinions (Opinions should be delivered to below address ATTN: US Onshore Land or email hmyles@hess.com).
<b>Hess Corporation</b> Carol Donnelly One Allen Center 500 Dallas Street Houston,TX 77002 cdonnelly@hess.com	1															Upon first production, please notify Carol Donnelly and provide a well completion report to company address when it is filed with the NDIC

Note: SERVICE COMPANIES, please distribute reports to all partners and government agencies as indicated

**DISTRIBUTION LIST:**

Wade 5300 21-30H

Date: March 28, 2011

**DRILLING CONTRACTOR:**

Township153 North, Range 100 West

Section 29-30

Indian Hills Area, McKenzie County  
NORTH DAKOTA

**Operator: Oasis Petroleum**

**TIGHT HOLE YES X NO**

"CONFIDENTIAL INFORMATION"

NAME/ADDRESSES	NOTIFICATION (Note Operations Requiring Partner Notification)	Drilling Order - Title Opinion	WELL PERMIT, SURVEY PLAT- EMAIL	SUNDRY NOTICES, STATE/ FEDERAL FORMS-EMAIL	DAILY DRLG REPORT E-MAIL	DIRECTIONAL PLAN - SURVEYS & MWD	OPEN/CASED WIRELINE LOGS		MUD LOG			DRILLING & COMPLETION PROCEDURE	DST/CORE/S IDEWALL ANALYSES	GEOLOGIC REPORT	PRODUCTION REPORTS, OIL WATER ANALYSIS	OTHER
							PAPER PRINTS	DIGITAL DATA	DAILY	FINAL	DRY SAMPLE					
<b>Nadel and Gussman, LLC</b> 621 17th Street, Suite 1301 Denver, CO 80293 Phone: 303-296-2700 Fax: 303-296-2707 Email: NGRreports@naguss.com					1		1	1	1	1			1	1	1	
<b>Nadel and Gussman, LLC</b> 621 17th Street, Suite 1301 Denver, CO 80293 Phone: 303-296-2700 Fax: 303-296-2707 Lee Robinson - lrobinson@naguss.com Rick Morris - rmorris@naguss.com Hugo Cartaya - hcartaya@naguss.com	1	1														24 hour notice of intent to core, test or log Monthly production reports email to Hugo Cartaya
<b>Northern Oil &amp; Gas, Inc.</b> Kruise Kemp Email: kkemp@northernoil.com	1	1			1			1	1	1		1			1	
<b>Northern Oil &amp; Gas, Inc.</b> Michael Reger Email: mreger@northernoil.com production@northernoil.com	1				1			1	1	1		1	1		1	
<b>OASIS PETROLEUM</b> 1001 Fannin St. #1500 HOUSTON, TEXAS 77002 dailyreports@oasispetroleum.com	At Spud	1	1	1	1	1	2	1	1	1		1	1	1	1	
<b>OASIS PETROLUEM</b> Bob Candito-VP Geology 1001 Fannin ST.#1500 Houston,TX 77002 Direct: 281-404-9463/ Cell: 832-594-0141 bcandito@oasispetroleum.com	At Spud				1				1							
<b>OASIS PETROLUEM</b> Dean Gilbert 1001 Fannin ST.#1500 Houston, TX 77002 dgilbert@oasispetroleum.com					1				1							
<b>OASIS PETROLUEM</b> Brian Gates 1001 Fannin ST.#1500 Houston, TX 77002 bgates@oasispetroleum.com					1				1							
<b>OASIS PETROLUEM</b> Mike Box 1001 Fannin ST.#1500 Houston, TX 77002 mbox@oasispetroleum.com					1				1							
<b>OASIS PETROLUEM</b> Paul Garvey 1001 Fannin ST.#1500 Houston, TX 77002 pgarvey@oasispetroleum.com					1				1							

Note: SERVICE COMPANIES, please distribute reports to all partners and government agencies as indicated

**DISTRIBUTION LIST:**

Wade 5300 21-30H

Date: March 28, 2011

**DRILLING CONTRACTOR:**

Township153 North, Range 100 West

Section 29-30

Indian Hills Area, McKenzie County  
NORTH DAKOTA

**Operator: Oasis Petroleum**

**TIGHT HOLE YES X NO**

"CONFIDENTIAL INFORMATION"

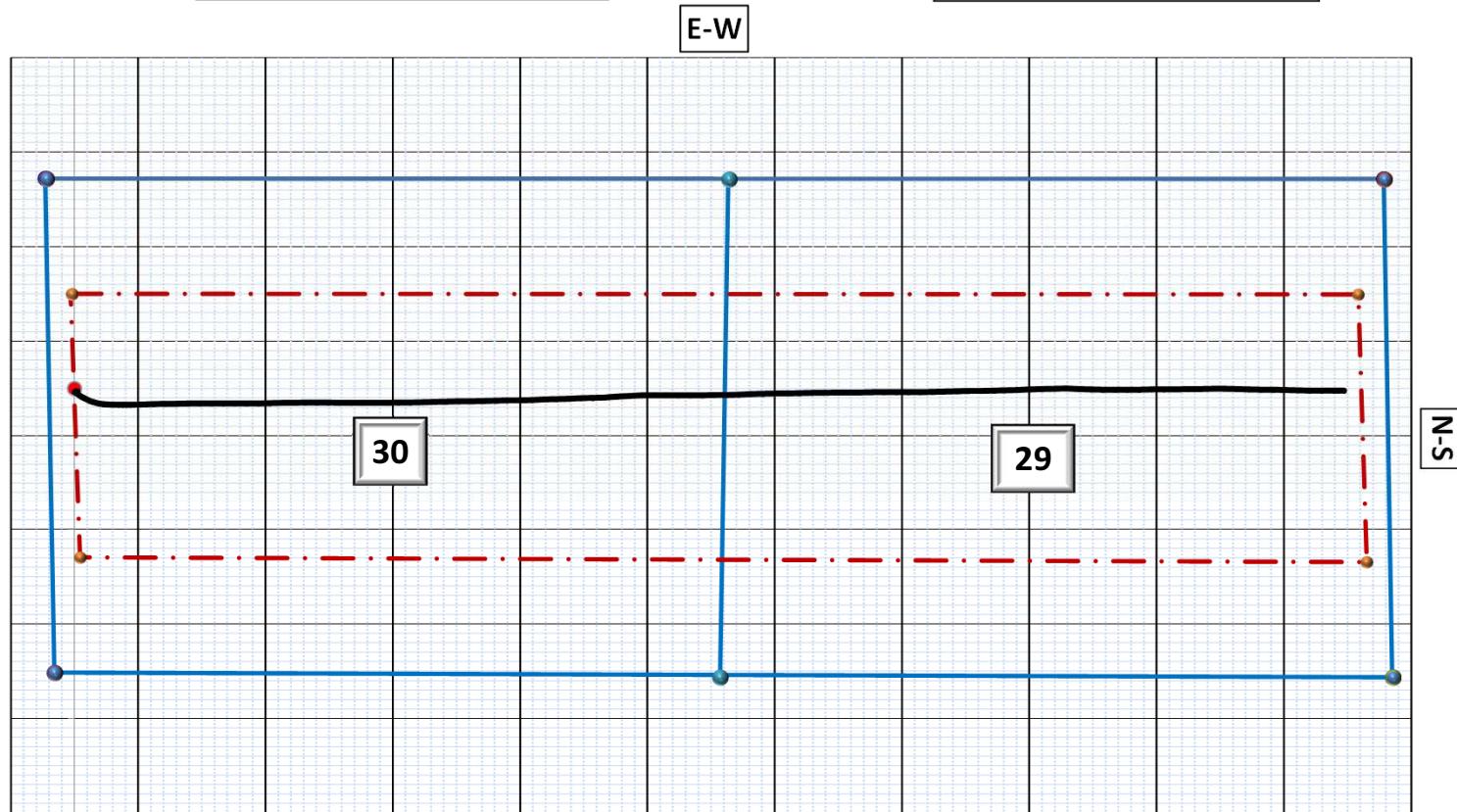
NAME/ADDRESSES	NOTIFICATION (Note Operations Requiring Partner Notification)	Drilling Order - Title Opinion	WELL PERMIT, SURVEY PLAT- EMAIL	SUNDRY NOTICES, STATE/ FEDERAL FORMS-EMAIL	DAILY DRLG REPORT E-MAIL	DIRECTIONAL PLAN - SURVEYS & MWD	OPEN/CASED WIRELINE LOGS		MUD LOG			DRILLING & COMPLETION PROCEDURE	DST/CORE/S IDEWALL ANALYSES	GEOLOGIC REPORT	PRODUCTION REPORTS, OIL WATER ANALYSIS	OTHER
							PAPER PRINTS	DIGITAL DATA	DAILY	FINAL	DRY SAMPLE					
<b>OASIS PETROLEUM</b> Andy Nelson 1001 Fannin ST.#1500 Houston, TX 77002 anelson@oasispetroleum.com					1				1							
<b>OASIS PETROLEUM</b> John Gillespie 1001 Fannin ST.#1500 Houston, TX 77002 jgillespie@oasispetroleum.com					1				1							
<b>OASIS PETROLEUM</b> Laura Strong 1001 Fannin ST.#1500 Houston, TX 77002 lstrong@oasispetroleum.com					1				1							
<b>OASIS PETROLEUM</b> Yohance Sampson 1001 Fannin ST.#1500 Houston, TX 77002 smith@oasispetroleum.com					1				1							
Note service companies please distribute all reports to partners and government agencies as indicated: <b>Industrial Commission of North Dakota</b> <b>Oil and Gas Division</b> <b>600 East Boulevard, Dept. 405</b> <b>Bismarck, ND-58505-0840</b>						1	1	1	1	1		1	1			

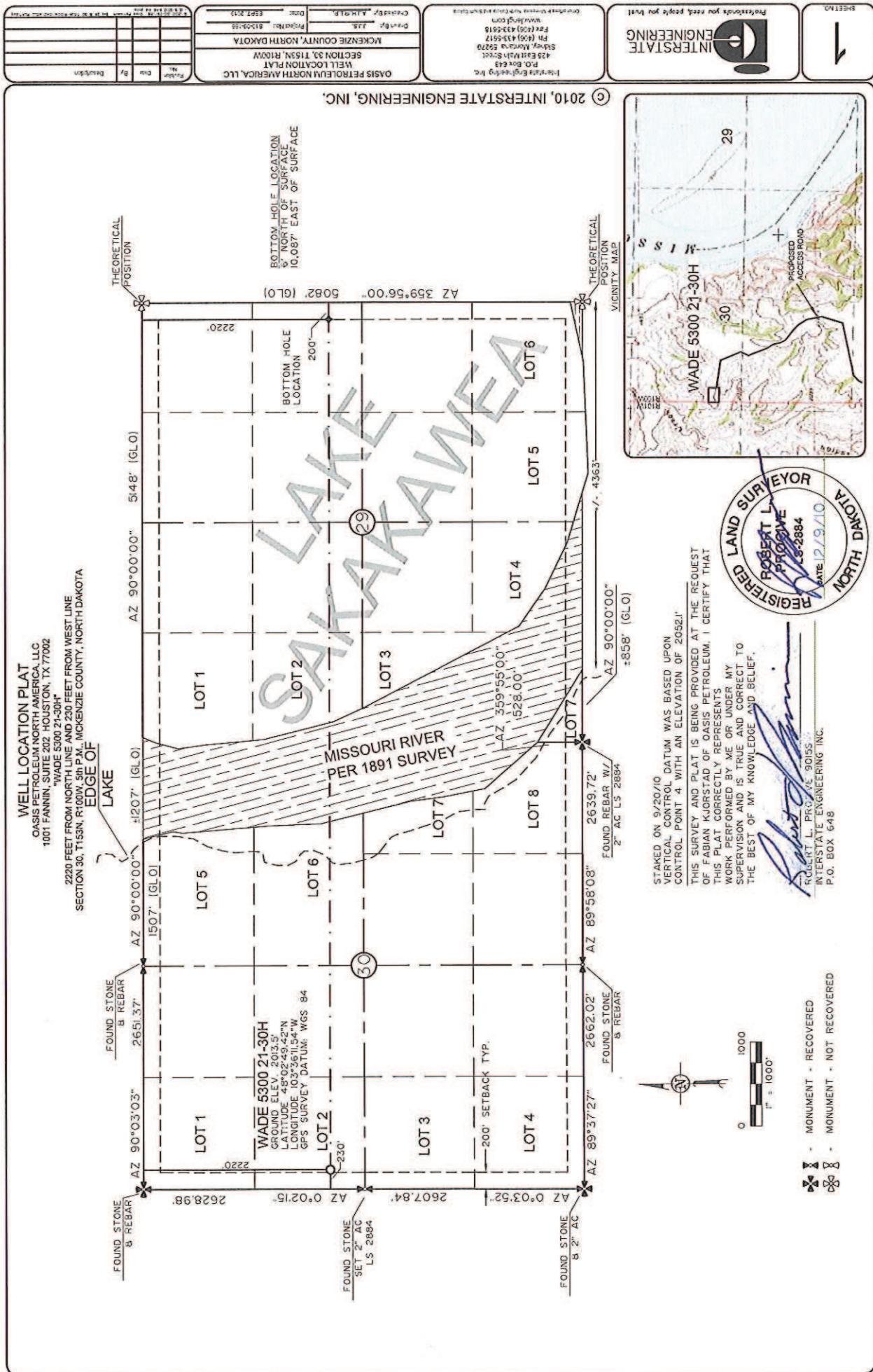


## Vertical Section View

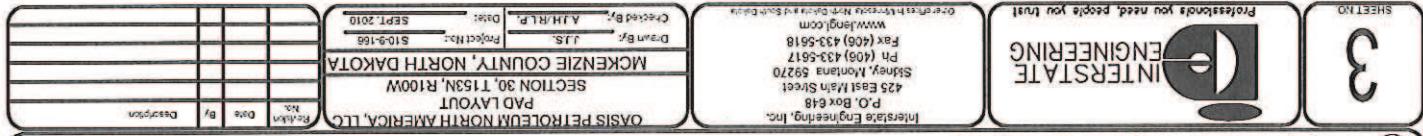
**Surface Location:**  
2220' FNL & 230' FWL  
SW NW Sec. 30, T153N, R100W  
McKenzie County, ND

**Bottom Hole Location**  
23.03' S & 9971.67' E  
of surface location or approx.  
2243.03' FNL & 311.76' FEL  
SE NW Sec. 29 T153N, R100W





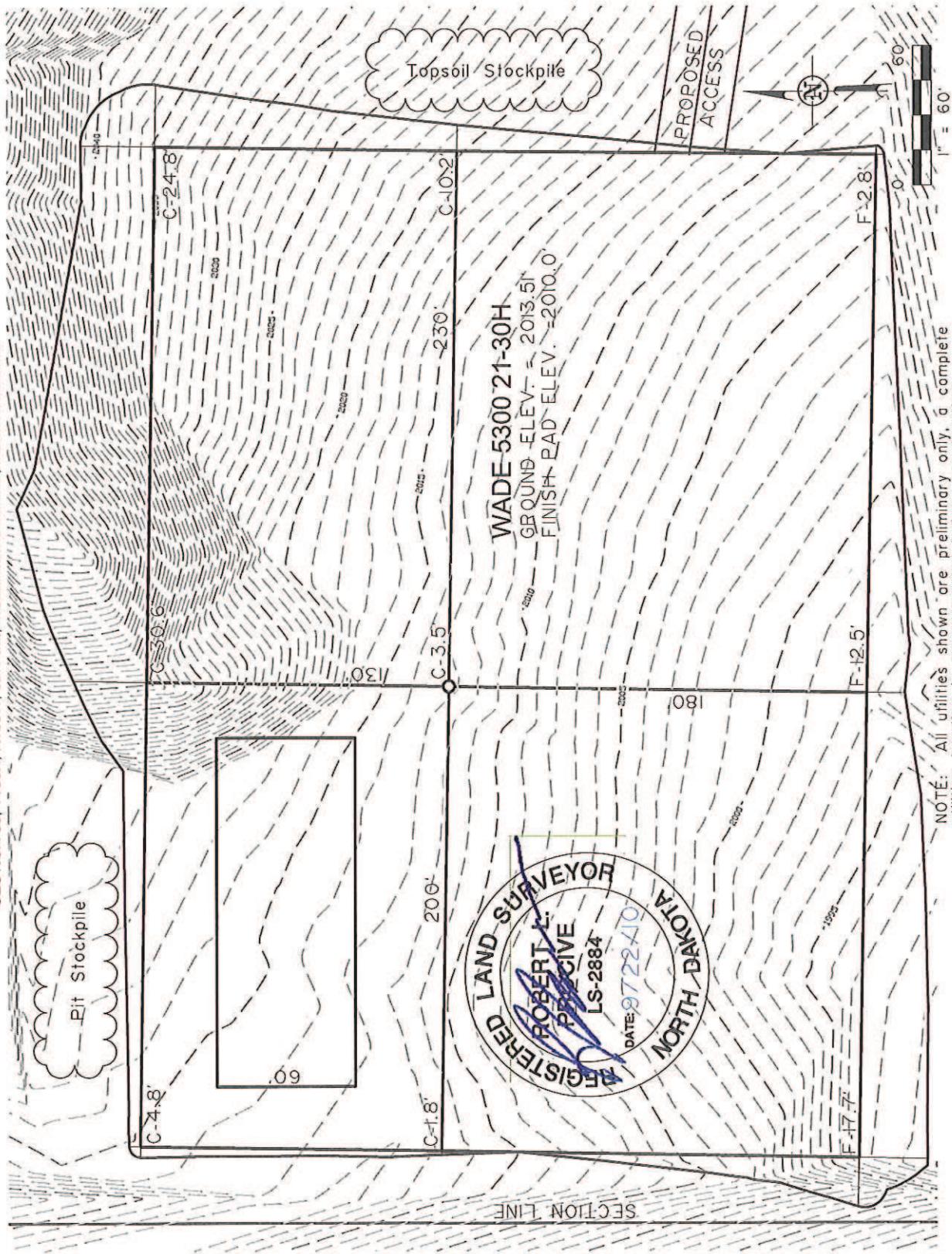




PAGE LAYOUT

OASIS PETROLEUM NORTH AMERICA, LLC  
1001 FANNIN, SUITE 202 HOUSTON, TX 77002

"WADE 5300 21-301"  
2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA



ACCESS APPROACH  
OASIS PETROLEUM NORTH AMERICA, LLC  
1001 FANNIN, SUITE 202 HOUSTON, TX 77002

"WADE 5300 21-30H"

2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA

WADE 5300 21-30H

FOUND STONE  
SET 2" AC  
LS 2884

FOUND STONE  
8 2" AC

LEWIS 5300 31-31H

FOLLOW PROPOSED  
ROAD #1.49 MILES

NOTE: All utilities shown are preliminary only, a complete  
utilities location is recommended before construction.

MISSOURI RIVER  
PER 1891 SURVEY

LANDOWNER:  
LAWRENCE LINDVIG  
SECTION 30  
4,026 FT = 244 RODS

AZ 167°57'40"  
236.86'

AZ 98°36'09"  
823.59'  
AZ 157°35'50"  
642.18'

AZ 203°49'31"  
255.93'  
AZ 158°44'29"  
601.01'

AZ 146°41'44"  
197.82'

AZ 153°15'03"  
166.97'

AZ 127°54'57"  
387.14'

AZ 169°22'35"  
442.74'

AZ 258°18'14"  
1583.29'

AZ 196°36'03"  
642.38'

AZ 207°00'45"  
251.47'

AZ 202°21'05"  
246.82'

AZ 172°44'48"  
226.76'

AZ 170°51'17"  
518.94'

FOUND STONE  
FOR WITNESS  
CORNER

AZ 185°37'24"  
135.49'

AZ 166°23'53"  
326.12'

AZ 219°18'21"  
157.11'

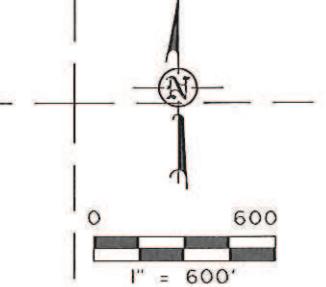
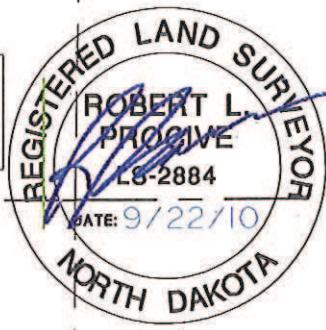
AZ 147°36'00"  
241.69'

AZ 171°18'24"  
482.79'

AZ 248°18'32"  
416.73'

AZ 280°04'29"  
340.48'

TIE INTO EXISTING  
PROPOSED ROAD



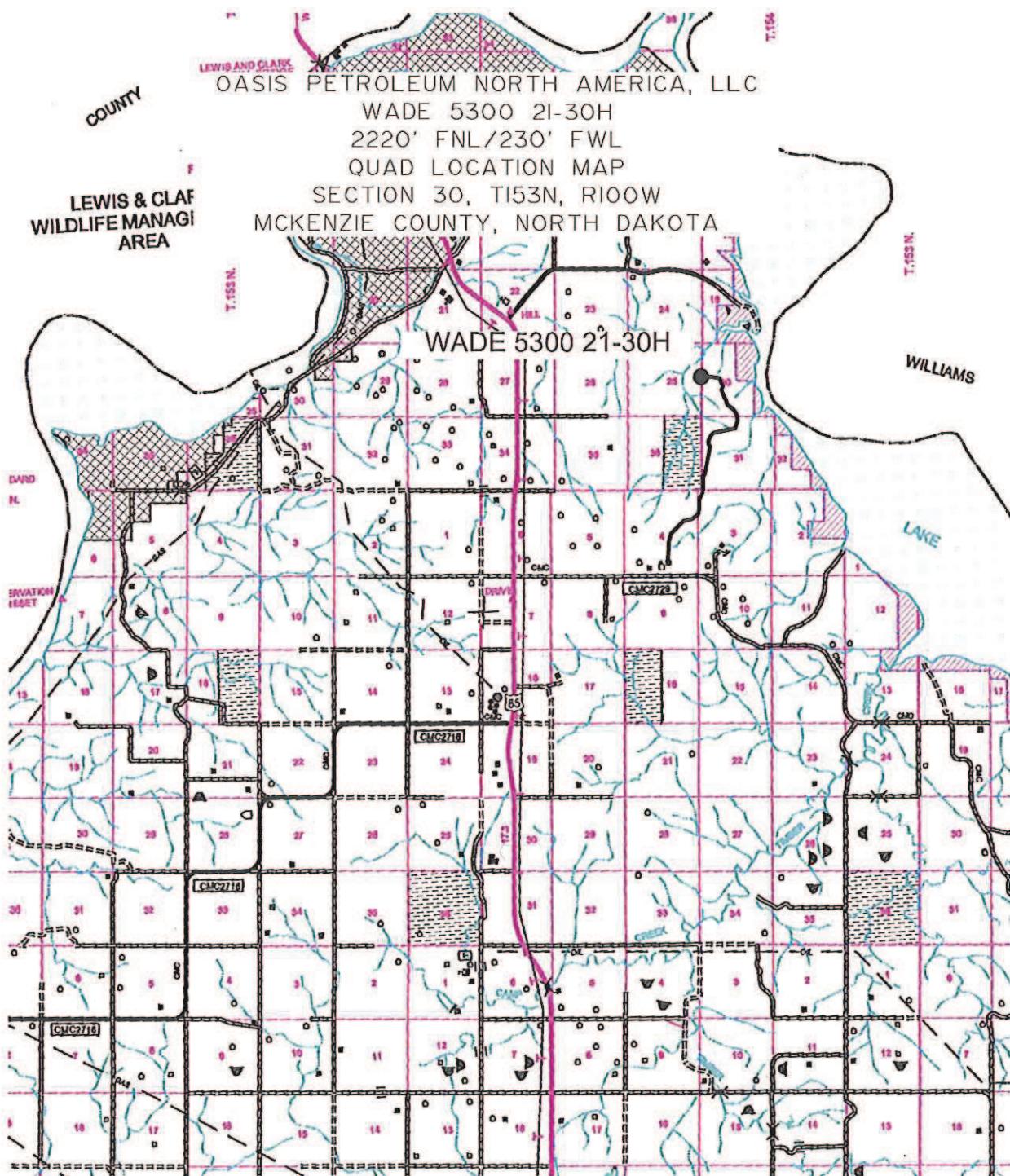
File Number	Date	By	Description

# COUNTY ROAD MAP

OASIS PETROLEUM NORTH AMERICA, LLC  
1001 FANNIN, SUITE 202 HOUSTON, TX 77002

"WADE 5300 21-30H"

2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA



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SCALE: 1" = 2 MILE

6



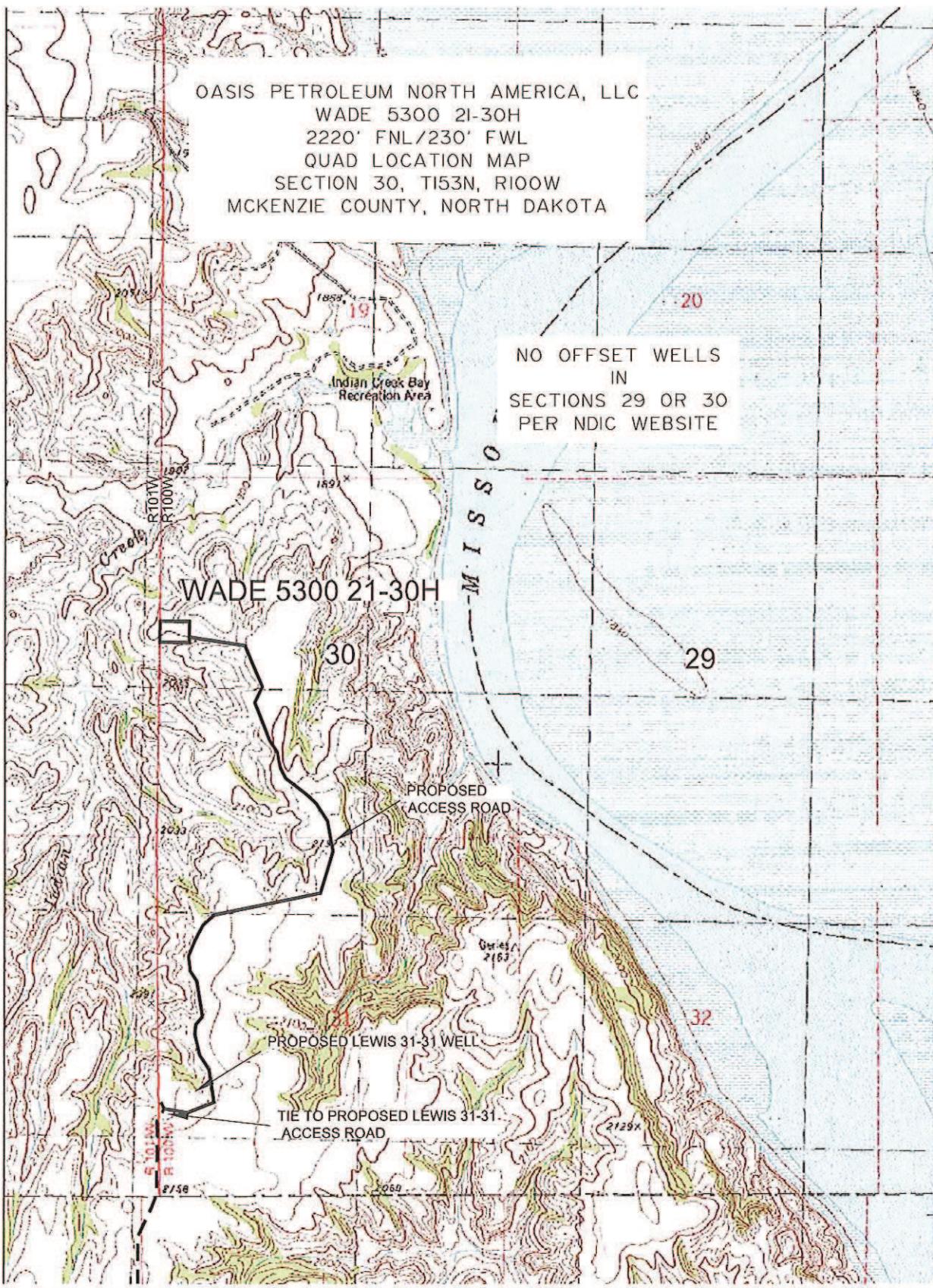
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P.O. Box 648  
425 East Main Street  
Sidney, Montana 59270  
Ph (406) 433-5617  
Fax (406) 433-5618  
[www.engl.com](http://www.engl.com)  
Offices in Minnesota, North Dakota and South Dakota

OASIS PETROLEUM NORTH AMERICA, LLC  
COUNTY ROAD MAP  
SECTION 30, T153N, R100W  
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.J.S. Project No.: S10-09-165  
Checked By: A.J.H./R.L.P. Date: SEPT, 2010

Fieldwork No.	Date	E/	Description



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5



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 Sidney, Montana 59270  
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 Fax (406) 433-5618  
[www.jengi.com](http://www.jengi.com)  
Office locations in Minnesota, North Dakota and South Dakota

OASIS PETROLEUM NORTH AMERICA, LLC  
 QUAD LOCATION MAP  
 SECTION 30, T153N, R100W  
 MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: JJS Project No.: S10-09-165  
 Checked By: AJH/R.L.P. Date: SEPT. 2010

Revision No.	Date	By	Description

DRILLING PLAN								
PROSPECT/FIELD	Indian Hill	Horizontal Middle Bakken with No Pilot		COUNTY/STATE	McKenzie ND			
OPERATOR	Oasis Petroleum	1280 Acre Spacing		RIG:	Nabors	149		
WELL NO.	Wade 5300 21-30H		LEASE	Wade				
LOCATION	30-T153N-R100W		Surface Location:	2220' FNL	230' FWL			
EST. T.D.	Lateral TD: 20,530' MD		GROUND ELEV.		2010	Plat-Finished Pad		
TOTAL LATERAL:	9,590' (est)		KB ELEV:	2035				
PROGNOSIS:	Based on 2,035' KB(est) Assumed 25' KB height for calc		LOGS:	Type	Interval			
MARKER	DEPTH	DATUM	OH Logs:	Triple Combo	From KOP to Kibbey			
Pierre	NDIC MAP	1,910	GR/Res	GR	From KOP to Base od Surface Csg			
Greenhorn		4,515			To Surface			
Mowry		4,927			Above Cement Top/ GR to BSC			
Dakota		5,366			KOP to lateral TD			
Rierdon		6,274						
Dunham Salt		6,788						
Dunham Salt Base		6,849						
Spearfish		6,868						
Pine Salt		7,172						
Pine Salt Base		7,236						
Opeche Salt		7,284						
Opeche Salt Base		7,338						
Broom Creek (Top of Minnelusa G		7,509						
Amsden		7,534						
Tyler		7,725						
Otter (Base of Minnelusa Gp.)		7,975						
Kibbey		8,279						
Charles Salt		8,416						
UB		9,066						
Base Last Salt		9,132						
Ratcliffe		9,194						
Mission Canyon		9,347						
Lodgepole		9,916						
Lodgepole Fracture Zone		10,170						
False Bakken		10,622						
Upper Bakken		10,632						
Middle Bakken		10,647						
Middle Bakken Sand Target		10,655						
Base Middle Bakken Sand Target		10,666						
Lower Bakken		10,681						
Three Forks		10,687						
Dip Rate:	0.75 ft/100 ft	Down	1					
Max. Anticipated BHP:	4603			Surface Formation:	Glacial Till			
MUD:	Interval	Type	WT	Vis	WL	Remarks		
Surface Hole:	0' - 2,010'	FW / Gel-Lime Sweeps	8.6 - 8.9	28-34	NC	Circ Mud Tanks		
Pilot Hole:	N/A	Invert	9.6-9.8	40-60	30+(HpHt)	Circ Mud Tanks		
Intermediate Hole:	2,010' - 10,940'	Invert	9.6-10.4	40-60	30+(HpHt)	Circ Mud Tanks		
Lateral:	10,940' - 20,530'	Salt Water	9.3-10.4	28-34	NC	Circ Mud Tanks		
CASING:	Size	Wt pfp	Hole	Depth	TOL:	Cement	WOC	Remarks
Surface:	9-5/8"	36	13-1/2"	2,010'	To Surface		12 hrs	
Intermediate:	7"	29/32	8-3/4"	10,940'		4860'	24 hrs	500' above Dakota
Production:								
Production Liner:	4-1/2"	11.6	6"	20,530'	TOL @ 10,125'			
PROBABLE PLUGS, IF REQ'D:								
OTHER:	MD	TVD	FNL/FSL	FEL/FWL	S-T-R	AZI		
Surface:	N/A	N/A	2220' FNL	230' FWL	30-T153N-R100W	N/A	Survey Company:	Ryan
Pilot Hole:	N/A	N/A	2220' FNL	230' FWL	30-T153N-R100W	N/A	Build Rate:	12 deg /100'
KOP:	10,177'	10,177'	2220' FNL	230' FWL	30-T153N-R100W	N/A		
EOC:	10,928'	10,655'	2220' FNL	708' FWL	30-T153N-R100W	90.0		
Casing:	10,940'	10,655'	2220' FNL	720' FWL	30-T153N-R100W	90.0	Turn Rate:	/100'
Bakken Lateral TD:	20,530'	10,727'	2220' FNL	200' FEL	29 T153N R100W	90.0		
Comments:								
DRILL TO KOP AND LOG.								
DRILL CURVE TO 90 DEG AND 7" CASING POINT.								
SET 7" CASING. DRILL MIDDLE BAKKEN LATERAL.								
MWD Surveys will be taken every 100' in vertical hole, and a minimum of every 30' while building curve and every 90' while drilling lateral								
MWD GR to be run from KOP to Lateral TD.								
<b>GR must be run to ground surface.</b>								
Lateral length calculated by: Bakken lateral TD - Csg shoe TD.								
<b>Lateral vertical change calc</b>								
TVD at end of lateral:								
Prep By:	M. M. Cowan	Date:	12/9/2010	Doc:	Wade 5300 21-30H			

## **Formation Tops**

<b>Operator:</b> <b>Well Name:</b> <b>Location:</b> <b>Elevation:</b>	<b>Subject Well:</b>  Oasis Petroleum <b>Wade 5300 21-30H</b> 2220' FNL 230' FWL SW NW 30-153N-100W GL: 2,013' Sub: 25' KB: 2,038'						
Formation/ Zone	Prog. Top	Prog. MSL Datum	Est. MD Top (ROP)	TVD Top (E-Log)	Est. MLS Datum	Thickness	Dip To <i>Uran 1-27H</i>
Kibbey Lime	8,279	-5,967'	8,279'	8,320'	-6,008'	166'	83' Low
1st Charles Salt	8,416	-6,104'	8,416'	8,486'	-6,174'	652'	71' Low
Base Last Charles Salt	9,132	-6,820'	9,132'	9,138'	-6,826'	218'	55' Low
Mission Canyon	9,347	-7,035'	9,347'	9,356'	-7,044'	266'	69' Low
Lodgepole	9,916	-7,604'	9,916'	9,622'	-7,310'	1,014'	79' Low
False Bakken	10,622	-8,310'	-	10,636'	-8,324'	12'	74' Low
Bakken Shale	10,632	-8,320'	-	10,648	-8,336'	14'	76' Low
Middle Bakken	10,655	-8,343'	-	10,662	-8,350'	-	75' Low
Target	10,666	-8,354'	-	-	-	-	-

## **Control Wells**

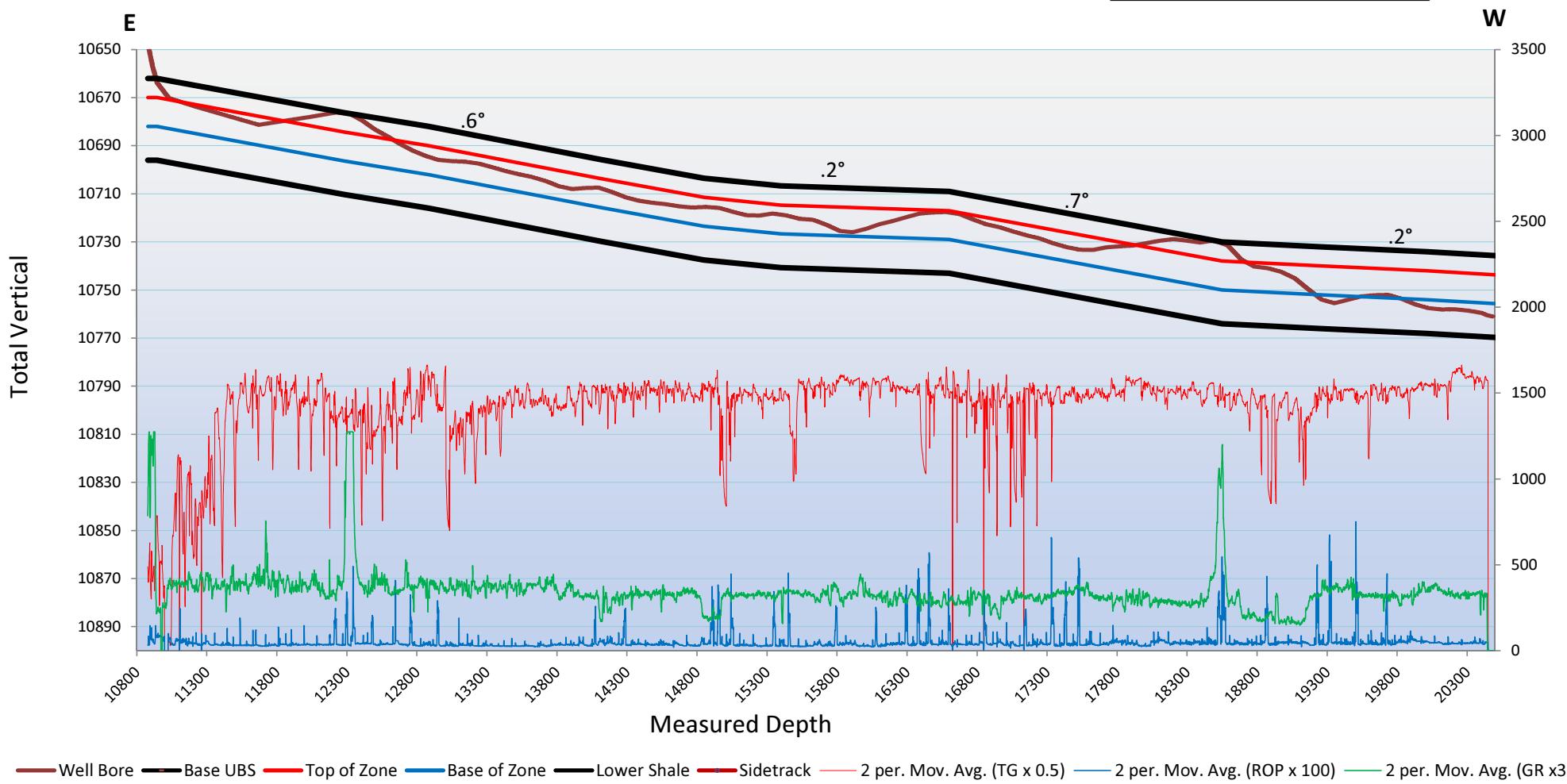
<b>Operator:</b> <b>Well Name:</b> <b>Location:</b> <b>Elevation:</b>	<b>Harper Oil Company</b> <b>Verlin Fossum Et Al 26-1</b> NW SE Sec. 26 T153N R101W McKenzie County, ND 1.4 miles west of Wade 5300 21-30H				<b>Harper Oil Company</b> <b>Federal Land Bank 1-26</b> NE NW Sec. 26 T153N R101W McKenziel County, ND 1.7 mi. NW of Wade 5300 21-30H			
Formation/ Zone	E-Log	MSL Datum	Thickness	Dist to target	E-Log	MSL Datum	Thickness	Dist to target
Charles Salt	8422	-6,247	690	2,206	8526	-6,278	682	2,208
Base of Charles Salt	9112	-6,937	767	1,516	9208	-6,960	763	1,526
Lodgepole	9879	-7,704	411	749	9971	-7,723	414	763
Lodgepole Marker A	10290	-8,115	45	338	10385	-8,137	50	349
Lodgepole Marker B	10335	-8,160	111	293	10435	-8,187	112	299
Lodgepole Marker C	10446	-8,271	22	182	10547	-8,299	22	187
Lodgepole Marker D	10468	-8,293	29	160	10569	-8,321	31	165
Lodgepole Marker E	10497	-8,322	54	131	10600	-8,352	52	134
Lodgepole Marker F	10551	-8,376	45	77	10652	-8,404	45	82
False Bakken	10596	-8,421	8	32	10697	-8,449	12	37
Upper Bakken Shale	10604	-8,429	14	24	10709	-8,461	15	25
Middle Bakken	10618	-8,443	10	10	10724	-8,476	10	10
Target	10628	-8,453	-	-	10734	-8,486	-	-



Surface: 2220' FNL & 230' FWL  
SW NW Sec. 30, T153N, R100W  
McKenzie County, ND

## Wade Federal 5300 21-30H Horizontal Cross Section

Bottom Hole Location  
23.03' S & 9971.67' E  
of surface location or approx.  
2243.03' FNL & 311.76' FEL  
SE NW Sec. 29 T153N, R100W



Survey #	Measured Depth	Inclination	Azimuth	TVD
Tie In	2018	0.00	0.00	2018.00
1	2072	0.50	126.50	2072.00
2	2168	0.30	161.70	2168.00
3	2263	0.60	226.10	2262.99
4	2359	1.00	223.50	2358.98
5	2454	1.10	227.10	2453.97
6	2550	1.30	220.40	2549.95
7	2645	1.80	222.90	2644.91
8	2740	0.80	222.50	2739.89
9	2836	0.30	237.30	2835.88
10	2931	0.50	237.80	2930.88
11	3027	0.50	249.70	3026.88
12	3122	0.30	278.30	3121.87
13	3217	0.40	275.80	3216.87
14	3313	0.40	281.10	3312.87
15	3406	0.20	326.70	3405.87
16	3501	0.20	355.20	3500.87
17	3596	0.30	353.40	3595.87
18	3692	0.20	348.10	3691.87
19	3783	0.20	18.80	3782.87
20	3878	0.20	9.40	3877.87
21	3973	0.30	11.00	3972.86
22	4069	0.20	18.10	4068.86
23	4164	0.10	356.60	4163.86
24	4259	0.10	39.30	4258.86
25	4355	0.10	337.60	4354.86
26	4450	0.10	318.10	4449.86
27	4546	0.10	257.60	4545.86
28	4641	0.20	246.60	4640.86
29	4736	0.10	222.30	4735.86
30	4832	0.20	258.70	4831.86
31	4927	0.20	192.70	4926.86
32	5023	0.30	192.80	5022.86
33	5118	0.30	144.10	5117.86
34	5213	1.50	135.90	5212.85
35	5309	1.60	136.40	5308.81
36	5404	0.90	120.90	5403.79
37	5499	0.80	117.80	5498.78
38	5595	0.80	95.80	5594.77
39	5690	0.80	90.90	5689.76
40	5786	0.90	103.80	5785.75
41	5881	1.00	123.20	5880.74
42	5977	0.80	135.50	5976.72
43	6072	0.50	131.90	6071.72
44	6167	0.50	141.30	6166.71
45	6263	0.50	118.70	6262.71
46	6358	0.30	118.50	6357.71
47	6454	0.20	217.00	6453.71
48	6549	0.30	267.60	6548.71
49	6644	0.40	269.80	6643.70

50	6740	0.60	264.60	6739.70
51	6835	0.80	273.60	6834.69
52	6931	0.70	257.30	6930.69
53	7026	0.60	263.20	7025.68
54	7121	0.50	275.60	7120.68
55	7217	0.70	290.30	7216.67
56	7312	0.80	299.80	7311.66
57	7407	0.40	325.70	7406.66
58	7503	0.20	359.10	7502.66
59	7598	0.30	4.00	7597.65
60	7693	0.20	59.70	7692.65
61	7789	0.20	199.70	7788.65
62	7884	0.50	219.70	7883.65
63	7980	0.60	216.60	7979.65
64	8076	0.80	211.40	8075.64
65	8171	0.40	209.90	8170.63
66	8264	0.30	246.70	8263.63
67	8359	0.50	221.50	8358.63
68	8455	0.30	215.80	8454.63
69	8550	0.30	195.90	8549.63
70	8646	0.30	234.90	8645.63
71	8741	0.40	265.30	8740.62
72	8837	0.20	226.70	8836.62
73	8932	0.30	248.90	8931.62
74	9028	0.40	226.60	9027.62
75	9123	0.40	224.70	9122.62
76	9218	0.30	227.30	9217.62
77	9314	0.50	229.20	9313.61
78	9409	0.60	216.10	9408.61
79	9505	0.60	222.40	9504.60
80	9601	0.60	229.80	9600.60
81	9696	0.70	230.10	9695.59
82	9792	0.70	224.90	9791.59
83	9887	0.70	227.84	9886.58
84	9983	0.80	246.50	9982.57
85	10078	0.90	240.70	10077.56
86	10124	1.00	239.40	10123.55



<b>Operator:</b> <b>Oasis Petroleum</b>	
Well : Wade 5300 21-30H	
MWD Providers	Ryan
Directional Supervision:	RPM

Section:	30	QQ:	NW	County:	McKenzie	State:	ND
Township:	153	N/S:	N	Footages:	2220	FN/SL:	N
Range:	100	E/W:	W		230	FE/WL:	W

Vertical Section Plane: **90**

*Coordinates*

#	MD	Inc.	Azm.	T.V.D.	Ver. Sect.	+N / -S	+E / -W	DLS
<b>Tie</b>	<b>10124.00</b>	<b>1.00</b>	<b>239.40</b>	<b>10123.55</b>	<b>-20.16</b>	<b>-28.59</b>	<b>-20.16</b>	
1	10178.00	1.10	128.00	10177.55	-20.16	-29.15	-20.16	3.21
2	10210.00	6.10	101.80	10209.47	-18.25	-29.69	-18.25	16.05
3	10242.00	11.30	101.20	10241.09	-13.51	-30.64	-13.51	16.25
4	10273.00	15.10	111.60	10271.27	-6.77	-32.72	-6.77	14.41
5	10305.00	18.10	128.40	10301.95	1.01	-37.35	1.01	17.60
6	10337.00	19.70	136.40	10332.23	8.62	-44.34	8.62	9.51
7	10369.00	21.10	135.60	10362.23	16.37	-52.36	16.37	4.46
8	10401.00	25.20	134.10	10391.64	25.30	-61.22	25.30	12.94
9	10433.00	30.30	132.40	10419.95	36.16	-71.41	36.16	16.13
10	10464.00	35.30	130.60	10446.00	48.75	-82.52	48.75	16.43
11	10496.00	39.50	127.50	10471.42	63.85	-94.74	63.85	14.38
12	10528.00	43.70	124.60	10495.35	81.03	-107.22	81.03	14.44
13	10560.00	47.70	121.40	10517.70	100.24	-119.67	100.24	14.40
14	10592.00	52.70	118.20	10538.18	121.57	-131.86	121.57	17.41
15	10623.00	57.10	114.20	10556.00	144.33	-143.03	144.33	17.68
16	10655.00	61.40	109.20	10572.37	169.87	-153.17	169.87	18.99
17	10687.00	65.80	104.40	10586.60	197.30	-161.42	197.30	19.22
18	10719.00	68.70	99.30	10598.98	226.17	-167.47	226.17	17.26
19	10751.00	71.50	93.60	10609.88	256.05	-170.83	256.05	18.89
20	10783.00	73.20	90.70	10619.58	286.52	-171.97	286.52	10.14
21	10814.00	72.90	90.60	10628.62	316.17	-172.31	316.17	1.02
22	10846.00	72.30	90.80	10638.19	346.70	-172.68	346.70	1.97
23	10878.00	72.00	90.80	10648.00	377.16	-173.11	377.16	0.94
24	10910.00	75.00	89.90	10657.08	407.84	-173.29	407.84	9.76
25	10942.00	80.60	88.70	10663.84	439.10	-172.91	439.10	17.88
26	10965.00	84.90	88.00	10666.75	461.90	-172.25	461.90	18.94
27	11025.00	88.60	88.00	10670.15	521.76	-170.16	521.76	6.17
28	11057.00	88.80	88.00	10670.87	553.73	-169.04	553.73	0.63
29	11120.00	89.10	88.00	10672.03	616.68	-166.84	616.68	0.48
30	11213.00	88.90	88.40	10673.65	709.62	-163.92	709.62	0.48
31	11304.00	88.50	88.70	10675.72	800.57	-161.62	800.57	0.55

32	11396.00	88.80	89.60	10677.88	892.53	-160.26	892.53	1.03
33	11488.00	88.90	89.30	10679.73	984.51	-159.37	984.51	0.34
34	11579.00	89.40	90.10	10681.08	1075.50	-158.90	1075.50	1.04
35	11670.00	90.30	90.30	10681.32	1166.49	-159.22	1166.49	1.01
36	11762.00	90.60	90.10	10680.59	1258.49	-159.54	1258.49	0.39
37	11854.00	90.60	89.30	10679.63	1350.48	-159.06	1350.48	0.87
38	11946.00	90.40	89.20	10678.83	1442.47	-157.85	1442.47	0.24
39	12037.00	90.60	88.60	10678.03	1533.45	-156.10	1533.45	0.69
40	12129.00	90.60	88.20	10677.07	1625.41	-153.54	1625.41	0.43
41	12220.00	90.50	88.80	10676.20	1716.37	-151.15	1716.37	0.67
42	12312.00	89.10	89.90	10676.52	1808.36	-150.11	1808.36	1.94
43	12404.00	87.30	90.30	10679.41	1900.31	-150.27	1900.31	2.00
44	12495.00	88.00	90.40	10683.14	1991.24	-150.83	1991.24	0.78
45	12586.00	88.30	91.30	10686.08	2082.18	-152.17	2082.18	1.04
46	12678.00	87.70	90.60	10689.29	2174.11	-153.70	2174.11	1.00
47	12769.00	88.80	89.30	10692.07	2265.06	-153.62	2265.06	1.87
48	12861.00	88.50	89.90	10694.23	2357.03	-152.98	2357.03	0.73
49	12952.00	89.40	88.90	10695.90	2448.01	-152.02	2448.01	1.48
50	13046.00	90.00	88.80	10696.39	2541.99	-150.14	2541.99	0.65
51	13142.00	89.70	88.70	10696.65	2637.97	-148.04	2637.97	0.33
52	13238.00	89.40	88.60	10697.40	2733.94	-145.78	2733.94	0.33
53	13333.00	88.80	87.50	10698.89	2828.87	-142.55	2828.87	1.32
54	13429.00	89.30	88.80	10700.48	2924.80	-139.45	2924.80	1.45
55	13524.00	89.10	88.90	10701.81	3019.78	-137.55	3019.78	0.24
56	13620.00	89.50	88.40	10702.98	3115.74	-135.28	3115.74	0.67
57	13725.00	88.50	88.40	10704.82	3220.68	-132.35	3220.68	0.95
58	13811.00	88.80	88.50	10706.84	3306.63	-130.03	3306.63	0.37
59	13907.00	89.80	88.70	10708.01	3402.59	-127.68	3402.59	1.06
60	14002.00	90.70	88.20	10707.60	3497.55	-125.11	3497.55	1.08
61	14097.00	89.50	87.80	10707.43	3592.49	-121.80	3592.49	1.33
62	14193.00	88.30	86.90	10709.28	3688.37	-117.36	3688.37	1.56
63	14289.00	89.10	87.70	10711.46	3784.24	-112.84	3784.24	1.18
64	14385.00	89.20	87.10	10712.88	3880.13	-108.48	3880.13	0.63
65	14481.00	89.80	87.90	10713.72	3976.03	-104.30	3976.03	1.04
66	14576.00	89.50	87.20	10714.30	4070.94	-100.24	4070.94	0.80
67	14671.00	89.40	86.30	10715.21	4165.78	-94.85	4165.78	0.95
68	14767.00	90.00	84.50	10715.71	4261.47	-87.15	4261.47	1.98
69	14863.00	90.30	85.50	10715.46	4357.10	-78.78	4357.10	1.09
70	14959.00	89.20	87.80	10715.88	4452.93	-73.18	4452.93	2.66
71	15054.00	88.90	90.20	10717.46	4547.89	-71.52	4547.89	2.55
72	15150.00	89.40	89.90	10718.88	4643.88	-71.60	4643.88	0.61
73	15245.00	90.40	90.50	10719.05	4738.88	-71.93	4738.88	1.23
74	15340.00	90.60	90.00	10718.22	4833.88	-72.35	4833.88	0.57
75	15436.00	88.50	89.40	10718.97	4929.87	-71.84	4929.87	2.28

76	15531.00	89.80	89.90	10720.38	5024.85	-71.26	5024.85	1.47
77	15627.00	89.70	88.40	10720.80	5120.84	-69.84	5120.84	1.57
78	15722.00	87.80	86.30	10722.87	5215.70	-65.45	5215.70	2.98
79	15818.00	89.10	87.30	10725.47	5311.52	-60.09	5311.52	1.71
80	15913.00	90.30	88.70	10725.96	5406.45	-56.78	5406.45	1.94
81	16008.00	91.40	88.30	10724.56	5501.41	-54.29	5501.41	1.23
82	16103.00	90.90	89.10	10722.65	5596.36	-52.14	5596.36	0.99
83	16198.00	90.70	88.40	10721.32	5691.33	-50.07	5691.33	0.77
84	16294.00	91.20	88.40	10719.73	5787.28	-47.39	5787.28	0.52
85	16388.00	90.60	89.60	10718.25	5881.25	-45.75	5881.25	1.43
86	16483.00	90.00	89.00	10717.76	5976.24	-44.58	5976.24	0.89
87	16578.00	90.20	88.80	10717.59	6071.22	-42.76	6071.22	0.30
88	16674.00	88.80	89.90	10718.43	6167.21	-41.67	6167.21	1.85
89	16769.00	88.50	88.80	10720.67	6262.18	-40.59	6262.18	1.20
90	16864.00	89.10	90.10	10722.66	6357.15	-39.68	6357.15	1.51
91	16960.00	89.40	90.40	10723.91	6453.14	-40.10	6453.14	0.44
92	17055.00	88.50	89.50	10725.65	6548.12	-40.02	6548.12	1.34
93	17149.00	89.60	89.10	10727.21	6642.10	-38.87	6642.10	1.25
94	17245.00	88.80	87.90	10728.55	6738.06	-36.36	6738.06	1.50
95	17341.00	88.80	88.00	10730.56	6833.97	-32.92	6833.97	0.10
96	17437.00	89.30	88.80	10732.16	6929.92	-30.24	6929.92	0.98
97	17533.00	89.40	88.20	10733.24	7025.88	-27.73	7025.88	0.63
98	17629.00	90.50	88.90	10733.33	7121.85	-25.30	7121.85	1.36
99	17724.00	90.80	88.40	10732.25	7216.82	-23.06	7216.82	0.61
100	17819.00	89.70	87.10	10731.84	7311.74	-19.34	7311.74	1.79
101	17915.00	90.70	88.20	10731.50	7407.65	-15.40	7407.65	1.55
102	18011.00	90.50	87.20	10730.50	7503.57	-11.55	7503.57	1.06
103	18106.00	90.70	87.90	10729.50	7598.48	-7.49	7598.48	0.77
104	18202.00	90.10	87.70	10728.83	7694.40	-3.80	7694.40	0.66
105	18298.00	89.10	86.80	10729.50	7790.29	0.81	7790.29	1.40
106	18394.00	90.00	86.90	10730.25	7886.14	6.08	7886.14	0.94
107	18490.00	91.00	87.40	10729.42	7982.02	10.85	7982.02	1.16
108	18586.00	86.60	89.50	10731.43	8077.93	13.45	8077.93	5.08
109	18681.00	86.40	89.20	10737.23	8172.75	14.53	8172.75	0.38
110	18777.00	90.00	90.50	10740.24	8268.68	14.78	8268.68	3.99
111	18873.00	89.20	91.20	10740.91	8364.67	13.35	8364.67	1.11
112	18968.00	89.00	91.10	10742.40	8459.64	11.45	8459.64	0.24
113	19064.00	87.80	90.60	10745.08	8555.59	10.02	8555.59	1.35
114	19159.00	86.80	90.90	10749.56	8650.47	8.78	8650.47	1.10
115	19255.00	88.00	90.20	10753.91	8746.37	7.86	8746.37	1.45
116	19351.00	90.10	91.80	10755.51	8842.33	6.18	8842.33	2.75
117	19446.00	91.60	93.50	10754.10	8937.21	1.79	8937.21	2.39
118	19542.00	90.10	92.40	10752.67	9033.07	-3.15	9033.07	1.94
119	19637.00	90.50	92.10	10752.18	9127.99	-6.88	9127.99	0.53

120	19733.00	89.70	92.50	10752.01	9223.92	-10.73	9223.92	0.93
121	19827.00	88.40	90.90	10753.57	9317.86	-13.52	9317.86	2.19
122	19923.00	88.80	90.70	10755.91	9413.82	-14.86	9413.82	0.47
123	20019.00	89.30	91.60	10757.50	9509.78	-16.78	9509.78	1.07
124	20115.00	90.00	92.10	10758.09	9605.73	-19.88	9605.73	0.90
125	20211.00	90.10	91.10	10758.01	9701.69	-22.56	9701.69	1.05
126	20306.00	89.20	90.00	10758.59	9796.68	-23.48	9796.68	1.50
127	20401.00	89.20	89.70	10759.91	9891.68	-23.23	9891.68	0.32
128	20433.00	89.20	89.90	10760.36	9923.67	-23.12	9923.67	0.62
129	20481.00	89.20	89.90	10761.03	9971.67	-23.03	9971.67	0.00

# **Wade Federal 5300 21-30H**

## **LITHOLOGY**

*Rig crews caught lagged samples in 30' intervals in the vertical hole from 8,250 to 10,710' MD and through the lateral from 11.020 to 19,807' total depth (TD) with 10' samples taken from 10,710' to 11,020'*

*Electric geophysical log, sample and/or MWD gamma ray markers and tops are included in the sample descriptions below for reference. Samples were examined wet and dry under a binocular microscope and checked for hydrocarbon cut fluorescence with Carbo-sol (trichloroethylene) in approximately 30' intervals. Sample descriptions begin just above the **Kibbey Lime Formation**. The drilling fluid was diesel invert during vertical and curve build sections to ICP and salt water brine throughout the lateral to TD.*

### **Drilling vertical hole above the Kibbey Lime Formation**

8250-8280 SHALE: orange to rounded, light brown in part, trace light gray, firm to soft, sub blocky to sub platy, earthy texture, slightly to moderately calcareous, silty in part;  
SILTSTONE: orange to rounded, very fine grained, friable, sub round, very well sorted, calcareous cement

8280-8320 SHALE: orange to rounded, light brown in part, trace light gray, firm to soft, sub blocky to sub platy, earthy texture, slightly to moderately calcareous, silty in part;  
SILTSTONE: orange to rounded, very fine grained, friable, sub round, very well sorted, calcareous cement

### **Kibbey Lime**

**8,320 TVD (-6,282')**

8320-8334 ANHYDRITE: reddish orange, white, soft, amorphous texture

8334-8354 LIMESTONE: wackestone, off white, cream, light brown, firm to hard, microcrystalline, crystalline texture, common fossils fragment, good visible porosity;

8354-8380 SHALE: orange to rounded, light brown gray, firm to soft, sub blocky to sub platy, earthy texture, slightly to moderately calcareous, silty in part; SILTSTONE: orange to rounded, very fine grained, friable, sub round, very well sorted, calcareous cement

8380-8400 SHALE: orange to rounded, trace light gray, firm to soft, sub blocky to sub platy, earthy texture, slightly to moderately calcareous, silty in part; ANHYDRITE: milky white, microcrystalline, very soft, massive, amorphous texture

8400-8430 SHALE: orange to rounded, trace light gray, firm to soft, sub blocky to sub platy, earthy texture, slightly calcareous, silty in part, SILTSTONE: orange to rounded, very fine grained, friable, sub round, very well sorted, calcareous cement

8444-8462 Salt: clear, milky, translucent, crystalline, hard, euhedral to subhedral, crystalline texture; SHALE: orange to rounded, trace light gray, firm to soft, sub blocky to sub platy, earthy texture, slightly calcareous, silty in part, Trace ANHYDRITE

8462-8486 SHALE: orange to rounded, light brown gray, firm to soft, sub blocky to sub platy, earthy texture, slightly to moderately calcareous

**Charles Salt Formation**

**8,486 TVD (-6,448')**

8476-8520 Salt: clear, milky, translucent, crystalline, hard, euhedral to subhedral, crystalline texture

8520-8550 Salt: clear, milky, translucent, crystalline, hard, euhedral to subhedral, crystalline texture

8550-8600 Salt: milky, translucent, crystalline, hard, anhedral to subhedral, crystalline texture; ANHYDRITE: white, gray, cryptocrystalline, soft, amorphous text

8600-8652 SALT: as above

8652-8672 SHALE: orange to rounded, light brown gray, firm to soft, sub blocky to sub platy, earthy texture, slightly to moderately calcareous

8672-8686 Salt: milky, translucent, crystalline, hard, anhedral to subhedral, crystalline texture

8686-8700 SHALE: as above

8708-8734 SALT: as above; ARGILLACIOUS LIMESTONE: mudstone, light brown, gray, cryptocrystalline to microcrystalline, firm to earthy to chalky texture, no visible porosity

8734-8750 SALT: as above

8750-8790 LIMESTONE: mudstone to wackestone, medium brown, gray, microcrystalline, firm, microcrystalline texture, trace fossils fragment, abundant pellets, visible sparry calcareous, possible very weak oil stain, no visible porosity

8790-8832 Salt: milky, translucent, crystalline, hard, anhedral to subhedral, crystalline texture

8832-8870 LIMESTONE: mudstone to wackestone, light to dark brown, microcrystalline, firm, microcrystalline texture, abundant algal matt, visible sparry calcareous, siliceous in part, mottled appearance, visible dead oil stain, no visible porosity, possible fracture porosity

8870-8896 LIMESTONE: mudstone, light to medium gray, soft, microcrystalline texture, trace fossils fragment, very lite disseminated pyrite, no visible porosity; interbedded white anhydrite in part

8896-8920 ANHYDRITE: white, dark gray, soft, cryptocrystalline, amorphous texture

8920-8930 SHALE: white, trace dark gray, firm to soft, sub blocky, earthy texture

8930-8956 Salt: milky, translucent, crystalline, hard, anhedral to subhedral, crystalline texture

8956-8978 ANHYDRITE as above; SHALE: white, trace dark gray, firm to soft, sub blocky, earthy texture

8978-9006 LIMESTONE: mudstone, tan to light brown, firm, microcrystalline texture, trace fossils fragment, very common algal matt, trace dead oil stain, no visible porosity

9000-9050 LIMESTONE: mudstone to wackestone, cream to light brown, trace light gray, firm, microcrystalline texture, trace fossils fragment, very lite disseminated pyrite, no visible porosity

9050-9052 ANHYDRITE: white, dark gray, soft, cryptocrystalline, amorphous texture

90602-9096 LIMESTONE: mudstone to wackestone, cream to light brown, trace light gray, firm, microcrystalline texture, trace fossils fragment, very lite disseminated pyrite, no visible porosity; SHALE: white, trace dark gray, firm to soft, sub blocky, earthy texture

9096-9137 Salt: milky, translucent, crystalline, hard, anhedral to subhedral, crystalline texture

**Base Charles Salt**

**9,137' TVD (-7,099)**

9137-9184 LIMESTONE: mudstone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace sparry calcite, no visible porosity, no visible oil stain; ANHYDRITE: cream to white, cryptocrystalline, very soft, amorphous text

9184-9210 LIMESTONE: mudstone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace sparry calcite, no visible porosity, no visible oil stain; ANHYDRITE: cream to white, cryptocrystalline, very soft, amorphous text

9210-9240 ARGILLACIOUS LIMESTONE: mudstone to wackestone, light to dark brown, microcrystalline, firm, microcrystalline texture, abundant algal matt, mottled appearance, visible dead oil stain, no visible porosity; ANHYDRITE: cream to white, cryptocrystalline, very soft, amorphous text

9240-9270 ARGILLACIOUS LIMESTONE: mudstone to wackestone, light to dark brown, microcrystalline, firm, microcrystalline texture, abundant algal matt, mottled appearance, visible dead oil stain, no visible porosity; ANHYDRITE: cream to white, cryptocrystalline, very soft, amorphous text

9270-9300 ARGILLACIOUS LIMESTONE: mudstone to wackestone, light to dark brown, light gray, microcrystalline, firm to soft, microcrystalline texture, trace calcite fracture fill, mottled appearance, visible dead oil stain, no visible porosity, possible fracture porosity

9300-9330 ARGILLACIOUS LIMESTONE: mudstone to wackestone, light to dark brown, light gray, cream, microcrystalline, firm to soft, microcrystalline texture, trace calcite fracture fill, mottled appearance, visible dead oil stain, no visible porosity, possible fracture porosity

9330-9360 LIMESTONE: mudstone to wackestone, light gray, dark gray, light brown, cream, microcrystalline, firm to soft, microcrystalline texture, abundant algal matt, mottled appearance, trace visible dead oil stain, no visible porosity, possible fracture porosity, Trace DOLOMITE LIMESTONE

**Mission Canyon Formation**

**9,356' TVD (-7,318')**

9360-9390 LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace sparry calcite, trace fossils fragment, no visible porosity, no visible oil stain; Trace ANHYDRITE

9390-9420 LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace sparry calcite, trace fossils fragment, no visible porosity, no visible oil stain; Trace ANHYDRITE

9420-9450 LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace sparry calcite, trace fossils fragment, no visible porosity, no visible oil stain; Trace ANHYDRITE

9450-9480 LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace calcareous fracture fill, trace fossils fragment, no visible porosity, no visible oil stain

9480-9510 LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace calcareous fracture fill, trace fossils fragment, no visible porosity, no visible oil stain

9510-9540 LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, earthy texture, trace calcareous fracture fill, trace fossils fragment, no visible porosity, no visible oil stain

9540-9600 LIMESTONE: mudstone to wackestone, mottled gray to brown, light gray, microcrystalline, firm to soft, crystalline texture, trace calcareous fracture fill, visible sparry calcareous, trace fossils fragment, common algal matt, visible dead oil stain, no visible porosity

9600-9630 LIMESTONE: mudstone to wackestone, medium to dark gray, brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, very trace fossils fragment, common algal matt, visible dead oil stain, no visible porosity

9630-9660 LIMESTONE: mudstone to wackestone, medium to dark gray, brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, very trace fossils fragment, increase algal matt, very weak disseminated pyrite, visible dead oil stain, no visible porosity

9660-9700 LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, abundant algal matt, very weak disseminated pyrite, common dead oil stain, no visible porosity

9690-9720 LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, common algal matt, very weak disseminated pyrite, common dead oil stain, no visible porosity

9720-9760 LIMESTONE: mudstone to wackestone, medium to dark gray, brown, trace black, microcrystalline, firm, crystalline texture, visible sparry calcareous, common algal matt, very weak disseminated pyrite, common dead oil stain, no visible porosity

9760-9800 LIMESTONE: mudstone to wackestone, black, medium to dark gray, trace brown, microcrystalline, firm, crystalline texture, visible sparry calcareous, abundant algal matt, common dead oil stain, no visible porosity

9800-9840 LIMESTONE: mudstone to wackestone, black, medium to dark gray, trace brown, microcrystalline, firm, crystalline texture, visible sparry calcareous, abundant algal matt, common dead oil stain, no visible porosity

9840-9870 LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, common algal matt, no visible porosity

9870-9900 LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

9900-9934 LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

**Lodgepole Formation** **9,934' TVD (-7,896')**

9934-9960 LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

9960-9990 LIMESTONE: mudstone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcareous, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity; Trace DOLOMITE LIMESTONE

9990-10020 DOLOMITE LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, visible sparry calcite, moderately algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

10020-10050 DOLOMITE LIMESTONE: mudstone to wackestone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm to soft, trace hard, crystalline texture, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

10050-10080 LIMESTONE: mudstone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm, crystalline texture, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

10080-10110 LIMESTONE: mudstone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm to soft, trace hard, crystalline texture, visible sparry calcareous, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

10110-10140 LIMESTONE: mudstone, medium to dark gray, black, trace brown, trace cream, microcrystalline, firm to soft, smooth hard, crystalline texture, trace algal matt, visible fossils fragment, trace dead oil stain, no visible porosity

10140-10170 DOLOMITE LIMESTONE: mudstone, medium to dark gray, black, trace brown, trace cream, firm to soft, crystalline texture, trace algal matt, trace visible fossils fragment, trace dead oil stain, no visible porosity

10170-10200 DOLOMITE LIMESTONE: mudstone, light gray to brown, dark gray in part, microcrystalline to very fine crystalline, hard to firm, earthy texture, trace sparry calcite, no visible porosity, trace light brown oil stain

10200-10250 ARGILLACEOUS LIMESTONE: mudstone, light gray to brown, dark gray in part, microcrystalline, hard to firm, earthy texture, trace algal matt, no visible porosity, trace light brown oil stain

10250-10300 ARGILLACEOUS LIMESTONE: mudstone, light gray to brown, dark gray in part, microcrystalline, hard to firm, earthy texture, trace sparry calcite, no visible porosity

10300-10350 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray to brown, microcrystalline to cryptocrystalline, hard, earthy texture, trace sparry calcite, rare disseminated pyrite, no visible porosity

10350-10400 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, trace sparry calcite, no visible porosity

10400-10450 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, trace sparry calcite, no visible porosity

10450-10500 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, trace sparry calcite, no visible porosity

10500-10550 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, trace sparry calcite, no visible porosity

10550-10600 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, trace sparry calcite, no visible porosity

10600-10650 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, trace sparry calcite, no visible porosity

10650-10700 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, no visible porosity

10700-10740 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, no visible porosity

10740-10750 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, no visible porosity

10750-10800 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, no visible porosity

10840-10850 SHALE: very dark gray to brown, sub blocky to blocky, friable to firm, smooth hard, waxy texture, calcareous, occasional disseminated pyrite, no visible oil stain

10810-10840 ARGILLACEOUS LIMESTONE: mudstone, gray to brown, occasional dark gray, microcrystalline to cryptocrystalline, hard, earthy texture, no visible porosity

**Lodgepole False Bakken Marker                    10,840' MD / 10,636' TVD (-8,598')**

10876-10900 SHALE: very dark brown, black, sub blocky to blocky, friable, hard, waxy texture, slightly calcareous, trace disseminated and nodules pyrite, carbonaceous, abundant visible oil stain, possible fracture porosity

10850-10876 LIMESTONE: mudstone to wackestone, gray to brown, occasional dark gray to brown, microcrystalline to very fine crystalline, hard, earthy texture, trace sparry calcite, trace disseminated pyrite, no visible porosity, trace light brown oil stain

**Bakken Formation, Upper Shale                    10,876 MD / 10,648 TVD (-8,610')**

10910-10944 SHALE: very dark brown, black, sub blocky to blocky, friable, hard, waxy texture, slightly calcareous, trace disseminated and nodules pyrite, carbonaceous, abundant visible oil stain, possible fracture porosity

**Bakken Formation, Middle Member****10,944' MD / 10,662' TVD (-8,624')**

10944-10970 SILTSTONE: white to off white, light gray, very fine grained, firm to friable, sub rounded to sub angular, vitreous, slightly to n calcareous, well sorted, poor cemented, trace disseminated pyrite, trace patchy oil stain, trace intergranular porosity

10970-11000 SILTSTONE: white to off white, light gray, very fine grained, friable, sub rounded to sub angular, slightly calcareous, vitreous, very well sorted, poor cemented, trace disseminated and nodules pyrite, common patchy oil stain, trace intergranular porosity

11000-11023 SILTY SANDSTONE: white to off white, light gray, very fine grained, friable, sub rounded, vitreous, well sorted, slightly to n calcareous, poor cemented, common patchy oil stain, trace intergranular porosity

11023-11050 SILTY SANDSTONE: light to medium gray, off white, firm to friable, sub rounded to sub angular, moderately sorted, trace disseminated pyrite, calcite to dolomite cement, trace intergranular porosity, trace oil stain

11050-11100 SILTY SANDSTONE: light to medium gray, off white, firm to friable, sub rounded to sub angular, moderately sorted, trace disseminated pyrite, calcite to dolomite cement, trace intergranular porosity, trace oil stain, slightly faint white diffuse cut

11100-11150 SILTY SANDSTONE: light to medium gray, off white, firm to friable, sub rounded to sub angular, moderately sorted, trace disseminated pyrite, calcite to dolomite cement, trace intergranular porosity, trace oil stain, slightly faint white diffuse cut

11150-11200 SILTY SANDSTONE: light to medium gray, off white, firm to friable, sub rounded to sub angular, moderately sorted, trace disseminated pyrite, calcite to dolomite cement, trace intergranular porosity, trace oil stain, slightly faint white diffuse cut

11200-11250 SILTY SANDSTONE: white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, trace disseminated pyrite, calcite to dolomite cement, trace intergranular porosity, trace oil stain, slightly faint white diffuse cut

11250-11300 SILTY SANDSTONE: white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, trace disseminated pyrite, calcite to dolomite cement, trace intergranular porosity, trace light brown oil stain, slightly faint white diffuse cut

11300-11350 SILTY SANDSTONE: white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace intergranular porosity, trace light brown oil stain, slightly faint white diffuse cut

11350-11400 SILTY SANDSTONE: white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace to occasional disseminated and nodules pyrite, trace intergranular porosity, trace light brown oil stain, slightly faint white diffuse cut

11400-11450 SILTY SANDSTONE: white, light to medium gray, tan to brown, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace to occasional disseminated and nodules pyrite, trace intergranular porosity, trace light brown oil stain, slightly faint white diffuse cut, very slightly streaming cut

11450-11500 SILTY SANDSTONE: tan to brown, white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, trace intergranular porosity, trace light brown oil stain, slightly faint white diffuse cut, very slightly streaming cut

11500-11550 SILTY SANDSTONE: tan to brown, white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, trace intergranular porosity, trace light brown oil stain, slightly faint white diffuse cut, very slightly streaming cut

11550-11600 SILTY SANDSTONE: tan to brown, white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, occasional disseminated and nodules pyrite, trace intergranular porosity, moderately light brown oil stain, slightly faint white diffuse cut, very slightly streaming cut

11600-11650 SILTY SANDSTONE: tan to brown, white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, occasional disseminated and nodules pyrite, occasional intergranular porosity, moderately light brown oil stain, slightly faint white diffuse cut

11650-11700 SILTY SANDSTONE: tan to brown, white, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, occasional disseminated and nodules pyrite, trace to occasional intergranular porosity, moderately light brown oil stain, slightly faint white diffuse cut

11700-11750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, occasional intergranular porosity, abundant light brown oil stain, moderately fast white diffuse cut

11750-11800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, occasional disseminated and nodules pyrite, occasional intergranular porosity, abundant light brown oil stain, slightly faint white diffuse cut, very slightly streaming cut

11800-11850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, trace intergranular porosity, abundant light brown oil stain, slightly faint white to yellow diffuse cut, very slightly streaming cut

11850-11900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, trace intergranular porosity, abundant light brown oil stain, slightly faint white to yellow diffuse cut

11900-11950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, trace intergranular porosity, trace light brown oil stain, slightly faint white to yellow diffuse cut, very slightly faint streaming cut

11950-12000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, trace intergranular porosity, trace light brown oil stain, slightly faint white to yellow cut

12000-12050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, trace to occasional intergranular porosity, trace light brown oil stain, slightly faint white to yellow diffuse cut

12050-12100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace to occasional intergranular porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12100-12150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace intergranular porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12150-12200 SILTSTONE: white to off white, light gray, very fine grained, friable, sub rounded to sub angular, slightly calcareous, vitreous, very well sorted, poor cemented, trace disseminated and nodules pyrite, common patchy oil stain, trace intergranular porosity, possible fracture porosity, weak slightly diffuse cut

12200-12250SILTSTONE: white to off white, light gray, very fine grained, friable, sub rounded to sub angular, slightly calcareous, vitreous, very well sorted, poor cemented, trace disseminated and nodules pyrite, common patchy oil stain, trace intergranular porosity

12285-12300 SHALE: very dark brown, black, sub blocky to blocky, friable, hard, waxy texture, slightly calcareous, trace disseminated and nodules pyrite, carbonaceous, abundant visible oil stain, possible fracture porosity

12250-12285 SILTSTONE: white to off white, light gray, very fine grained, friable, sub rounded to sub angular, slightly calcareous, very well sorted, poor cemented, trace disseminated and nodules pyrite, common patchy oil stain, trace intergranular porosity

12300-12365 SHALE: very dark brown, black, sub blocky to blocky, friable, hard, waxy texture, slightly calcareous, trace disseminated and nodules pyrite, carbonaceous, abundant visible oil stain, possible fracture porosity

12365-12400 SILTSTONE: white to off white, light gray, very fine grained, friable, sub rounded to sub angular, slightly calcareous, very well sorted, poor cemented, trace disseminated and nodules pyrite, common patchy oil stain, trace intergranular porosity

12400-12450 SILTSTONE: white to off white, light gray, very fine grained, friable, sub rounded to sub angular, slightly calcareous, vitreous, very well sorted, poor cemented, trace disseminated and nodules pyrite, common patchy oil stain, trace intergranular porosity

12470-12500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12450-12470 SILTSTONE: white to off white, light gray, very fine grained, friable, sub rounded to sub angular, slightly calcareous, vitreous, very well sorted, poor cemented, trace disseminated and nodules pyrite, common patchy oil stain, trace intergranular porosity

12500-12550 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12550-12600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12600-12650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12650-12700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12700-12750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12750-12800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12800-12850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12850-12900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12900-12950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

12950-13000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13000-13050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13050-13100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13100-13150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13150-13200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13200-13250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13250-13300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13300-13350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13350-13400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13400-13450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13450-13500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13500-13550 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13550-13600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13600-13650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13650-13700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13700-13750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13750-13800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13800-13850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13850-13900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13900-13950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

13950-14000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14000-14050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14050-14100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14100-14150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14150-14200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14200-14250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14250-14300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14300-14350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14350-14400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14400-14450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14450-14500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14500-14550 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14550-14600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14600-14650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14650-14700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14700-14750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14750-14800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

14800-14850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, trace light brown oil stain, slightly faint white to yellow diffuse cut

14850-14900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, trace light brown oil stain, slightly faint white to yellow diffuse cut

14900-14950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, trace light brown oil stain, slightly faint white to yellow diffuse cut, slightly steaming cut

14950-15000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, trace light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

15000-15050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15050-15100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15100-15150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace to common disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15150-15200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15200-15250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15250-15300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

15300-15350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15350-15400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15400-15450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse

15450-15500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15500-15550 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15550-15600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15600-15650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15650-15700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15700-15750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15750-15800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15800-15850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15850-15900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15900-15950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

15950-16000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16000-16050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16050-16100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16100-16150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16150-16200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16200-16250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16250-16300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16300-16350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16350-16400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16400-16450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16450-16500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, trace streaming cut

16500-16050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16550-16600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16600-16650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16650-16700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, moderately slightly streaming cut

16700-16750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16750-16800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16800-16850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

16850-16900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

16900-16950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, trace slightly to moderately streaming cut

16950-17000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

17000-17050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

17050-17100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

17100-17150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

17150-17200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

17200-17250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17250-17300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17300-17350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17350-17400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17400-17450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17450-17500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17500-17550 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17550-17600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17600-17650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17650-17700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17700-17750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17750-17800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17800-17850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17850-17900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17900-17950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

17950-18000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

18000-18050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

18050-18100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18100-18150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

18150-18200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

18200-18250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18250-18300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18300-18350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18350-18400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18400-18450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18450-18500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18500-18550 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18550-18600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18600-18650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18650-18700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18700-18750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

18750-18800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodular pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

18800-18850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated and nodules pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut, slightly streaming cut

18850-18900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18900-18950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

18950-19000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19000-19050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19050-19100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19100-19150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19150-19200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19200-19250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19250-19300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19300-19350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19350-19400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19400-19450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19450-19500 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19500-19550 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19550-19600 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19600-19650 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19650-19700 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19700-19750 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19750-19800 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19800-19850 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19850-19900 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19900-19950 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

19950-20000 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20000-20050 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20050-20100 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20100-20150 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20150-20200 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20200-20250 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20250-20300 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20300-20350 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20350-20400 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20400-20450 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

20450-20481 SILTY SANDSTONE: white, tan to brown, light to medium gray, firm to friable, sub rounded to sub angular, moderately sorted, calcite to dolomite cement, trace disseminated pyrite, vitreous texture, trace intergranular porosity, possible fracture porosity, moderately light brown oil stain, slightly faint white to yellow diffuse cut

**20,481 TD reached @ 0115 hrs MST, 23 Apr. 2011**

# ELECTRIC LOG REPORT

<b>LOGGING COMPANY:</b>	Weatherford	<b>DRILLER'S TD DEPTH:</b>	10,172'
<b>ENGINEERS:</b>	J. Ornquist /D. Naasz	<b>DRILLER'S CASING DEPTH:</b>	2,018'
<b>WITNESSED BY:</b>	D. Ramsdell / Joe Large	<b>LOGGER'S TD DEPTH:</b>	10,181'
<b>DATE:</b>	13 April 2011	<b>LOGGER'S CASING DEPTH:</b>	2,018'

<b>ELEVATION:</b>	GL: 2,013'	<b>MUD CONDITIONS:</b>	Wt: 9.8 lbm/gal
	KB: 2,038'	Oil Based Mud	Vis: 55 s
<b>HOLE CONDITION:</b>	Run #1: Pulled good	<b>TECHNICAL PROBLEMS:</b>	No problems.

## Logging Time:

Time arrived:	01:00 Hrs 13 April 2011	Job ended:	06:00 Hrs on 13 April 2011
Job started:	01:30 Hrs on 13 April 2011	Time Departed:	10:00 Hrs on 13 April 2011

## Electric Logging Program:

### Array Induction Log with gamma

Interval logged = 2,018' - 10,172'  
 Grain density = 2.71 g/cc  
 Resistivity scale = .20 to 2000 Ohms

### Compensated neutron log 3 detector density with gamma

Interval logged = 5,300' - 10,166'  
 Grain density = 2.71 g/cc  
 Porosity scale =30.00 to -10.0

## Formation Tops

	<b>TVD</b>	<b>Sub Sea</b>
Greenhorn	4,536'	-2,224'
Mowry	4,960'	-2,648'
Dakota	5,381'	-3,069'
Rierdon	6,295'	-3,983'
Dunham Salt	6,737'	-4,425'
Dunham Salt Base	6,768'	-4,456'
Spearfish	6,832'	-4,520'
Pine Salt	7,183'	-4,871'
Pine Salt Base	7,203'	-4,891'
Kibby Lime	8,320'	-6,008'
Charles Salt	8,486'	-6,174'
Base Charles Salt	9,138'	-6,826'
Mission Canyon	9,356'	-7,044'
Lodgepole	9,622'	-7,310'

### COMMENTS:

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# Oil and Gas Division

20197

Lynn D. Helms - Director

Bruce E. Hicks - Assistant Director

**Department of Mineral Resources**

Lynn D. Helms - Director

**North Dakota Industrial Commission**

[www.dmr.nd.gov/oilgas](http://www.dmr.nd.gov/oilgas)

January 8, 2016

Michael Kukuk  
OASIS PETRO NO AMER  
1001 FANNIN ST. SUITE 1500  
HOUSTON, TX 77002

RE: See Attached List of Wells  
*List Reference WF# 20197*

Dear Michael Kukuk:

We have not received the geological reports on the referenced well list. Please submit one paper copy and one digital pdf file of this report for each well.

If you have any questions, please contact Richard Suggs at (701) 328-8020.

Sincerely,

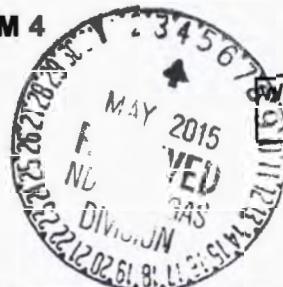
Taylor Roth  
Engineering Technician



# SUNDRY NOTICES AND REPORTS ON WELLS - FORM 4

INDUSTRIAL COMMISSION OF NORTH DAKOTA  
OIL AND GAS DIVISION  
600 EAST BOULEVARD DEPT 405  
BISMARCK, ND 58505-0840  
SFN 5749 (09-2006)

Well File No.  
**20197**



PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.

PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

<input type="checkbox"/> Notice of Intent	Approximate Start Date	<input type="checkbox"/> Drilling Prognosis	<input type="checkbox"/> Spill Report
<input checked="" type="checkbox"/> Report of Work Done	Date Work Completed <b>October 29, 2011</b>	<input type="checkbox"/> Redrilling or Repair	<input type="checkbox"/> Shooting
<input type="checkbox"/> Notice of Intent to Begin a Workover Project that may Qualify for a Tax Exemption Pursuant to NDCC Section 57-51.1-03.	Approximate Start Date	<input type="checkbox"/> Casing or Liner	<input type="checkbox"/> Acidizing
		<input type="checkbox"/> Plug Well	<input type="checkbox"/> Fracture Treatment
		<input type="checkbox"/> Supplemental History	<input checked="" type="checkbox"/> Change Production Method
		<input type="checkbox"/> Temporarily Abandon	<input type="checkbox"/> Reclamation
		<input type="checkbox"/> Other	<b>Well is now on pump</b>

Well Name and Number

**Wade Federal 5300 21-30H**

Footages	Qtr-Qtr	Section	Township	Range
2220 F N L	230 F W L	LOT 2	30	153 N 100 W
Field <b>Baker</b>	Pool <b>Bakken</b>		County <b>McKenzie</b>	

## 24-HOUR PRODUCTION RATE

Before		After	
Oil	Bbls	Oil	Bbls
Water	Bbls	Water	Bbls
Gas	MCF	Gas	MCF

Name of Contractor(s)

Address	City	State	Zip Code
---------	------	-------	----------

## DETAILS OF WORK

**Effective 10/29/11 the above referenced well is on pump.**

**End of Tubing: 2-7/8" L-80 tubing @ 10,080'**

**Pump: 2-1/2" x 2.0" x 24' insert pump @ 9,898'**

Company <b>Oasis Petroleum North America LLC</b>	Telephone Number <b>281-404-9652</b>	
Address <b>1001 Fannin, Suite 1500</b>		
City <b>Houston</b>	State <b>TX</b>	Zip Code <b>77002</b>
Signature 	Printed Name <b>Victoria Siemieniewski</b>	
Title <b>Regulatory Specialist</b>	Date <b>May 1, 2015</b>	
Email Address <b>vsiemieniewski@oasispetroleum.com</b>		

## FOR STATE USE ONLY

<input checked="" type="checkbox"/> Received	<input type="checkbox"/> Approved
Date <b>5-7-2015</b>	
By 	
Title <b>JARED THUNE</b>	<b>Engineering Technician</b>



# SUNDRY NOTICE AND REPORTS ON WELLS - FORM 4

INDUSTRIAL COMMISSION OF NORTH DAKOTA  
OIL AND GAS DIVISION  
600 EAST BOULEVARD DEPT 405  
BISMARCK, ND 58505-0840  
SFN 5749 (09-2006)

Well File No.

20197



PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.

PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

<input type="checkbox"/> Notice of Intent	Approximate Start Date
<input checked="" type="checkbox"/> Report of Work Done	Date Work Completed <b>July 16, 2012</b>
<input type="checkbox"/> Notice of Intent to Begin a Workover Project that may Qualify for a Tax Exemption Pursuant to NDCC Section 57-51.1-03.	Approximate Start Date

- |   |   |
|---|---|
| <input type="checkbox"/> Drilling Prognosis   | <input type="checkbox"/> Spill Report             |
| <input type="checkbox"/> Redrilling or Repair | <input type="checkbox"/> Shooting                 |
| <input type="checkbox"/> Casing or Liner      | <input type="checkbox"/> Acidizing                |
| <input type="checkbox"/> Plug Well            | <input type="checkbox"/> Fracture Treatment       |
| <input type="checkbox"/> Supplemental History | <input type="checkbox"/> Change Production Method |
| <input type="checkbox"/> Temporarily Abandon  | <input checked="" type="checkbox"/> Reclamation   |
| <input type="checkbox"/> Other                | <b>Reserve pit reclamation</b>                    |

Well Name and Number <b>Wade Federal 5300 21-30H</b>					
Footages <b>2220 F N L</b>	<b>230 F W L</b>	Qtr-Qtr <b>LOT2</b>	Section <b>30</b>	Township <b>153 N</b>	Range <b>100 W</b>
Field <b>Wildcat</b>	Pool <b>Bakken</b>	County <b>McKenzie</b>			

24-HOUR PRODUCTION RATE			
Before		After	
Oil	Bbls	Oil	Bbls
Water	Bbls	Water	Bbls
Gas	MCF	Gas	MCF

Name of Contractor(s) <b>Excel Industries</b>			
Address <b>P. O. Box 159</b>	City <b>Miles City</b>	State <b>MT</b>	Zip Code <b>59301</b>

## DETAILS OF WORK

Oasis Petroleum North America LLC has completed the reclamation of the reserve pit for the above referenced well as follows:

The NDIC field inspector, Kevin Conners and the landowner were notified of our intent to reclaim this pit.

Surface owners: Wesley G Lindvig & Barbara J Lindvig, 14075 41st Street NW, Williston, ND 58801

Fluids from the pit were hauled to the Landtech Enterprises, Doris Dore 201, Sec. 9 T24N R58E, Richland, MT. All fluid was drained from pit. Cuttings were mixed with clay and straw to solidify. Pit was capped and location was sloped and contoured to ensure proper drainage.

Company <b>Oasis Petroleum North America LLC</b>	Telephone Number <b>281-404-9491</b>	
Address <b>1001 Fannin, Suite 1500</b>		
City <b>Houston</b>	State <b>TX</b>	Zip Code <b>77002</b>
Signature 	Printed Name <b>Brandi Terry</b>	
Title <b>Regulatory Specialist</b>	Date <b>July 18, 2012</b>	
Email Address <b>bterry@oasispetroleum.com</b>		

<input checked="" type="checkbox"/> Received	<input type="checkbox"/> Approved
Date <b>9-4-12</b>	
By 	
Title 	

Industrial Commission of North Dakota  
Oil and Gas Division  
Spill / Incident Report

Date/Time Reported : Feb 8 2012 / 13:17

State Agency person :

Responsible Party :

Well Operator : OASIS PETROLEUM NORTH AMERICA LLC

Date/Time of Incident : 2/6/2012 12:00:00 AM

NDIC File Number : 20197

Facility Number :

Well or Facility Name : WADE FEDERAL 5300 21-30H

Field Name : WILDCAT

County : MCKENZIE

Section : 30

Township : 153

Range : 100

Quarter-Quarter : L

Quarter : 2

Distance to nearest residence :

Distance to nearest water well :

Release Oil : 11 barrels

Release Brine : 0 barrels

Release Other : 0 barrels

Recovered Oil : 10 barrels

Recovered Brine : 0 barrels

Recovered Other : 0 barrels

Has/Will the incident be reported to the NRC? : No

Was release contained : Yes - Within Dike

Description of other released substance :

Immediate risk evaluation :

Followup Report Requested Y/N : N



## AUTHORIZATION TO PURCHASE AND TRANSPORT OIL FROM LEASE - FORM 8

INDUSTRIAL COMMISSION OF NORTH DAKOTA  
OIL AND GAS DIVISION  
600 EAST BOULEVARD DEPT 405  
BISMARCK, ND 58505-0840  
SFN 5698 (03-2000)



Well File No.
20197
NDIC CTB No. 120197

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.

PLEASE SUBMIT THE ORIGINAL AND FOUR COPIES.

Well Name and Number <b>Wade Federal 5300 21-30H</b>	Qtr-Qtr <b>LOT 2</b>	Section <b>30</b>	Township <b>153 N</b>	Range <b>100 W</b>	County <b>MCKENZIE</b>
Operator <b>OASIS PETROLEUM NORTH AMERICA LLC</b>	Telephone Number <b>(281) 404-9435</b>		Field <b>WILDCAT</b>		
Address <b>1001 FANNIN, STE 1500</b>	City <b>HOUSTON</b>		State <b>TX</b>	Zip Code <b>77002</b>	

Name of First Purchaser <b>OASIS PETROLEUM MARKETING LLC</b>	Telephone Number <b>(281) 404-9435</b>	% Purchased <b>100</b>	Date Effective <b>February 23, 2012</b>
Principal Place of Business <b>1001 FANNIN, STE 1500</b>	City <b>HOUSTON</b>	State <b>TX</b>	Zip Code <b>77002</b>
Field Address	City	State	Zip Code
Name of Transporter <b>BLACKSTONE CRUDE LLC</b>	Telephone Number <b>(425) 988-4940</b>	% Transported <b>100</b>	Date Effective <b>February 23, 2012</b>
Address <b>1940 SOUTH BROADWAY, PMB 154</b>	City <b>MINOT</b>	State <b>ND</b>	Zip Code <b>58701</b>
The above named producer authorizes the above named purchaser to purchase the percentage of oil stated above which is produced from the lease designated above until further notice. The oil will be transported by the above named transporter.			

Other First Purchasers Purchasing From This Lease	% Purchased	Date Effective
Other First Purchasers Purchasing From This Lease	% Purchased	Date Effective
Other Transporters Transporting From This Lease	% Transported	Date Effective
Other Transporters Transporting From This Lease	% Transported	Date Effective
Comments		

I hereby swear or affirm that the information provided is true, complete and correct as determined from all available records.		Date <b>February 23, 2012</b>
Signature 	Printed Name <b>DINA BARRON</b>	Title <b>MARKETING CONTRACTS ADMINISTRATOR</b>

Above Signature Witnessed By		
Witness Signature 	Witness Printed Name <b>MARIAN HARGIS</b>	Witness Title <b>MARKETING MANAGER</b>

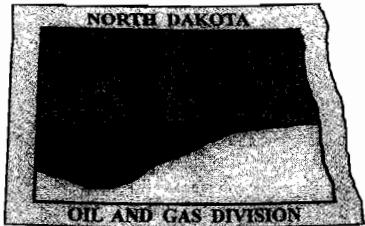
FOR STATE USE ONLY

Date Approved <b>MAR - 8 2012</b>	
By 	
Title <b>Eric Peterson</b>	
Oil & Gas Production Analyst	

ORIGINAL

# Oil and Gas Division

20197



Lynn D. Helms - Director      Bruce E. Hicks - Assistant Director

## Department of Mineral Resources

Lynn D. Helms - Director

## North Dakota Industrial Commission

[www.oilgas.nd.gov](http://www.oilgas.nd.gov)

February 16, 2012

ROBIN E. HESKETH  
OASIS PETRO NO AMER  
1001 FANNIN, SUITE 202  
HOUSTON, TX 77002

RE: WADE FEDERAL 5300 21-30H  
LOT 2 Sec. 30-153N-100W  
MCKENZIE COUNTY  
Well File No. 20197

Dear ROBIN E. HESKETH:

We have not received the geological report on the above referenced well. Please submit one paper copy and one digital pdf file for this report.

If you have any questions, please contact Richard Suggs at (701) 328-8020.

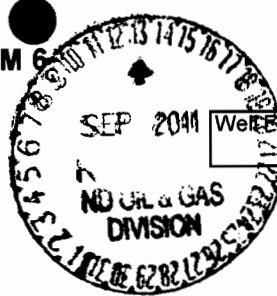
Sincerely,

Linda Llewellyn  
Office Assistant



WELL COMPLETION OR RECOMPLETION REPORT - FORM 6

INDUSTRIAL COMMISSION OF NORTH DAKOTA  
OIL AND GAS DIVISION  
600 EAST BOULEVARD DEPT 405  
BISMARCK, ND 58505-0840  
SFSN 2468 (04-2009)



SEP 2011      File No. 20197

**PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.**

**PLEASE SUBMIT THE ORIGINAL AND ONE COPY.**

**Designate Type of Completion**

- Oil Well       EOR Well       Recompletion       Deepened Well       Added Horizontal Leg       Extended Horizontal Leg  
 Gas Well       SWD Well       Water Supply Well       Other:

Well Name and Number <b>Wade 5300 21-30H</b>			Spacing Unit Description <b>Sec. 29 &amp; 30 T153N R100W</b> <i>Pending hearing order</i>
Operator <b>Oasis Petroleum North America LLC</b>	Telephone Number <b>281-404-9491</b>	Field <b>Wildcat</b>	
Address <b>1001 Fannin, Suite 1500</b>			Pool <b>Bakken</b>
City <b>Houston</b>	State <b>TX</b>	Zip Code <b>77002</b>	Permit Type <input checked="" type="checkbox"/> Wildcat <input type="checkbox"/> Development <input type="checkbox"/> Extension

**LOCATION OF WELL**

## **CASING & TUBULARS RECORD (Report all strings set in well)**

## **PERFORATION & OPEN HOLE INTERVALS**

## **PRODUCTION**

Current Producing Open Hole or Perforated Interval(s), This Completion, Top and Bottom, (MD Ft) <b>Lateral 1 - 11,009'-20,481'</b>								Name of Zone (If Different from Pool Name)	
Date of First Production Through Permanent Wellhead <b>7/12/2011</b>				Producing Method <b>Flowing</b>		Pumping-Size & Type of Pump			Well Status (Producing or Shut-In) <b>Producing</b>
Date of Test <b>8/17/2011</b>	Hours Tested <b>24</b>	Choke Size <b>48 /64</b>	Production for Test		Oil (Bbls) <b>2286</b>	Gas (MCF) <b>2438</b>	Water (Bbls) <b>3075</b>	Oil Gravity-API (Corr.) <b>40.2 °</b>	Disposition of Gas <b>Flared</b>
Flowing Tubing Pressure (PSI) <b>1023</b>		Flowing Casing Pressure (PSI)		Calculated 24-Hour Rate	Oil (Bbls) <b>2286</b>	Gas (MCF) <b>2438</b>	Water (Bbls) <b>3075</b>	Gas-Oil Ratio <b>1066</b>	

## GEOLOGICAL MARKERS

## **PLUG BACK INFORMATION**

CORES CUT

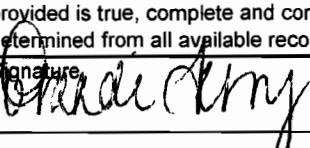
Top (Ft)	Bottom (Ft)	Formation	Top (Ft)	Bottom (Ft)	Formation

## Drill Stem Test

### Well Specific Stimulations

Date Stimulated 7/3/2011	Stimulated Formation Bakken		Top (Ft) 11082	Bottom (Ft) 20481	Stimulated In Cased Hole	Volume 76768	Volume Units Barrels
Type Treatment Sand Frac	Acid %	Lbs Proppant 4440376	Maximum Treatment Pressure (PSI) 9679		Maximum Treatment Rate (BBLS/Min) 42.3		
Details 40/70 sand - 723,700 lbs 20/40 sand- 1,006,140 lbs 20/40 ceramic- 2,710,536							
Date Stimulated	Stimulated Formation		Top (Ft)	Bottom (Ft)	Stimulated In	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)		Maximum Treatment Rate (BBLS/Min)		
Details							
Date Stimulated	Stimulated Formation		Top (Ft)	Bottom (Ft)	Stimulated In	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)		Maximum Treatment Rate (BBLS/Min)		
Details							
Date Stimulated	Stimulated Formation		Top (Ft)	Bottom (Ft)	Stimulated In	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)		Maximum Treatment Rate (BBLS/Min)		
Details							
Date Stimulated	Stimulated Formation		Top (Ft)	Bottom (Ft)	Stimulated In	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)		Maximum Treatment Rate (BBLS/Min)		
Details							

### ADDITIONAL INFORMATION AND/OR LIST OF ATTACHMENTS

I hereby swear or affirm that the information provided is true, complete and correct as determined from all available records. 	Email Address bterry@oasispetroleum.com	Date 9/7/2011
Signature	Printed Name Brandi Terry	Title Regulatory Specialist



## AUTHORIZATION TO PURCHASE AND TRANSPORT OIL FROM LEASE - FORM 8

INDUSTRIAL COMMISSION OF NORTH DAKOTA  
OIL AND GAS DIVISION  
600 EAST BOULEVARD DEPT 405  
BISMARCK, ND 58505-0840  
SFN 5698 (03-2000)



Well File No.	20197
NDIC CTB No.	120197

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.  
PLEASE SUBMIT THE ORIGINAL AND FOUR COPIES.

Well Name and Number <b>WADE FEDERAL 5300 21-30H</b>	Qtr-Qtr <b>LOT2</b>	Section <b>30</b>	Township <b>153 N</b>	Range <b>100 W</b>	County <b>MCKENZIE</b>
Operator <b>OASIS PETROLEUM NORTH AMERICA LLC</b>	Telephone Number <b>(281) 404-9435</b>		Field <b>WILDCAT</b>		
Address <b>1001 FANNIN, STE 1500</b>	City <b>HOUSTON</b>		State <b>TX</b>	Zip Code <b>77002</b>	

Name of First Purchaser <b>PLAINS MARKETING L.P.</b>	Telephone Number <b>(713) 646-4100</b>	% Purchased <b>100</b>	Date Effective <b>June 15, 2011</b>
Principal Place of Business <b>P.O. BOX 4648</b>	City <b>HOUSTON</b>	State <b>TX</b>	Zip Code <b>77210</b>
Field Address <b>303 6TH AVE NE</b>	City <b>BELFIELD</b>	State <b>ND</b>	Zip Code <b>58622</b>
Name of Transporter <b>PLAINS MARKETING L.P.</b>	Telephone Number <b>(701) 575-4349</b>	% Transported <b>100</b>	Date Effective <b>June 15, 2011</b>
Address <b>303 6TH AVE NE</b>	City <b>BELFIELD</b>	State <b>ND</b>	Zip Code <b>58622</b>
The above named producer authorizes the above named purchaser to purchase the percentage of oil stated above which is produced from the lease designated above until further notice. The oil will be transported by the above named transporter.			

Other First Purchasers Purchasing From This Lease	% Purchased	Date Effective
Other First Purchasers Purchasing From This Lease	% Purchased	Date Effective
Other Transporters Transporting From This Lease	% Transported	Date Effective
Other Transporters Transporting From This Lease	% Transported	Date Effective
Comments		

I hereby swear or affirm that the information provided is true, complete and correct as determined from all available records.	Date <b>July 26, 2011</b>
Signature 	Printed Name <b>DINA BARRON</b>
Title <b>CONTRACT ADMINISTRATOR</b>	

Above Signature Witnessed By	Witness Signature 	Witness Printed Name <b>GARY BURLESON</b>	Witness Title <b>MARKETING MANAGER</b>
------------------------------	-----------------------	--	---

FOR STATE USE ONLY		
Date Approved <b>AUG 04 2011</b>		
By 		
Title <b>Oil &amp; Gas Production Analyst</b>		

Industrial Commission of North Dakota  
Oil and Gas Division

Well or Facility No  
**20197**

Verbal Approval To Purchase and Transport Oil      Tight Hole    Yes

**OPERATOR**

Operator <b>OASIS PETROLEUM NORTH AMERICA LL</b>	Representative <b>kelly johnson</b>	Rep Phone <b>(701) 572-0268</b>
---	--	------------------------------------

**WELL INFORMATION**

Well Name <b>WADE FEDERAL 5300 21-30H</b>	Inspector <b>Kevin Connors</b>
Well Location QQ            Sec            Twp            Rng	County <b>MCKENZIE</b>
LOT 2        30        153        N        100        W	Field <b>WILDCAT</b>
Footages 2220        Feet From the N Line	Pool
230        Feet From the W Line	
Date of First Production Through Permanent Wellhead	7/16/2011      This Is The First Sales

**PURCHASER / TRANSPORTER**

Purchaser <b>PLAINS MARKETING, L.P.</b>	Transporter <b>PLAINS MARKETING, L.P.</b>
--	--

**TANK BATTERY**

Single Well Tank Battery Number :
-----------------------------------

**SALES INFORMATION** This Is The First Sales

ESTIMATED BARRELS TO BE SOLD		ACTUAL BARRELS SOLD		DATE
5000	BBLS	228	BBLS	7/16/2011
	BBLS		BBLS	

**DETAILS**

1st run ticket is from Plains not Diamond B
---

Start Date    7/16/2011  
Date Approved 7/18/2011  
Approved By    Jessica Stalker



# SUNDRY NOTICES AND REPORTS ON WELLS - FORM 4

INDUSTRIAL COMMISSION OF NORTH DAKOTA  
OIL AND GAS DIVISION  
600 EAST BOULEVARD DEPT 405  
BISMARCK, ND 58505-0840  
SFN 5749 (09-2006)



Well File No.  
**20197**

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.  
PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

<input checked="" type="checkbox"/> Notice of Intent	Approximate Start Date <b>June 21, 2011</b>	<input type="checkbox"/> Drilling Prognosis	<input type="checkbox"/> Spill Report
<input type="checkbox"/> Report of Work Done	Date Work Completed	<input type="checkbox"/> Redrilling or Repair	<input type="checkbox"/> Shooting
<input type="checkbox"/> Notice of Intent to Begin a Workover Project that may Qualify for a Tax Exemption Pursuant to NDCC Section 57-51.1-03.		<input type="checkbox"/> Casing or Liner	<input type="checkbox"/> Acidizing
Approximate Start Date		<input type="checkbox"/> Plug Well	<input type="checkbox"/> Fracture Treatment
		<input type="checkbox"/> Supplemental History	<input type="checkbox"/> Change Production Method
		<input type="checkbox"/> Temporarily Abandon	<input type="checkbox"/> Reclamation
		<input checked="" type="checkbox"/> Other	<u>Change well status to CONFIDENTIAL</u>

Well Name and Number <b>Wade Federal 5300 21-30H</b>					
Footages <b>2220 F N L</b>	Qtr-Qtr <b>230 F W L</b>	Section <b>LOT2</b>	Township <b>30</b>	Range <b>153 N</b>	Range <b>100 W</b>
Field <b>Wildcat</b>	Pool <b>Bakken</b>	County <b>McKenzie</b>			

24-HOUR PRODUCTION RATE			
Before		After	
Oil	Bbls	Oil	Bbls
Water	Bbls	Water	Bbls
Gas	MCF	Gas	MCF

Name of Contractor(s)			
Address		City	State
			Zip Code

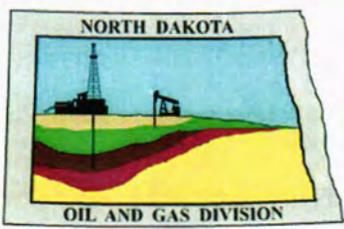
## DETAILS OF WORK

Effective immediately, we request CONFIDENTIAL STATUS for the above referenced well.

Ends 12-22-2011

Company <b>Oasis Petroleum North America LLC</b>		Telephone Number <b>281-404-9491</b>	
Address <b>1001 Fannin, Suite 1500</b>			
City <b>Houston</b>		State <b>TX</b>	Zip Code <b>77002</b>
Signature 		Printed Name <b>Brandi Terry</b>	
Title <b>Engineering Tech</b>		Date <b>June 21, 2011</b>	
Email Address <b>bterry@oasispetroleum.com</b>			

FOR STATE USE ONLY	
<input type="checkbox"/> Received	<input checked="" type="checkbox"/> Approved
Date <b>6-22-2011</b>	
By <b>David Tabor</b>	
Title <b>Engineering Technician</b>	



# Oil and Gas Division

Lynn D. Helms - Director      Bruce E. Hicks - Assistant Director

**Department of Mineral Resources**

Lynn D. Helms - Director

**North Dakota Industrial Commission**

[www.oilgas.nd.gov](http://www.oilgas.nd.gov)

December 17, 2010

Brandi Terry  
Engineering Tech  
OASIS PETROLEUM NORTH AMERICA LLC  
1001 Fannin Suite 1500  
Houston, TX 77002

**RE: HORIZONTAL WELL  
WADE 5300 21-30H  
LOT 2 Section 30-153N-100W  
McKenzie County  
Well File # 20197**

Dear Brandi :

Pursuant to Commission Order No. 14007, approval to drill the above captioned well is hereby given. The approval is granted on the condition that all portions of the well bore not isolated by cement, be no closer than the **1220' setback** (per Commission policy) from the north & south boundaries and **200' setback** (per ICO 14498) from the east & west boundaries within the 1280 acre drilling unit consisting of Sections 29 & 30-T153N-R100W.

**PERMIT STIPULATIONS: OASIS PETROLEUM must contact NDIC Field Inspector John Axtman at 701-770-2564 prior to location construction.**

#### New Policy

Operators shall not commence operations on a drill site until the 3rd business day following publication of the approved drilling permit on the NDIC - OGD Daily Activity Report. If circumstances require operations to commence before the 3rd business day following publication on the Daily Activity Report, the waiting period may be waived by the Director. Application for a waiver must be by sworn affidavit providing the information necessary to evaluate the extenuating circumstances, the factors of NDAC 43-02-03-16.2 (1), (a)-(f), and any other information that would allow the Director to conclude that in the event another owner seeks revocation of the drilling permit, the applicant should retain the permit.

#### Permit Fee & Notification

Payment was received in the amount of \$100 via credit card .The permit fee has been received. It is requested that notification be given immediately upon the spudding of the well. This information should be relayed to the Oil & Gas Division, Bismarck, via telephone. The following information must be included: Well name, legal location, permit number, drilling contractor, company representative, date and time of spudding. Office hours are 8:00 a.m. to 12:00 p.m. and 1:00 p.m. to 5:00 p.m. Central Time. Our telephone number is (701) 328-8020, leave a message if after hours or on the weekend.

Brandi Terry  
December 17, 2010  
Page 2

### **Survey Requirements for Horizontal, Horizontal Re-entry, and Directional Wells**

NDAC Section 43-02-03-25 (Deviation Tests and Directional Surveys) states in part (that) the survey contractor shall file a certified copy of all surveys with the director free of charge within thirty days of completion. Surveys must be submitted as one electronic copy, or in a form approved by the director. However, the director may require the directional survey to be filed immediately after completion if the survey is needed to conduct the operation of the director's office in a timely manner. Certified surveys must be submitted via email in one adobe document, with a certification cover page to [certsurvey@nd.gov](mailto:certsurvey@nd.gov).

Survey points shall be of such frequency to accurately determine the entire location of the well bore.

### **Reserve pit**

Please be advised that conditions may be imposed on the use and reclamation of a drilling reserve pit on this site if specific site conditions warrant.

### **Surface casing cement**

Tail cement utilized on surface casing must have a minimum compressive strength of 500 psi within 12 hours, and tail cement utilized on production casing must have a minimum compressive strength of 500 psi before drilling the plug or initiating tests.

### **Logs**

NDAC Section 43-02-03-31 requires the running of a Cement Bond Log from which the presence of cement can be determined in every well in which production or intermediate casing has been set and a Gamma Ray Log must be run from total depth to ground level elevation of the well bore. All logs must be submitted as one paper copy and one digital copy in LAS (Log ASCII) format, or a format approved by the Director. Image logs that include, but are not limited to, Mud Logs, Cement Bond Logs, and Cyberlook Logs, cannot be produced in their entirety as LAS (Log ASCII) files. To create a solution and establish a standard format for industry to follow when submitting image logs, the Director has given approval for the operator to submit an image log as a TIFF (\*.tif) formatted file. The TIFF (\*.tif) format will be accepted only when the log cannot be produced in its entirety as a LAS (Log ASCII) file format. The digital copy may be submitted on a 3.5" floppy diskette, a standard CD, or attached to an email sent to [digitallogs@nd.gov](mailto:digitallogs@nd.gov).  
Thank you for your cooperation.

Sincerely,

Nathaniel Erbele  
Petroleum Resource Specialist



## APPLICATION FOR PERMIT TO DRILL HORIZONTAL WELL - FORM 1H

INDUSTRIAL COMMISSION OF NORTH DAKOTA  
OIL AND GAS DIVISION  
600 EAST BOULEVARD DEPT 405  
BISMARCK, ND 58505-0840  
SFN 54269 (08-2005)

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.

PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

Type of Work <b>New Location</b>	Type of Well <b>Oil &amp; Gas</b>	Approximate Date Work Will Start <b>2 / 01 / 2011</b>	Confidential Status <b>No</b>	
Operator <b>OASIS PETROLEUM NORTH AMERICA LLC</b>			Telephone Number <b>281-404-9491</b>	
Address <b>1001 Fannin Suite 1500</b>		City <b>Houston</b>		State <b>TX</b> Zip Code <b>77002</b>

Notice has been provided to the owner of any permanently occupied dwelling within 1,320 feet.  This well is not located within five hundred feet of an occupied dwelling.

### WELL INFORMATION (If more than one lateral proposed, enter data for additional laterals on page 2)

Well Name <b>WADE</b>			Well Number <b>5300 21-30H</b>			
Surface Footages <b>2220 F N L      230 F W L</b>		Qtr-Qtr <b>LOT 2</b>	Section <b>30</b>	Township <b>153 N</b>	Range <b>100 W</b>	County <b>McKenzie</b>
Longstring Casing Point Footages <b>2220 F N L      720 F W L</b>		Qtr-Qtr <b>LOT2</b>	Section <b>30</b>	Township <b>153 N</b>	Range <b>100 W</b>	County <b>McKenzie</b>
Longstring Casing Point Coordinates From Well Head <b>0 N From WH      490 E From WH</b>		Azimuth <b>90 °</b>	Longstring Total Depth <b>10940 Feet MD      10655 Feet TVD</b>			
Bottom Hole Footages From Nearest Section Line <b>2220 F N L      203 F E L</b>		Qtr-Qtr <b>SENE</b>	Section <b>29</b>	Township <b>153 N</b>	Range <b>100 W</b>	County <b>McKenzie</b>
Bottom Hole Coordinates From Well Head <b>0 N From WH      10080 E From WH</b>		KOP Lateral 1 <b>10177 Feet MD</b>	Azimuth Lateral 1 <b>90 °</b>		Estimated Total Depth Lateral 1 <b>20530 Feet MD      10727 Feet TVD</b>	
Latitude of Well Head <b>48 ° 02 ' 49.42 "</b>	Longitude of Well Head <b>-103 ° 36 ' 11.54 "</b>	NAD Reference <b>WGS84</b>		Description of Drilling Unit: (Subject to NDIC Approval) <b>Sections 29 &amp; 30-T153N-R100W</b>		
Ground Elevation <b>2013 Feet Above S.L.</b>	Acres in Spacing/Drilling Unit <b>1280</b>	Spacing/Drilling Unit Setback Requirement <b>1220 Feet N/S      200 Feet E/W</b>			Industrial Commission Order <b>14007</b>	
North Line of Spacing/Drilling Unit <b>10513 Feet</b>	South Line of Spacing/Drilling Unit <b>10523 Feet</b>	East Line of Spacing/Drilling Unit <b>5082 Feet</b>			West Line of Spacing/Drilling Unit <b>5237 Feet</b>	
Objective Horizons <b>Bakken</b>						
Proposed Surface Casing <b>9 - 5/8 "</b>	Size <b>36 Lb./Ft.</b>	Weight <b>2010 Feet</b>	Depth <b>625 Sacks</b>	Cement Volume <b>NOTE: Surface hole must be drilled with fresh water and surface casing must be cemented back to surface.</b>		
Proposed Longstring Casing <b>7 - "</b>	Weight(s) <b>29/32 Lb./Ft.</b>	Longstring Total Depth <b>10940 Feet MD      10655 Feet TVD</b>		Cement Volume <b>700 Sacks</b>	Cement Top <b>4860 Feet</b>	Top Dakota Sand <b>5366 Feet</b>
Base Last Charles Salt (If Applicable) <b>9132 Feet</b>		NOTE: Intermediate or longstring casing string must be cemented above the top Dakota Group Sand.				
Proposed Logs <b>Triple Combo-KOP to KibbyGR/RES-KOP to BSCCBL/GR-TOCGR to BSCMWD GR-KOP to TD</b>						
Drilling Mud Type (Vertical Hole - Below Surface Casing) <b>Invert</b>			Drilling Mud Type (Lateral) <b>Salt Water Gel</b>			
Survey Type in Vertical Portion of Well <b>MWD Every 100 Feet</b>		Survey Frequency: Build Section <b>30 Feet</b>		Survey Frequency: Lateral <b>90 Feet</b>		Survey Contractor <b>Ryan</b>

NOTE: A Gamma Ray log must be run to ground surface and a CBL must be run on intermediate or longstring casing string if set.

Surveys are required at least every 30 feet in the build section and every 90 feet in the lateral section of a horizontal well. Measurement inaccuracies are not considered when determining compliance with the spacing/drilling unit boundary setback requirement except in the following scenarios: 1) When the angle between the well bore and the respective boundary is 10 degrees or less and the well bore is within 150 feet of the respective setback requirement; or 2) If industry standard methods and equipment are not utilized. Consult the applicable field order for exceptions.

If measurement inaccuracies are required to be considered, a 2° MWD measurement inaccuracy will be applied to the horizontal portion of the well bore. This measurement inaccuracy is applied to the well bore from KOP to TD.

**REQUIRED ATTACHMENTS:** Certified surveyor's plat, horizontal section plat, estimated geological tops, proposed mud/cementing plan, directional plot/plan, \$100 fee.  
See Page 2 for Comments section and signature block.

**COMMENTS, ADDITIONAL INFORMATION, AND/OR LIST OF ATTACHMENTS**

**Additional Attachments:** Drill Plan with geological tops/mud Well Summary with casing and cement plans Directional plan/plot and surveyor's plats.

**Lateral 2**

KOP Lateral 2 Feet MD	Azimuth Lateral 2 °	Estimated Total Depth Lateral 2 Feet MD		Feet TVD	KOP Coordinates From Well Head From WH		From WH
Formation Entry Point Coordinates From Well Head From WH		Bottom Hole Coordinates From Well Head From WH			From WH		
KOP Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	
Bottom Hole Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	

**Lateral 3**

KOP Lateral 3 Feet MD	Azimuth Lateral 3 °	Estimated Total Depth Lateral 3 Feet MD		Feet TVD	KOP Coordinates From Well Head From WH		From WH
Formation Entry Point Coordinates From Well Head From WH		Bottom Hole Coordinates From Well Head From WH			From WH		
KOP Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	
Bottom Hole Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	

**Lateral 4**

KOP Lateral 4 Feet MD	Azimuth Lateral 4 °	Estimated Total Depth Lateral 4 Feet MD		Feet TVD	KOP Coordinates From Well Head From WH		From WH
Formation Entry Point Coordinates From Well Head From WH		Bottom Hole Coordinates From Well Head From WH			From WH		
KOP Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	
Bottom Hole Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	

**Lateral 5**

KOP Lateral 5 Feet MD	Azimuth Lateral 5 °	Estimated Total Depth Lateral 5 Feet MD		Feet TVD	KOP Coordinates From Well Head From WH		From WH
Formation Entry Point Coordinates From Well Head From WH		Bottom Hole Coordinates From Well Head From WH			From WH		
KOP Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	
Bottom Hole Footages From Nearest Section Line F L		Qtr-Qtr	Section	Township <b>N</b>	Range <b>W</b>	County	

I hereby swear or affirm the information provided is true, complete and correct as determined from all available records.

Date

12 / 15 / 2010

**ePermit**Printed Name  
**Brandi Terry**Title  
**Engineering Tech****FOR STATE USE ONLY**

Permit and File Number <b>20197</b>	API Number <b>33 - 053 - 03413</b>
Field <b>WILDCAT</b>	
Pool <b>BAKKEN</b>	Permit Type <b>WILDCAT</b>

**FOR STATE USE ONLY**

Date Approved <b>12 / 17 / 2010</b>
By <b>Nathaniel Erbele</b>
Title <b>Petroleum Resource Specialist</b>

WELL LOCATION PLAT  
ASIS PETROLEUM NORTH AMERICA, LLC  
1 FANNIN, SUITE 202, HOUSTON, TX 77002

OASIS PETROLEUM NORTH AMERICA, LLC

ANNIN, SUITE 202 HOUSTON, TX 77002  
PHONE 222-21-2011

"WADE 5300 21-30H"  
2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA

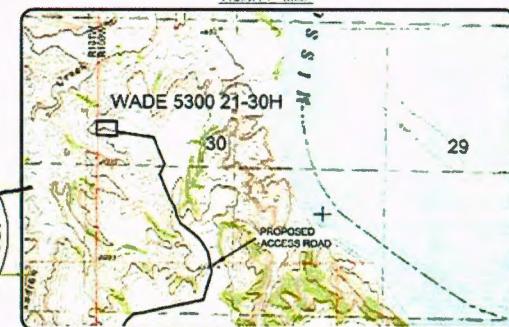
EDGE C

## LAKE

STAKED ON 9/20/10  
VERTICAL CONTROL DATUM WAS BASED UPON  
CONTROL POINT 4 WITH AN ELEVATION OF 2

THIS SURVEY AND PLAT IS BEING PROVIDED AT THE REQUEST  
OF FABIAN KJORSTAD OF OASIS PETROLEUM. I CERTIFY THAT  
THIS PLAT CORRECTLY REPRESENTS  
WORK PERFORMED BY ME OR UNDER MY  
SUPERVISION AND IS TRUE AND CORRECT TO  
THE BEST OF MY KNOWLEDGE AND BELIEF.

ROBERT L. PROVINE 90155  
INTERSTATE ENGINEERING INC  
P.O. BOX 648



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DRILLING PLAN								
PROSPECT/FIELD	Indian Hill	Horizontal Middle Bakken with No Pilot		COUNTY/STATE	McKenzie ND			
OPERATOR	Oasis Petroleum	1280 Acre Spacing		RIG:	Nabors	149		
WELL NO.	Wade 5300 21-30H	LEASE		Wade				
LOCATION	30-T153N-R100W	Surface Location:		2220' FNL	230' FWL			
EST. T.D.	Lateral TD: 20,530' MD	GROUND ELEV.		2010	Plat-Finished Pad			
TOTAL LATERAL:	9,590' (est)	KB ELEV:		2035				
PROGNOSIS:	Based on 2,035' KB(est) Assumed 25' KB height for calc	LOGS:		Type	Interval			
MARKER	DEPTH	DATUM		OH Logs: Triple Combo GR/Res GR	From KOP to Kibbey From KOP to Base od Surface Csg To Surface			
Pierre	NDIC MAP	1,910	125					
Greenhorn		4,515	(2,480)					
Mowry		4,927	(2,892)					
Dakota		5,366	(3,331)	CBL/GR MWD GR	Above Cement Top/ GR to BSC KOP to lateral TD			
Rierdon		6,274	(4,239)					
Dunham Salt		6,788	(4,753)					
Dunham Salt Base		6,849	(4,814)					
Spearfish		6,868	(4,833)					
Pine Salt		7,172	(5,137)					
Pine Salt Base		7,236	(5,201)					
Opeche Salt		7,284	(5,249)					
Opeche Salt Base		7,338	(5,303)		DEVIATION:			
Broom Creek (Top of Minnelusa G		7,509	(5,474)		Surf: 3 deg. max., 1 deg / 100'; svry every 500' Prod: 5 deg. max., 1 deg / 100'; svry every 1000'			
Amsden		7,534	(5,499)					
Tyler		7,725	(5,690)					
Otter (Base of Minnelusa Gp.)		7,975	(5,940)					
Kibbey		8,279	(6,244)					
Charles Salt		8,416	(6,381)		DST'S:			
UB		9,066	(7,031)		None planned			
Base Last Salt		9,132	(7,097)					
Ratcliffe		9,194	(7,159)					
Mission Canyon		9,347	(7,312)					
Lodgepole		9,916	(7,881)					
Lodgepole Fracture Zone		10,170	(8,135)		CORES:			
False Bakken		10,622	(8,587)		None planned			
Upper Bakken		10,632	(8,597)					
Middle Bakken		10,647	(8,612)					
Middle Bakken Sand Target		10,655	(8,620)		SAMPLES:			
Base Middle Bakken Sand Target		10,666	(8,631)		10' or 30' samples at direction of wellsite geologist			
Lower Bakken		10,681	(8,646)					
Three Forks		10,687	(8,652)		Mudlogging: Two-Man: 8,216' 200' above Charles Salt - Casing Point Casing Point to TD			
Dip Rate:	0.75 ft/100 ft	Down	1		BOP:			
Max. Anticipated BHP:	4603	Surface Formation: Glacial Till						
MUD:	Interval	Type	WT	Vis	WL	Remarks		
Surface Hole:	0' - 2,010'	FW / Gel-Lime Sweeps	8.6 - 8.9	28-34	NC	Circ Mud Tanks		
Pilot Hole:	N/A	Invert	9.6-9.8	40-60	30+(HptH)	Circ Mud Tanks		
Intermediate Hole:	2,010' - 10,940'	Invert	9.6-10.4	40-60	30+(HptH)	Circ Mud Tanks		
Laterale:	10,940' - 20,530'	Salt Water	9.3-10.4	28-34	NC	Circ Mud Tanks		
CASING:	Size	Wt pfp	Hole	Depth	TOL:	Cement	WOC	Remarks
Surface:	9-5/8"	36	13-1/2"	2,010'	To Surface		12 hrs	
Intermediate:	7"	29/32	8-3/4"	10,940'		4860'	24 hrs	500' above Dakota
Production:								
Production Liner:	4-1/2"	11.6	6"	20,530'	TOL @ 10,125'			
PROBABLE PLUGS, IF REQ'D:								
OTHER:	MD	TVD	ENL/FSL	FEL/FWL	S-T-R	AZI		
Surface:	N/A	N/A	2220' FNL	230' FWL	30-T153N-R100W	N/A	Survey Company:	Ryan
Pilot Hole:	N/A	N/A	2220' FNL	230' FWL	30-T153N-R100W	N/A	Build Rate:	12 deg /100'
KOP:	10,177'	10,177'	2220' FNL	230' FWL	30-T153N-R100W	N/A		
EOC:	10,928'	10,655'	2220' FNL	708' FWL	30-T153N-R100W	90.0		
Casing:	10,940'	10,655'	2220' FNL	720' FWL	30-T153N-R100W	90.0	Turn Rate:	/100'
Bakken Lateral TD:	20,530'	10,727'	2220' FNL	200' FEL	29 T153N R100W	90.0		
Comments:								
DRILL TO KOP AND LOG.								
DRILL CURVE TO 90 DEG AND 7" CASING POINT.								
SET 7" CASING. DRILL MIDDLE BAKKEN LATERAL.								
MWD Surveys will be taken every 100' in vertical hole, and a minimum of every 30' while building curve and every 90' while drilling lateral								
MWD GR to be run from KOP to Lateral TD.								
<b>GR must be run to ground surface.</b>								
Lateral length calculated by: Bakken lateral TD - Csg shoe TD.								
<b>Lateral vertical change calc</b>								
<b>TVD at end of lateral:</b>								
Prep By:	M. M. Cowan	Date:	12/9/2010		Doc:	Wade 5300 21-30H		

**Oasis Petroleum  
Wade 5300 21-30H  
Section 30 T153N R100W  
McKenzie County, ND**

**SURFACE CASING AND CEMENT DESIGN**

Size	Interval	Weight	Grade	Coupling	I.D.	Drift	Make-up Torque (ft-lbs)		
							Minimum	Optimum	Max
9-5/8"	0' to 2010'	36	J-55	LTC	8.921"	8.765"	3400	4530	5660

Interval	Description	Collapse (psi) a	Burst (psi) b	Tension (1000 lbs) c	Cost per ft
0' to 2010'	9-5/8", 36#, J-55, LTC, 8rd	2020 / 2.1	3520 / 3.7	453 / 2.7	

**API Rating & Safety Factor**

- a) Based on full casing evacuation with 9.0 ppg fluid on backside
- b) Burst pressure based on 9 ppg fluid with no fluid on backside
- c) Based on string weight in 9.0 ppg fluid at 2010' TVD plus 100k# overpull.  
(Buoyed weight equals 62,400 lbs.)

Cement volumes are based on 9-5/8" casing set in 13-1/2" hole with 60% excess to circulate cement back to surface.  
Mix and pump the following slurry.

**Pre-flush (Spacer):**

**20 bbls** of fresh water

**Lead Slurry:** **425 sx** (230 bbls) **ECONOCEM SYSTEM** with 0.125 lb per sx Poly E Flake (lost circulation additive)

**Tail Slurry:** **200sx** (53 bbls) **SWIFTCEM SYSTEM** with 0.125 lb per sx Poly E Flake (lost circulation additive)

**Oasis Petroleum**  
**Wade 5300 21-30H**  
**Section 30 T153N R100W**  
**McKenzie County, ND**

**INTERMEDIATE CASING AND CEMENT DESIGN**

**Intermediate Casing Design**

<b>Size</b>	<b>Interval</b>	<b>Weight</b>	<b>Grade</b>	<b>Coupling</b>	<b>I.D.</b>	<b>Drift</b>	<b>Make-up Torque (ft-lbs)</b>		
							<b>Minimum</b>	<b>Optimum</b>	<b>Max</b>
7"	0' – 6,700'	29	P-110	LTC	6.184"	6.059"	5,980	7,970	8,770
7"	6,700' – 9,300'	32	HCP-110	LTC	6.094"	6.000"**	6,730	8,970	9,870
7"	9,300' – 10,940'	29	P-110	LTC	6.184"	6.059"	5,980	7,970	8,770

\*\*Special Drift

<b>Interval</b>	<b>Description</b>	<b>Collapse</b>	<b>Burst</b>	<b>Tension</b>	<b>Cost per ft</b>
		(psi) a	(psi) b	(1000 lbs) c	
0' – 6,700'	7", 29#, P-110, LTC, 8rd	8,530 / 2.4	11,220 / 1.3	797/2.1	
6,700' – 9,300'	7", 32#, HCP-110, LTC, 8rd	11,820 / 1.01	12,460 / 1.4		
9,300' – 10,940'	7", 29 lb, P-110, LTC, 8rd	8,530 / 1.4	11,220 / 1.2		

**API Rating & Safety Factor**

- a) Collapse Strength Reduction Factor = .963 @ 7,900' & negligible below 8700'. Assume full casing evacuation with 10 ppg fluid on backside (from 0 to 6,700' & 9,300' to 10,940'). And assume full casing evacuation with 1.2 psi/ft equivalent fluid gradient across salt intervals (from 6,700' to 9,300' TVD).
- b) Burst pressure based on 8,200 psig max press for stimulation plus 10 ppg fluid in casing and 9.0 ppg fluid on backside—to 10,655 TVD.
- c) Based on string weight in 10 ppg fluid, (275.4k lbs) plus 100k#.

Cement volumes are estimates based on 7" casing set in an 8-3/4" hole with 30% excess.

**Pre-flush (Spacer):**

**20 bbls Tuned Spacer III**

**200 bbls of Pozmix Scavenger Cement with Anhib II**

**20 bbls of Fresh Water**

**Lead Slurry:** **110sx (50 bbls) ECONOCEM SYSTEM** with 0.3% HR-5 Retarder, 0.2% Thixotropic Additive & 0.125 lb per sx Poly E Flake (lost circulation additive)

**Primary Slurry:** **230 sx (57 bbls) EXTENDACEM SYSTEM** with 0.25% HR-5 Retarder, 0.2% Thixotropic Additive, & 0.125 lb per sx Poly E Flake (lost circulation additive)

**Tail Slurry:** **360 sx (100 bbls) HALCEM SYSTEM** with 0.3% HR-5 Retarder & 0.125 lb per sx Poly E Flake (lost circulation additive)

**Oasis Petroleum**  
**Wade 5300 21-30H**  
**Section 30 T153N R100W**  
**McKenzie County, ND**

**PRODUCTION LINER**

Size	Interval	Weight	Grade	Coupling	I.D.	Drift	Make-up Torque (ft-lbs)		
							Minimum	Optimum	Max
4-1/2"	10,125' to 20,530'	11.6	P-110	LTC	4.000"	3.875"	2,270	3,020	3,780

Interval	Description	Collapse	Burst	Tension	Cost per ft
		(psi) a	(psi) b	(1000 lbs) c	
10,125' to 20,530'	4-1/2", 11.6 lb, P-110, LTC, 8rd	7,580 / 1.4	10,690 / 1.2	277 / 1.3	

**API Rating & Safety Factor**

- a) Based on full casing evacuation with 9.5 ppg fluid on backside @ 10,727' TVD (at end of lateral).
- b) Burst pressure based on 8,200 psi Stimulation pressure with 10 ppg internal fluid gradient with 9.0 ppg gradient on backside at 10,727' TVD (at end of lateral).
- c) Based on string weight in 9.5 ppg fluid (Buoyed weight: 103.2k lbs.) plus 100k lbs overpull.



Azimuths to True North  
Magnetic North: 8.82°

Magnetic Field  
Strength: 56796.6nT  
Dip Angle: 73.14°  
Date: 12/9/2010  
Model: IGRF2010

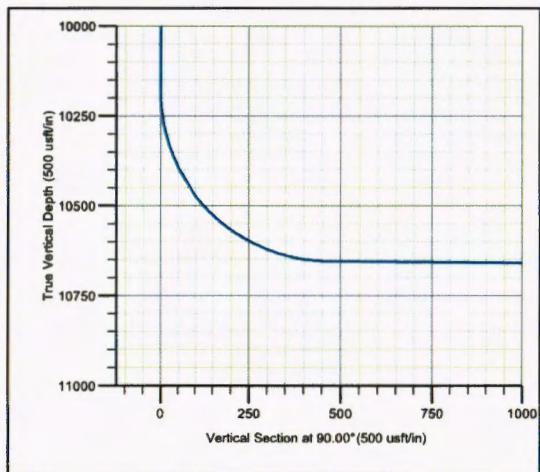
# Oasis Petroleum

## SITE DETAILS

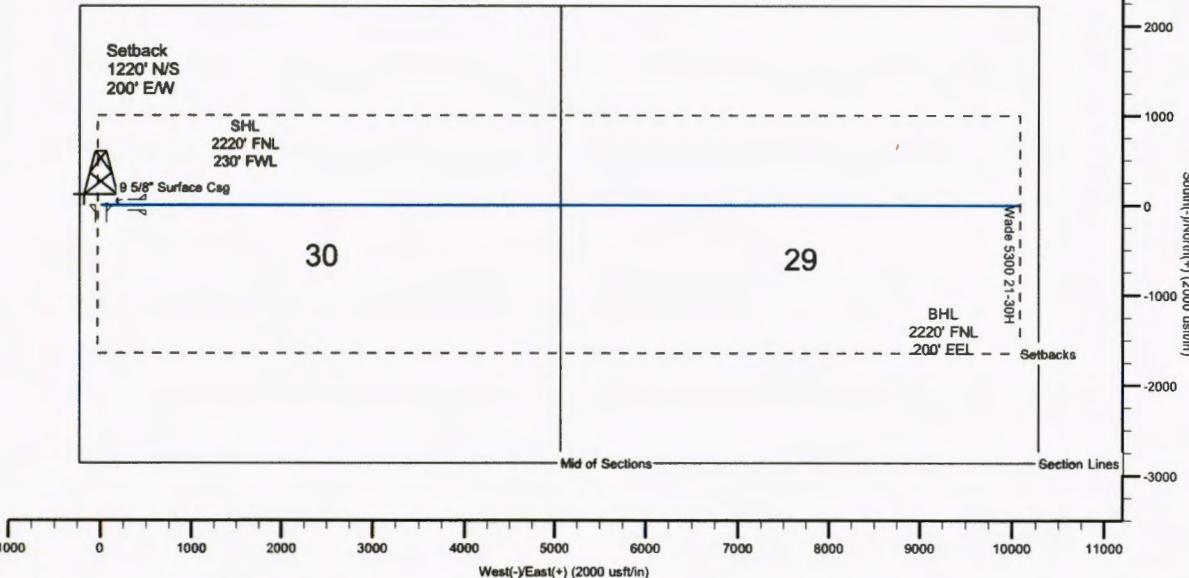
Legal Location: Sec 30 T153N R100W

Site Centre Latitude: 48°2' 49.420 N  
Longitude: 103°36' 11.540 W

Ref. Datum: WELL @ 2035.0usft (Original Well Elev)  
Positional Uncertainty: 0.0  
Convergence: -2.31

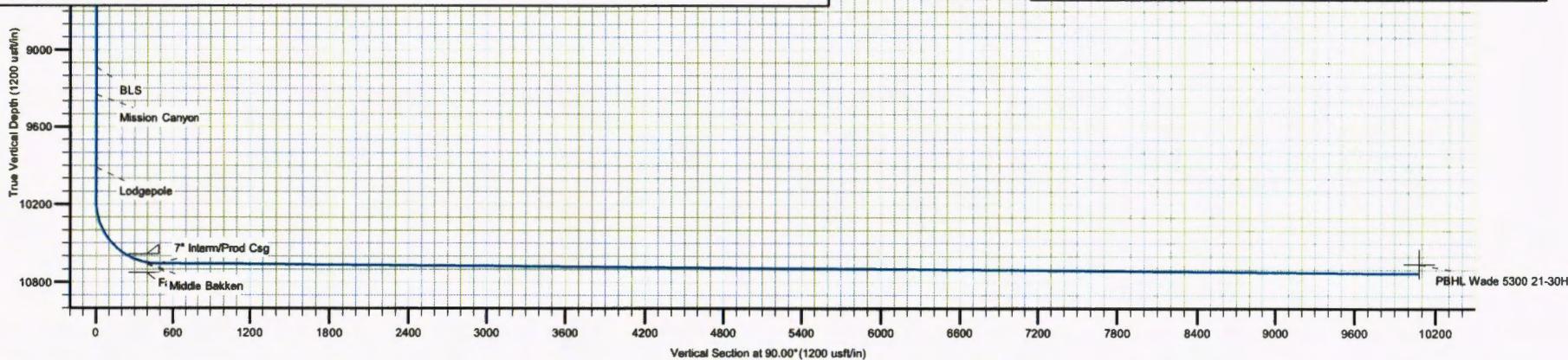


CASING DETAILS		
TVD	MD	Name
2010.0	2010.0	9 5/8" Surface Csg
10655.0	10940.0	7" Intern/Prod Csg



SECTION DETAILS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	DegTFace	VSect	Target	
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
10177.5	0.00	0.00	177.5	0.0	0.0	0.00	0.00	0.0	
10927.5	90.00	90.00	0655.0	0.0	477.5	12.00	90.00	477.5	
10927.6	90.00	90.00	0655.0	0.0	477.5	0.00	0.00	477.5	
10940.0	90.00	90.00	0655.0	0.0	489.9	0.00	0.00	489.9	
10947.2	89.57	90.00	0655.0	0.0	497.1	6.00	80.00	497.1	
20530.3	89.57	90.00	0727.0	0.01	10080.0	0.00	0.00	10080.0	

FORMATION TOP DETAILS		
TVDPath	MDPath	Formation
8416.0	8416.0	Charles Salt
9132.0	9132.0	BLS
9347.0	9347.0	Mission Canyon
9916.0	9916.0	Lodgepole
10622.0	10749.0	False Bakken
10647.0	10840.0	Middle Bakken
10655.0	10926.3	Mid Bakken Sand Target



## Planning Report

<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Site WAde 5300 21-30H							
<b>Company:</b>	Oasis Petroleum	<b>TVD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)							
<b>Project:</b>	McKenzie County, ND	<b>MD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)							
<b>Site:</b>	WAde 5300 21-30H	<b>North Reference:</b>	True							
<b>Well:</b>	Wade 5300 21-30H	<b>Survey Calculation Method:</b>	Minimum Curvature							
<b>Wellbore:</b>	Wade 5300 21-30H									
<b>Design:</b>	Plan 1 (12-9-10)									
<b>Project</b>	McKenzie County, ND									
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level							
<b>Geo Datum:</b>	North American Datum 1983									
<b>Map Zone:</b>	North Dakota Northern Zone									
<b>Site</b>	WAde 5300 21-30H									
<b>Site Position:</b>		<b>Northing:</b>	397,225.27 usft      48° 2' 49.420 N							
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,209,677.05 usft      103° 36' 11.540 W							
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "      Grid Convergence: -2.31 °							
<b>Well</b>	Wade 5300 21-30H, Sec 30 T153N R100W									
<b>Well Position</b>	+N-S +E-W	0.0 usft      Northing: Easting:	397,225.27 usft      Latitude: Longitude: 48° 2' 49.420 N 103° 36' 11.540 W							
<b>Position Uncertainty</b>	0.0 usft	Wellhead Elevation:	Ground Level: 2,010.0 usft							
<b>Wellbore</b>	Wade 5300 21-30H									
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>					
	IGRF2010	12/9/2010	8.82	73.14	56,797					
<b>Design</b>	Plan 1 (12-9-10)									
<b>Audit Notes:</b>										
<b>Version:</b>		<b>Phase:</b>	<b>PROTOTYPE</b>	<b>Tie On Depth:</b>	0.0					
<b>Vertical Section:</b>		<b>Depth From (TVD) (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Direction (°)</b>					
		0.0	0.0	0.0	90.00					
<b>Plan Sections</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	<b>TFO (°)</b>	<b>Target</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00
10,177.5	0.00	0.00	10,177.5	0.0	0.0	0.00	0.00	0.00	0.00	0.00
10,927.5	90.00	90.00	10,655.0	0.0	477.5	12.00	12.00	0.00	90.00	
10,927.6	90.00	90.00	10,655.0	0.0	477.5	0.00	0.00	0.00	0.00	
10,940.0	90.00	90.00	10,655.0	0.0	489.9	0.00	0.00	0.00	0.00	
10,947.2	89.57	90.00	10,655.0	0.0	497.1	6.00	-6.00	0.00	180.00	
20,530.3	89.57	90.00	10,727.0	0.0	10,080.0	0.00	0.00	0.00	0.00	

## Planning Report

<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Site WAde 5300 21-30H
<b>Company:</b>	Oasis Petroleum	<b>TVD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)
<b>Project:</b>	McKenzie County, ND	<b>MD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)
<b>Site:</b>	WAde 5300 21-30H	<b>North Reference:</b>	True
<b>Well:</b>	Wade 5300 21-30H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wade 5300 21-30H		
<b>Design:</b>	Plan 1 (12-9-10)		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
10,000.0	0.00	0.00	10,000.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
10,100.0	0.00	0.00	10,100.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
10,177.0	0.00	0.00	10,177.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
<b>KOP</b>										
10,177.5	0.00	0.00	10,177.5	0.0	0.0	0.0	0.00	0.00	0.00	0.00
10,200.0	2.70	90.00	10,200.0	0.0	0.5	0.5	12.00	12.00	0.00	0.00
10,300.0	14.70	90.00	10,298.7	0.0	15.6	15.6	12.00	12.00	0.00	0.00
10,400.0	26.70	90.00	10,392.0	0.0	50.9	50.9	12.00	12.00	0.00	0.00
10,500.0	38.70	90.00	10,476.0	0.0	104.8	104.8	12.00	12.00	0.00	0.00
10,600.0	50.70	90.00	10,547.0	0.0	175.0	175.0	12.00	12.00	0.00	0.00
10,700.0	62.70	90.00	10,601.8	0.0	258.4	258.4	12.00	12.00	0.00	0.00
10,749.0	68.57	90.00	10,622.0	0.0	303.0	303.0	12.00	12.00	0.00	0.00
<b>False Bakken</b>										
10,800.0	74.70	90.00	10,638.1	0.0	351.4	351.4	12.00	12.00	0.00	0.00
10,840.0	79.50	90.00	10,647.0	0.0	390.4	390.4	12.00	12.00	0.00	0.00
<b>Middle Bakken</b>										
10,900.0	86.70	90.00	10,654.2	0.0	449.9	449.9	12.00	12.00	0.00	0.00
10,926.3	89.70	90.00	10,655.0	0.0	476.2	476.2	11.42	11.42	0.00	0.00
<b>Mid Bakken Sand Target</b>										
10,927.6	90.00	90.00	10,655.0	0.0	477.5	477.5	23.35	23.35	0.00	0.00
10,928.0	90.00	90.00	10,655.0	0.0	477.9	477.9	0.00	0.00	0.00	0.00
<b>EOC</b>										
10,940.0	90.00	90.00	10,655.0	0.0	489.9	489.9	0.00	0.00	0.00	0.00
<b>7" Intern/Prod Csg</b>										
10,947.2	89.57	90.00	10,655.0	0.0	497.1	497.1	6.00	-6.00	0.00	0.00
11,000.0	89.57	90.00	10,655.4	0.0	549.9	549.9	0.00	0.00	0.00	0.00
11,100.0	89.57	90.00	10,656.2	0.0	649.9	649.9	0.00	0.00	0.00	0.00
11,200.0	89.57	90.00	10,656.9	0.0	749.9	749.9	0.00	0.00	0.00	0.00
11,300.0	89.57	90.00	10,657.7	0.0	849.9	849.9	0.00	0.00	0.00	0.00
11,400.0	89.57	90.00	10,658.4	0.0	949.9	949.9	0.00	0.00	0.00	0.00
11,500.0	89.57	90.00	10,659.2	0.0	1,049.9	1,049.9	0.00	0.00	0.00	0.00
11,600.0	89.57	90.00	10,659.9	0.0	1,149.9	1,149.9	0.00	0.00	0.00	0.00
11,700.0	89.57	90.00	10,660.7	0.0	1,249.9	1,249.9	0.00	0.00	0.00	0.00
11,800.0	89.57	90.00	10,661.4	0.0	1,349.9	1,349.9	0.00	0.00	0.00	0.00
11,900.0	89.57	90.00	10,662.2	0.0	1,449.9	1,449.9	0.00	0.00	0.00	0.00
12,000.0	89.57	90.00	10,662.9	0.0	1,549.9	1,549.9	0.00	0.00	0.00	0.00
12,100.0	89.57	90.00	10,663.7	0.0	1,649.9	1,649.9	0.00	0.00	0.00	0.00
12,200.0	89.57	90.00	10,664.4	0.0	1,749.9	1,749.9	0.00	0.00	0.00	0.00
12,300.0	89.57	90.00	10,665.2	0.0	1,849.9	1,849.9	0.00	0.00	0.00	0.00
12,400.0	89.57	90.00	10,665.9	0.0	1,949.9	1,949.9	0.00	0.00	0.00	0.00
12,500.0	89.57	90.00	10,666.7	0.0	2,049.9	2,049.9	0.00	0.00	0.00	0.00
12,600.0	89.57	90.00	10,667.4	0.0	2,149.9	2,149.9	0.00	0.00	0.00	0.00
12,700.0	89.57	90.00	10,668.2	0.0	2,249.9	2,249.9	0.00	0.00	0.00	0.00
12,800.0	89.57	90.00	10,668.9	0.0	2,349.9	2,349.9	0.00	0.00	0.00	0.00
12,900.0	89.57	90.00	10,669.7	0.0	2,449.9	2,449.9	0.00	0.00	0.00	0.00
13,000.0	89.57	90.00	10,670.4	0.0	2,549.9	2,549.9	0.00	0.00	0.00	0.00
13,100.0	89.57	90.00	10,671.2	0.0	2,649.9	2,649.9	0.00	0.00	0.00	0.00
13,200.0	89.57	90.00	10,671.9	0.0	2,749.9	2,749.9	0.00	0.00	0.00	0.00
13,300.0	89.57	90.00	10,672.7	0.0	2,849.9	2,849.9	0.00	0.00	0.00	0.00
13,400.0	89.57	90.00	10,673.4	0.0	2,949.9	2,949.9	0.00	0.00	0.00	0.00
13,500.0	89.57	90.00	10,674.2	0.0	3,049.9	3,049.9	0.00	0.00	0.00	0.00
13,600.0	89.57	90.00	10,675.0	0.0	3,149.9	3,149.9	0.00	0.00	0.00	0.00
13,700.0	89.57	90.00	10,675.7	0.0	3,249.9	3,249.9	0.00	0.00	0.00	0.00

## Planning Report

<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Site WAde 5300 21-30H
<b>Company:</b>	Oasis Petroleum	<b>TVD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)
<b>Project:</b>	McKenzie County, ND	<b>MD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)
<b>Site:</b>	WAde 5300 21-30H	<b>North Reference:</b>	True
<b>Well:</b>	Wade 5300 21-30H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	WAde 5300 21-30H		
<b>Design:</b>	Plan 1 (12-9-10)		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/S (usft)	+E/W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,800.0	89.57	90.00	10,676.5	0.0	3,349.8	3,349.8	0.00	0.00	0.00
13,900.0	89.57	90.00	10,677.2	0.0	3,449.8	3,449.8	0.00	0.00	0.00
14,000.0	89.57	90.00	10,678.0	0.0	3,549.8	3,549.8	0.00	0.00	0.00
14,100.0	89.57	90.00	10,678.7	0.0	3,649.8	3,649.8	0.00	0.00	0.00
14,200.0	89.57	90.00	10,679.5	0.0	3,749.8	3,749.8	0.00	0.00	0.00
14,300.0	89.57	90.00	10,680.2	0.0	3,849.8	3,849.8	0.00	0.00	0.00
14,400.0	89.57	90.00	10,681.0	0.0	3,949.8	3,949.8	0.00	0.00	0.00
14,500.0	89.57	90.00	10,681.7	0.0	4,049.8	4,049.8	0.00	0.00	0.00
14,600.0	89.57	90.00	10,682.5	0.0	4,149.8	4,149.8	0.00	0.00	0.00
14,700.0	89.57	90.00	10,683.2	0.0	4,249.8	4,249.8	0.00	0.00	0.00
14,800.0	89.57	90.00	10,684.0	0.0	4,349.8	4,349.8	0.00	0.00	0.00
14,900.0	89.57	90.00	10,684.7	0.0	4,449.8	4,449.8	0.00	0.00	0.00
15,000.0	89.57	90.00	10,685.5	0.0	4,549.8	4,549.8	0.00	0.00	0.00
15,100.0	89.57	90.00	10,686.2	0.0	4,649.8	4,649.8	0.00	0.00	0.00
15,200.0	89.57	90.00	10,687.0	0.0	4,749.8	4,749.8	0.00	0.00	0.00
15,300.0	89.57	90.00	10,687.7	0.0	4,849.8	4,849.8	0.00	0.00	0.00
15,400.0	89.57	90.00	10,688.5	0.0	4,949.8	4,949.8	0.00	0.00	0.00
15,500.0	89.57	90.00	10,689.2	0.0	5,049.8	5,049.8	0.00	0.00	0.00
15,600.0	89.57	90.00	10,690.0	0.0	5,149.8	5,149.8	0.00	0.00	0.00
15,700.0	89.57	90.00	10,690.7	0.0	5,249.8	5,249.8	0.00	0.00	0.00
15,800.0	89.57	90.00	10,691.5	0.0	5,349.8	5,349.8	0.00	0.00	0.00
15,900.0	89.57	90.00	10,692.2	0.0	5,449.8	5,449.8	0.00	0.00	0.00
16,000.0	89.57	90.00	10,693.0	0.0	5,549.8	5,549.8	0.00	0.00	0.00
16,100.0	89.57	90.00	10,693.7	0.0	5,649.8	5,649.8	0.00	0.00	0.00
16,200.0	89.57	90.00	10,694.5	0.0	5,749.8	5,749.8	0.00	0.00	0.00
16,300.0	89.57	90.00	10,695.2	0.0	5,849.8	5,849.8	0.00	0.00	0.00
16,400.0	89.57	90.00	10,696.0	0.0	5,949.8	5,949.8	0.00	0.00	0.00
16,500.0	89.57	90.00	10,696.7	0.0	6,049.8	6,049.8	0.00	0.00	0.00
16,600.0	89.57	90.00	10,697.5	0.0	6,149.8	6,149.8	0.00	0.00	0.00
16,700.0	89.57	90.00	10,698.2	0.0	6,249.8	6,249.8	0.00	0.00	0.00
16,800.0	89.57	90.00	10,699.0	0.0	6,349.8	6,349.8	0.00	0.00	0.00
16,900.0	89.57	90.00	10,699.7	0.0	6,449.8	6,449.8	0.00	0.00	0.00
17,000.0	89.57	90.00	10,700.5	0.0	6,549.8	6,549.8	0.00	0.00	0.00
17,100.0	89.57	90.00	10,701.2	0.0	6,649.8	6,649.8	0.00	0.00	0.00
17,200.0	89.57	90.00	10,702.0	0.0	6,749.8	6,749.8	0.00	0.00	0.00
17,300.0	89.57	90.00	10,702.7	0.0	6,849.8	6,849.8	0.00	0.00	0.00
17,400.0	89.57	90.00	10,703.5	0.0	6,949.7	6,949.7	0.00	0.00	0.00
17,500.0	89.57	90.00	10,704.2	0.0	7,049.7	7,049.7	0.00	0.00	0.00
17,600.0	89.57	90.00	10,705.0	0.0	7,149.7	7,149.7	0.00	0.00	0.00
17,700.0	89.57	90.00	10,705.7	0.0	7,249.7	7,249.7	0.00	0.00	0.00
17,800.0	89.57	90.00	10,706.5	0.0	7,349.7	7,349.7	0.00	0.00	0.00
17,900.0	89.57	90.00	10,707.2	0.0	7,449.7	7,449.7	0.00	0.00	0.00
18,000.0	89.57	90.00	10,708.0	0.0	7,549.7	7,549.7	0.00	0.00	0.00
18,100.0	89.57	90.00	10,708.7	0.0	7,649.7	7,649.7	0.00	0.00	0.00
18,200.0	89.57	90.00	10,709.5	0.0	7,749.7	7,749.7	0.00	0.00	0.00
18,300.0	89.57	90.00	10,710.2	0.0	7,849.7	7,849.7	0.00	0.00	0.00
18,400.0	89.57	90.00	10,711.0	0.0	7,949.7	7,949.7	0.00	0.00	0.00
18,500.0	89.57	90.00	10,711.8	0.0	8,049.7	8,049.7	0.00	0.00	0.00
18,600.0	89.57	90.00	10,712.5	0.0	8,149.7	8,149.7	0.00	0.00	0.00
18,700.0	89.57	90.00	10,713.3	0.0	8,249.7	8,249.7	0.00	0.00	0.00
18,800.0	89.57	90.00	10,714.0	0.0	8,349.7	8,349.7	0.00	0.00	0.00
18,900.0	89.57	90.00	10,714.8	0.0	8,449.7	8,449.7	0.00	0.00	0.00
19,000.0	89.57	90.00	10,715.5	0.0	8,549.7	8,549.7	0.00	0.00	0.00
19,100.0	89.57	90.00	10,716.3	0.0	8,649.7	8,649.7	0.00	0.00	0.00

## Planning Report

<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Site WAde 5300 21-30H
<b>Company:</b>	Oasis Petroleum	<b>TVD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)
<b>Project:</b>	McKenzie County, ND	<b>MD Reference:</b>	WELL @ 2035.0usft (Original Well Elev)
<b>Site:</b>	WAde 5300 21-30H	<b>North Reference:</b>	True
<b>Well:</b>	Wade 5300 21-30H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wade 5300 21-30H		
<b>Design:</b>	Plan 1 (12-9-10)		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
19,200.0	89.57	90.00	10,717.0	0.0	8,749.7	8,749.7	0.00	0.00	0.00
19,300.0	89.57	90.00	10,717.8	0.0	8,849.7	8,849.7	0.00	0.00	0.00
19,400.0	89.57	90.00	10,718.5	0.0	8,949.7	8,949.7	0.00	0.00	0.00
19,500.0	89.57	90.00	10,719.3	0.0	9,049.7	9,049.7	0.00	0.00	0.00
19,600.0	89.57	90.00	10,720.0	0.0	9,149.7	9,149.7	0.00	0.00	0.00
19,700.0	89.57	90.00	10,720.8	0.0	9,249.7	9,249.7	0.00	0.00	0.00
19,800.0	89.57	90.00	10,721.5	0.0	9,349.7	9,349.7	0.00	0.00	0.00
19,900.0	89.57	90.00	10,722.3	0.0	9,449.7	9,449.7	0.00	0.00	0.00
20,000.0	89.57	90.00	10,723.0	0.0	9,549.7	9,549.7	0.00	0.00	0.00
20,100.0	89.57	90.00	10,723.8	0.0	9,649.7	9,649.7	0.00	0.00	0.00
20,200.0	89.57	90.00	10,724.5	0.0	9,749.7	9,749.7	0.00	0.00	0.00
20,300.0	89.57	90.00	10,725.3	0.0	9,849.7	9,849.7	0.00	0.00	0.00
20,400.0	89.57	90.00	10,726.0	0.0	9,949.7	9,949.7	0.00	0.00	0.00
20,500.0	89.57	90.00	10,726.8	0.0	10,049.7	10,049.7	0.00	0.00	0.00
20,530.0	89.57	90.00	10,727.0	0.0	10,079.7	10,079.7	0.00	0.00	0.00
<b>PBHL</b>									
20,530.3	89.57	90.00	10,727.0	0.0	10,080.0	10,080.0	0.00	0.00	0.00

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N-S (usft)	+E-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
PBHL Wade 5300 21-30	0.00	0.00	10,655.0	0.0	10,080.0	396,819.12	1,219,748.87	48° 2' 49.393 N	103° 33' 43.180 W	
- plan misses target center by 72.0usft at 20529.8usft MD (10727.0 TVD, 0.0 N, 10079.5 E)										
- Point										

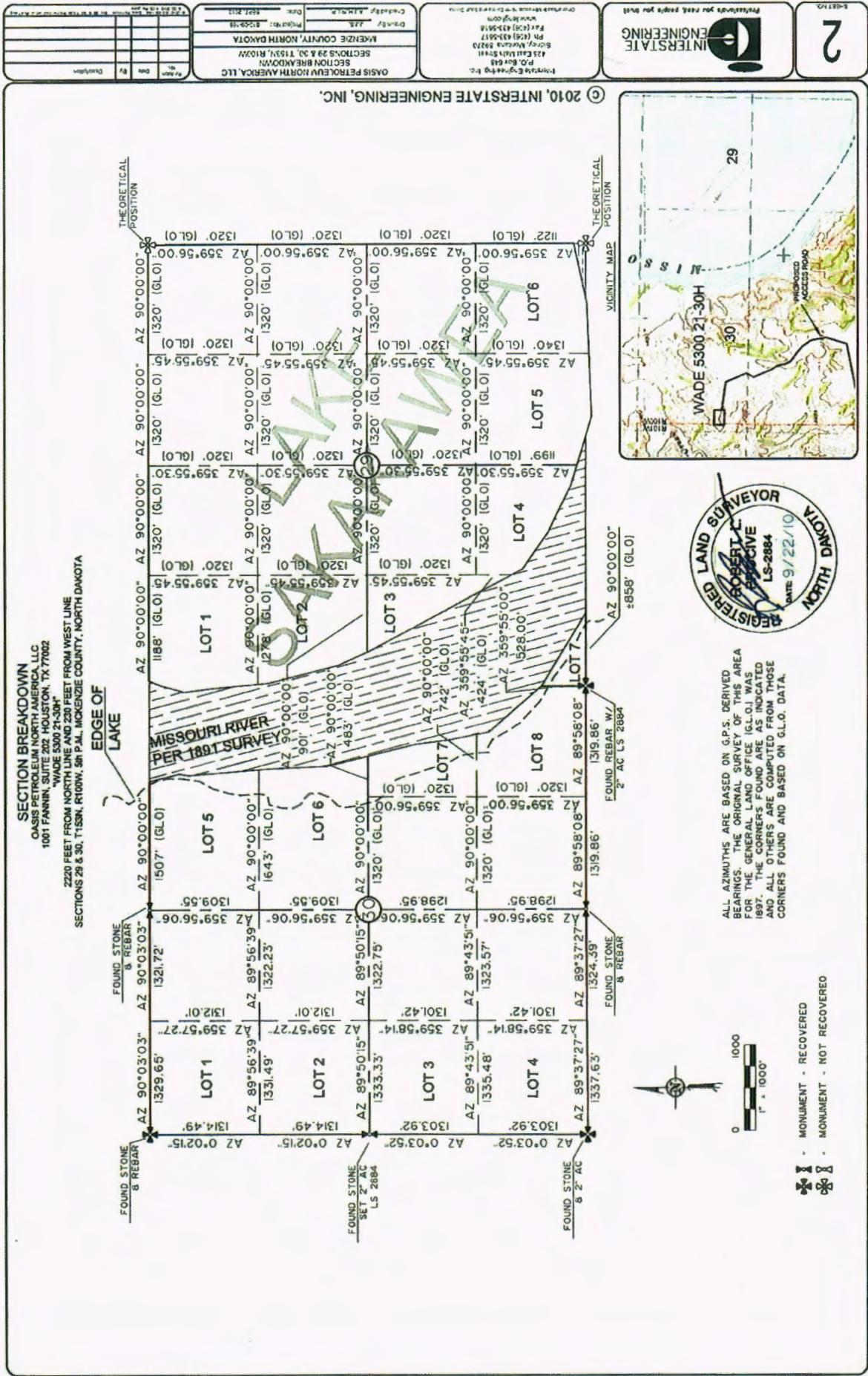
Casing Points						
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")		
2,010.0	2,010.0	9 5/8" Surface Csg	9-5/8	13-1/2		
10,940.0	10,655.0	7" Interm/Prod Csg	7	8-3/4		

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
8,416.0	8,416.0	Charles Salt		0.00		
9,132.0	9,132.0	BLS		0.00		
9,347.0	9,347.0	Mission Canyon		0.00		
9,916.0	9,916.0	Lodgepole		0.00		
10,749.0	10,622.0	False Bakken		0.00		
10,840.0	10,647.0	Middle Bakken		0.00		
10,926.3	10,655.0	Mid Bakken Sand Target		0.00		

## Planning Report

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Site WAde 5300 21-30H
Company:	Oasis Petroleum	TVD Reference:	WELL @ 2035.0usft (Original Well Elev)
Project:	McKenzie County, ND	MD Reference:	WELL @ 2035.0usft (Original Well Elev)
Site:	WAde 5300 21-30H	North Reference:	True
Well:	WAde 5300 21-30H	Survey Calculation Method:	Minimum Curvature
Wellbore:	WAde 5300 21-30H		
Design:	Plan 1 (12-9-10)		

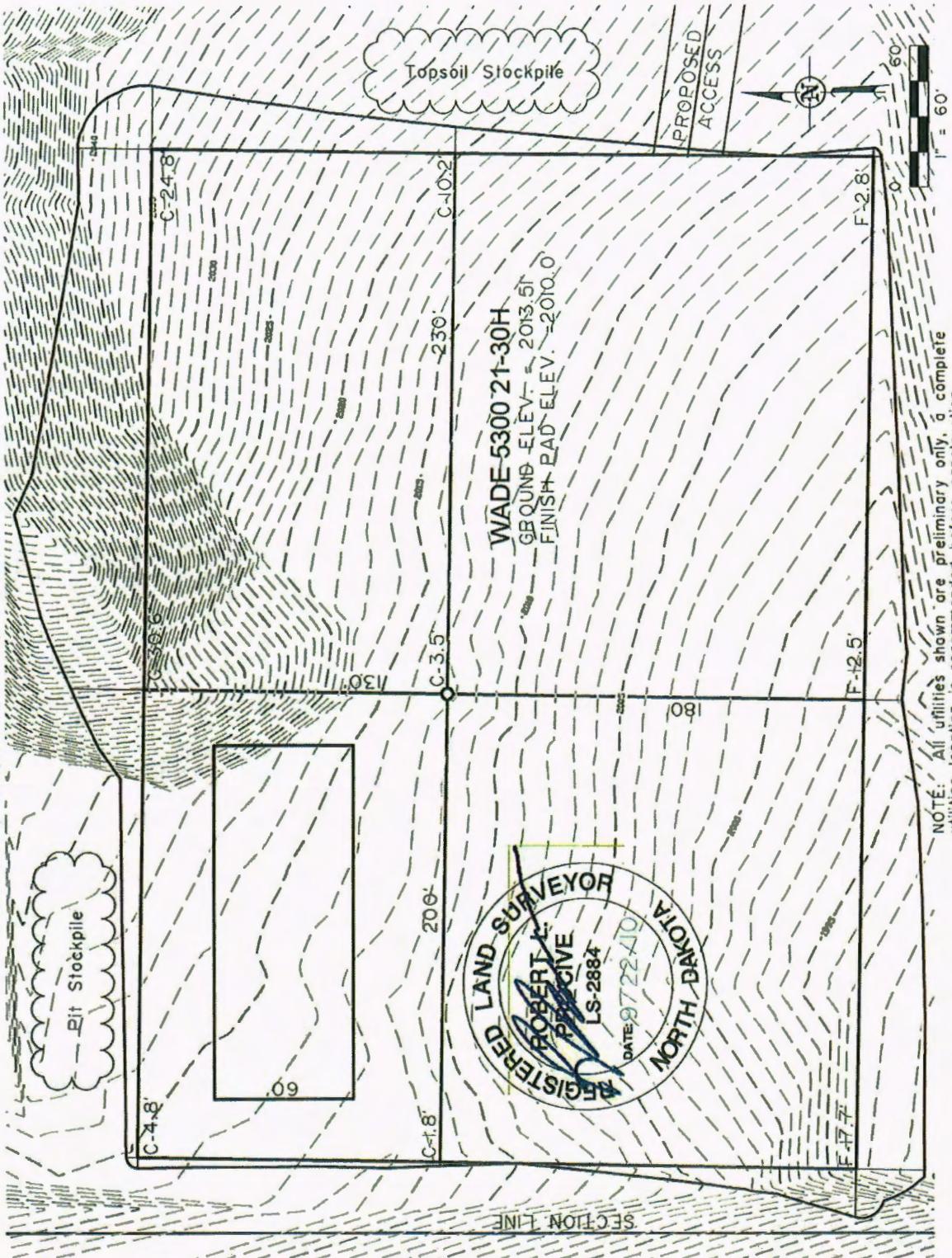
Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/S (usft)	+E/W (usft)		Comment
10,177.0	10,177.0	0.0	0.0	KOP	
10,928.0	10,655.0	0.0	477.9	EOC	
20,530.0	10,727.0	0.0	10,079.7	PBHL	



PAD LAYOUT

OASIS PETROLEUM NORTH AMERICA, LLC  
1001 FANNIN, SUITE 202 HOUSTON, TX 77002

2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA



**WELL LOCATION SITE QUANTITIES**  
 OASIS PETROLEUM NORTH AMERICA, LLC  
 1001 FANNIN, SUITE 202 HOUSTON, TX 77002  
 "WADE 5300 21-30H"  
 2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
 SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA

WELL SITE ELEVATION	2013.5
WELL PAD ELEVATION	2010.0

EXCAVATION	29,595
PLUS PIT	<u>3,150</u>
	32,745
EMBANKMENT	16,603
PLUS SHRINKAGE (15%)	<u>2,490</u>
	19,093
STOCKPILE PIT	3,150
STOCKPILE TOP SOIL (6")	2,810
STOCKPILE MATERIAL	7,692
DISTURBED AREA FROM PAD	3.48 ACRES

NOTE: ALL QUANTITIES ARE IN CUBIC YARDS (UNLESS NOTED)  
 CUT END SLOPES AT 1:1  
 FILL END SLOPES AT 1.5:1

WELL SITE LOCATION

2220' FNL  
 230' FWL

NOTE: BUFF EXCAVATION WAS NOT INCLUDED IN BALANCE.

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3A  
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 Offices in Montana, North Dakota and South Dakota

OASIS PETROLEUM, LLC  
 QUANTITIES  
 SECTION 30, T153N, R100W  
**MCKENZIE COUNTY, ND**  
 Drawn By: J.S. Project No.: S10-09-163  
 Checked By: A.J.H/R.L.P. Date: SEPT, 2010

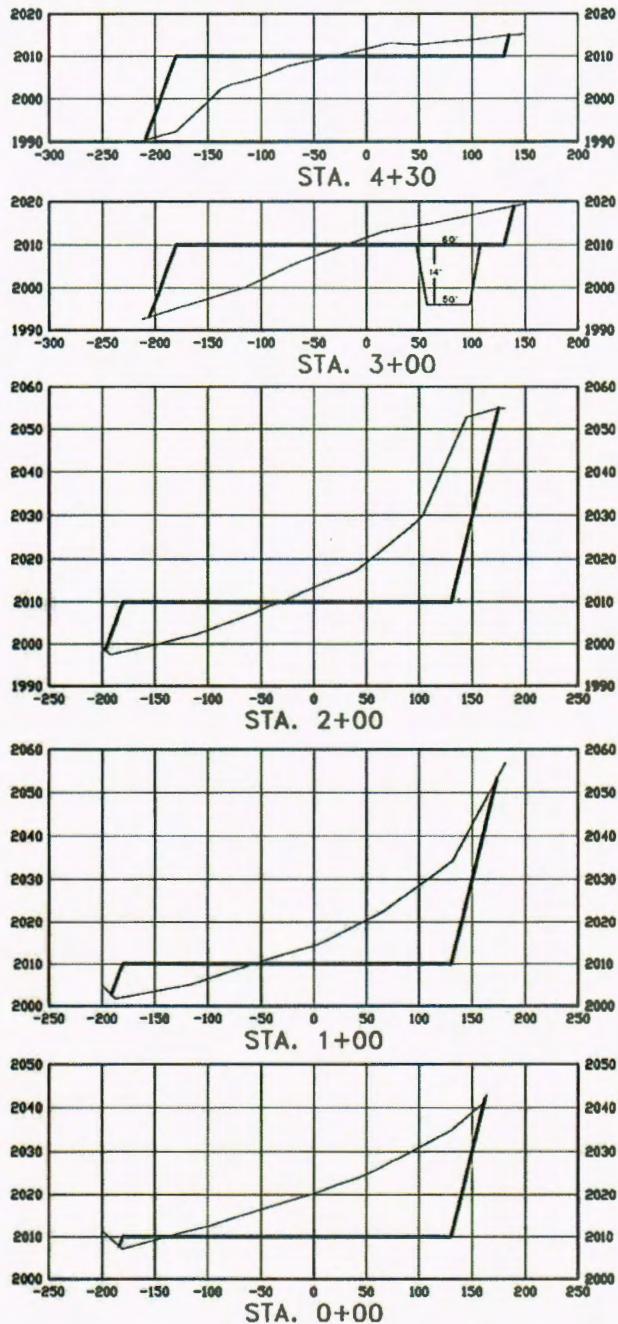
Revision No.	Date	By	Description

## CROSS SECTIONS

OASIS PETROLEUM NORTH AMERICA, LLC  
1001 FANNIN, SUITE 202 HOUSTON, TX 77002

"WADE 5300 21-30H"

WADE 33002-1-301  
2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA



### SCALE

**HORIZ 1' = 160'**  
**VERT 1' = 40'**

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OASIS PETROLEUM NORTH AMERICA, LLC  
PAD CROSS SECTIONS

**SECTION 30, T153N, R100W**

### ACCESS APPROACH

OASIS PETROLEUM NORTH AMERICA, LLC  
1001 FANNIN, SUITE 202 HOUSTON, TX 77002

"WADE 5300 21-30H"

2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA

WADE 5300 21-30H

FOUND STONE  
SET 2" AC  
LS 2884

AZ 98°36'09"  
823.59'

AZ 157°35'50"  
642.18'

30

AZ 203°49'31"  
255.93'

AZ 158°44'29"  
601.01'

AZ 146°41'44"  
197.82'

AZ 153°15'03"  
166.97'

AZ 127°54'57"  
387.14'

AZ 169°22'35"  
442.74'

LANDOWNER:  
LAWRENCE LINDVIG  
SECTION 30  
4,026 FT = 244 RODS

AZ 167°57'40"  
236.86'

AZ 132°31'34"  
193.65'

AZ 147°36'10"  
303.05'

FOUND STONE  
8 2" AC

FOUND STONE  
8 REBAR

AZ 196°36'03"  
642.38'

AZ 207°00'45"  
251.47'

AZ 202°21'05"  
246.82'

AZ 172°44'48"  
226.76'

AZ 170°51'17"  
518.94'

FOUND STONE  
FOR WITNESS  
CORNER

AZ 185°37'24"  
135.49'

AZ 166°23'53"  
326.12'

LEWIS 5300 31-31H

FOLLOW PROPOSED  
ROAD ±1.49 MILES

AZ 219°18'21"  
157.11'

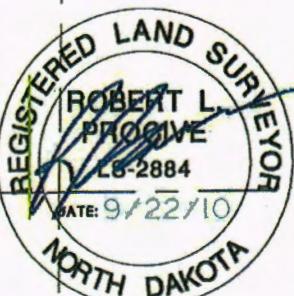
AZ 147°36'00"  
241.69'

AZ 171°18'24"  
482.79'

AZ 248°18'32"  
416.73'

AZ 280°04'29"  
340.48'

TIE INTO EXISTING  
PROPOSED ROAD



0 600  
1" = 600'

NOTE: All utilities shown are preliminary only, a complete  
utilities location is recommended before construction.

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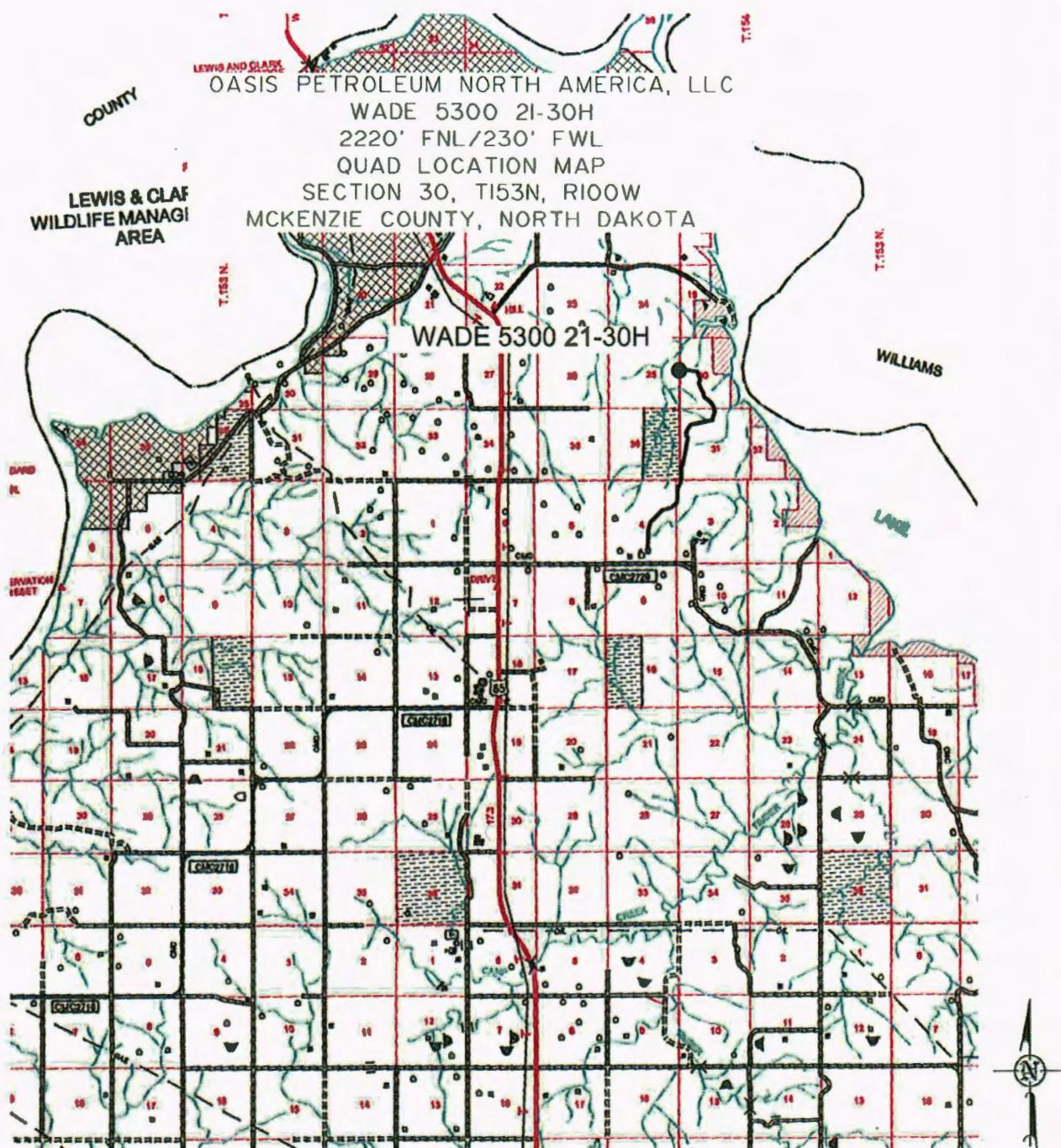
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OASIS PETROLEUM NORTH AMERICA, LLC  
ACCESS APPROACH  
SECTION 30, T153N, R100W  
MCKENZIE COUNTY, NORTH DAKOTA  
Drawn By: J.J.S. Project No: S10-09-166  
Checked By: A.J.H./R.P. Date: SEPT. 2010

File No.	Date	By	Description

**COUNTY ROAD MAP**  
 OASIS PETROLEUM NORTH AMERICA, LLC  
 1001 FANNIN, SUITE 202 HOUSTON, TX 77002  
 "WADE 5300 21-30H"  
 2220 FEET FROM NORTH LINE AND 230 FEET FROM WEST LINE  
 SECTION 30, T153N, R100W, 5th P.M., MCKENZIE COUNTY, NORTH DAKOTA



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SCALE: 1" = 2 MILE



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OASIS PETROLEUM NORTH AMERICA, LLC  
COUNTY ROAD MAP  
SECTION 30, T153N, R100W  
MCKENZIE COUNTY, NORTH DAKOTA

Project No.	Date	By	Description

Drawn By: J.J.S.  
Checked By: A.J.H./RLP.

Project No: S10-09-169  
Date: SEPT. 2010

OASIS PETROLEUM NORTH AMERICA, LLC  
WADE 5300 2I-30H  
2220' FNL/230' FWL  
QUAD LOCATION MAP  
SECTION 30, T153N, R100W  
MCKENZIE COUNTY, NORTH DAKOTA

NO OFFSET WELLS  
IN  
SECTIONS 29 OR 30  
PER NDIC WEBSITE

WADE 5300 2I-30H

30

PROPOSED  
ACCESS ROAD

PROPOSED LEWIS 31-31 WELL

TIE TO PROPOSED LEWIS 31-31  
ACCESS ROAD

29

32



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OASIS PETROLEUM NORTH AMERICA, LLC  
QUAD LOCATION MAP  
SECTION 30, T153N, R100W  
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.I.S. Project No.: S10-09-168  
Checked By: A.J.H/R.L.P. Date: SEPT. 2010

Revision No.	Date	By	Description