



**Bison Oil Well Cementing  
Tail & Lead**

Date: 8/8/2017

Invoice # 900146

API# 05-123-44241

Foreman: Corey B.

Customer: Noble Energy Inc.

Well Name: Wells Ranch AF07-631

County: Weld  
State: Colorado  
Sec: 8  
Twp: 5N  
Range: 62W

Consultant: Matt  
Rig Name & Number: H&P 517  
Distance To Location: 25  
Units On Location: 4027/3103-4032/3203  
Time Requested: 100  
Time Arrived On Location: 2330  
Time Left Location:

WELL DATA	Cement Data
<p>Casing Size (in) : 9.625 Casing Weight (lb) : 36 Casing Depth (ft.) : 1,941 Total Depth (ft) : 1953 Open Hole Diameter (in) : 13.50 Conductor Length (ft) : 80 Conductor ID : 15.25 Shoe Joint Length (ft) : 48 Landing Joint (ft) : 4</p> <p>Sacks of Tail Requested: 100 HOC Tail (ft): 0</p> <p>One or the other, cannot have quantity in both</p> <p>Max Rate: 8 Max Pressure: 2500</p>	<p><b>Lead</b></p> <p>Cement Name: BFN III Cement Density (lb/gal) : 13.5 Cement Yield (cuft) : 1.68 Gallons Per Sack 8.90 % Excess 15%</p> <p><b>Tail Type III</b></p> <p>Cement Name: Cement Density (lb/gal) : 15.2 Cement Yield (cuft) : 1.27 Gallons Per Sack: 5.80 % Excess: 0%</p> <p>Fluid Ahead (bbls) 50.0 H2O Wash Up (bbls) 20.0</p> <p><b>Spacer Ahead Makeup</b> 50 BBL ahead with Die in 2nd 10</p>

Casing ID 8.921 Casing Grade J-55 only used

Lead Calculated Results	Tail Calculated Results
<b>HOC of Lead</b> 1639.77 ft	<b>Tail Cement Volume In Ann</b> 127.00 cuft
Casing Depth - HOC Tail	(HOC Tail) X (OH Ann)
<b>Volume of Lead Cement</b> 801.41 cuft	<b>Total Volume of Tail Cement</b> 106.17 Cuft
HOC of Lead X Open Hole Ann	(HOC Tail X OH Ann) - (Shoe Length X Shoe Joint Ann)
<b>Volume of Conductor</b> 61.05 cuft	<b>bbls of Tail Cement</b> 22.62 bbls
(Conductor ID Squared) -(Casing Size OD Squared) X (.005454) X (Conductor Length ft)	(HOC of Tail) X (OH Ann) + (Cement Yield) X (Shoe Joint Ann) X (.1781) X (% Excess)
<b>Total Volume of Lead Cement</b> 862.46 cuft	<b>HOC Tail</b> 217.23 ft
(cuft of Lead Cement) + (Cuft of Conductor)	(Tail Cement Volume) ÷ (OH Ann)
<b>bbls of Lead Cement</b> 176.64 bbls	<b>Sacks of Tail Cement</b> 100.00 sk
(Total cuft of Lead Cement) X (.1781) X (1+%Lead Excess)	(Total Volume of Tail Cement) ÷ (Cement Yield)
<b>Sacks of Lead Cement</b> 590.37 sk	<b>bbls of Tail Mix Water</b> 13.81 bbls
(Total Slurry Volume) ÷ (Cement Yield) X (% Excess Cement)	(Sacks of Tail Cement X Gallons Per Sack) ÷ 42
<b>bbls of Lead Mix Water</b> 125.10 bbls	Pressure of cement in annulus
(Sacks Needed) X (Gallons Per Sack) ÷ 42	<b>Hydrostatic Pressure</b> 585.23 PSI
<b>Displacement</b> 146.64 bbls	<b>Collapse PSI:</b> 2020.00 psi
(Casing ID Squared) X (.0009714) X (Casing Depth) + (Landing Joint) - (Shoe Length)	<b>Burst PSI:</b> 3520.00 psi
<b>Total Water Needed:</b> 355.55 bbls	

*Mary Stapleton*  
Authorization To Proceed

Customers hereby acknowledges and specifically agrees to the terms and condition on this work order, including, without limitation, the provisions on this work order.

