



**Bison Oil Well Cementing
Tail & Lead**

Date: 2/15/2020
 Invoice # 900476
 AFE # 206785
 Foreman: Corey Barras

Customer: Noble Energy Inc.
 Well Name: Vogler State D33-779

County: Weld Consultant: Tim
 State: Colorado Rig Name & Number: H&P 321
 Distance To Location: 21
 Units On Location: 4028/3103-4020/3203
 Time Requested: 1730
 Time Arrived On Location: 1700
 Time Left Location: _____
 Sec: 21
 Twp: 3N
 Range: 64W

WELL DATA	Cement Data
Casing Size (in) : <u>9.625</u> Casing Weight (lb) : <u>36</u> Casing Depth (ft.) : <u>1,938</u> Total Depth (ft) : <u>1948</u> Open Hole Diameter (in) : <u>13.50</u> Conductor Length (ft) : <u>80</u> Conductor ID : <u>15.25</u> Shoe Joint Length (ft) : <u>42</u> Landing Joint (ft) : <u>30</u> Sacks of Tail Requested : <u>100</u> HOC Tail (ft): <u>0</u> <div style="border: 1px solid black; padding: 2px; width: fit-content;"> One or the other, cannot have quantity in both </div> Max Rate: <u>8</u> Max Pressure: <u>1500</u>	Lead Cement Name: Cement Density (lb/gal) : <u>13.5</u> Cement Yield (cuft) : <u>1.7</u> Gallons Per Sack <u>9.00</u> % Excess <u>10%</u> Tail Cement Name: Cement Density (lb/gal) : <u>15.2</u> Cement Yield (cuft) : <u>1.27</u> Gallons Per Sack: <u>5.89</u> % Excess: <u>0%</u> Fluid Ahead (bbls) <u>30.0</u> H2O Wash Up (bbls) <u>20.0</u> Spacer Ahead Makeup <u>30BBL WATER DYE IN 2ND 10</u>

Casing ID 8.921 Casing Grade J-55 only used

Lead Calculated Results	Tail Calculated Results
HOC of Lead <u>1605.44 ft</u>	Tail Cement Volume In Ann <u>127.00 cuft</u>
Casing Depth - HOC Tail	(HOC Tail) X (OH Ann)
Volume of Lead Cement <u>784.63 cuft</u>	Total Volume of Tail Cement <u>108.77 Cuft</u>
HOC of Lead X Open Hole Ann	(HOC Tail X OH Ann) - (Shoe Length X Shoe Joint Ann)
Volume of Conductor <u>61.05 cuft</u>	bbls of Tail Cement <u>22.62 bbls</u>
(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)
Total Volume of Lead Cement <u>845.68 cuft</u>	HOC Tail <u>222.56 ft</u>
(cuft of Lead Cement) + (Cuft of Conductor)	(Tail Cement Volume) ÷ (OH Ann)
bbls of Lead Cement <u>165.68 bbls</u>	Sacks of Tail Cement <u>100.00 sk</u>
(Total cuft of Lead Cement) X (.1781) X (1+%Lead Excess)	(Total Volume of Tail Cement) ÷ (Cement Yield)
Sacks of Lead Cement <u>547.20 sk</u>	bbls of Tail Mix Water <u>14.02 bbls</u>
(Total Slurry Volume) ÷ (Cement Yield) X (% Excess Cement)	(Sacks of Tail Cement X Gallons Per Sack) ÷ 42
bbls of Lead Mix Water <u>117.26 bbls</u>	Pressure of cement in annulus
(Sacks Needed) X (Gallons Per Sack) ÷ 42	Hydrostatic Pressure <u>585.23 PSI</u>
Displacement <u>146.56 bbls</u>	Collapse PSI: <u>2020.00 psi</u>
(Casing ID Squared) X (.0009714) X (Casing Depth) - (Shoe Length)	Burst PSI: <u>3520.00 psi</u>
Total Water Needed: <u>327.84 bbls</u>	

X [Signature]
 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.

Vogler State D33-779

