



**Bison Oil Well Cementing
Tail & Lead**

Date: 10/28/2017

Invoice # 666221

API# 05-123-44845

Supervisor: Nick Vigil

Customer: Noble Energy Inc.

Well Name: Waste Management Y23-768

County: Weld
State: Colorado
Sec: 11
Twp: 2N
Range: 64W

Consultant: Woodie
Rig Name & Number: H&P 517
Distance To Location: 36 miles
Units On Location: 4040/4032
Time Requested: 8:30
Time Arrived On Location: 8:30
Time Left Location:

WELL DATA	Cement Data
<p>Casing Size (in) : 9.625 Casing Weight (lb) : 36 Casing Depth (ft.) : 2,046 Total Depth (ft) : 2056 Open Hole Diameter (in) : 13.50 Conductor Length (ft) : 80 Conductor ID : 15.25 Shoe Joint Length (ft) : 45 Landing Joint (ft) :</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: 2000</p>	<p>Lead Cement Name: Cement Density (lb/gal) : 13.5 Cement Yield (cuft) : 1.7 Gallons Per Sack 9.00 % Excess 15%</p> <p>Tail Cement Name: Cement Density (lb/gal) : 15.2 Cement Yield (cuft) : 1.27 Gallons Per Sack: 5.89 % Excess: 0%</p> <p>Fluid Ahead (bbls) 50.0 H2O Wash Up (bbls) 20.0</p> <p>Spacer Ahead Makeup Dye in second 10 bbl</p>

Lead Calculated Results	Tail Calculated Results
HOC of Lead 1742.11 ft	Tail Cement Volume In Ann 127.00 cuft (HOC Tail) X (OH Ann)
Casing Depth - HOC Tail	Total Volume of Tail Cement 107.47 Cuft (HOC Tail X OH Ann) - (Shoe Length X Shoe Joint Ann)
Volume of Lead Cement 851.42 cuft	bbls of Tail Cement 22.62 bbls (HOC of Tail) X (OH Ann) + (Cement Yield) X (Shoe Joint Ann) X (.1781) X (% Excess)
HOC of Lead X Open Hole Ann	HOC Tail 219.89 ft (Tail Cement Volume) ÷ (OH Ann)
Volume of Conductor 61.05 cuft (Conductor ID Squared) - (Casing Size OD Squared) X (.005454) X (Conductor Length ft)	Sacks of Tail Cement 100.00 sk (Total Volume of Tail Cement) ÷ (Cement Yield)
Total Volume of Lead Cement 912.47 cuft (cuft of Lead Cement) + (Cuft of Conductor)	bbls of Tail Mix Water 14.02 bbls (Sacks of Tail Cement X Gallons Per Sack) ÷ 42
bbls of Lead Cement 186.89 bbls (Total cuft of Lead Cement) X (.1781) X (1+%Lead Excess)	Pressure of cement in annulus
Sacks of Lead Cement 617.26 sk (Total Slurry Volume) ÷ (Cement Yield) X (% Excess Cement)	Hydrostatic Pressure 585.23 PSI
bbls of Lead Mix Water 132.27 bbls (Sacks Needed) X (Gallons Per Sack) ÷ 42	Collapse PSI: 2020.00 psi Burst PSI: 3520.00 psi
Displacement 154.99 bbls (Casing ID Squared) X (.0009714) X (Casing Depth) + (Landing Joint) - (Shoe Length)	
Total Water Needed: 371.28 bbls	

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.

