Rico-Argentine Mine Site
Rico, Colorado

St. Louis Tunnel Drawdown and Recovery Test Field Implementation Plan

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

June 2021

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June 2021

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INTRODUCTION

Plans for a third relief well (RW-3A) are currently underway for implementation at the St. Louis Tunnel (SLT) in 2021. During drilling of the two existing relief wells (RW-2A and RW-2B) in 2016, the water elevation encountered when the SLT was intercepted was several feet higher than what had been anticipated based on monitoring data available at the time of drilling. Relief well operations to-date have provided observations and data that suggest the storage volume conditions in-by of RW-2A and RW-2B may be different than storage volumes modeled using historical tunnel geometry. RW-2A and RW-2B provide the nearest available monitoring points to the RW-3A interception location. Additional blockages in-by of the existing relief wells could complicate RW-3A drilling efforts by obscuring the true elevation and volume of stored water to be encountered when the SLT is intercepted. To obtain data necessary to infer the presence or absence of additional blockages in-by of relief wells RW-2A and RW-2B that may affect conditions during drilling and completion of RW-3A, a controlled stepwise drawdown and recovery test is proposed.

BACKGROUND

The SLT is an adit, or tunnel, which connects and drains a complex network of interconnected mine shafts and tunnels. In approximately 1996, the opening of the SLT collapsed, restricting the free flow of water from the tunnel. Although the resulting soil and rock forming the "debris plug" allows some water to flow out of the tunnel, water is currently impounded behind the debris plug(s) inside of the tunnel. The transmissivity of the debris plug(s) is decreasing over time due to the accumulation of sludges, silts, and clays in the soil/rock matrix.

The SLT water elevation is currently being managed in an operating envelope of 8871.0-8872.0 ft above mean sea level (AMSL) as defined in the St. Louis Tunnel Relief Well Water Management Operations and Procedures (Atlantic Richfield, 2020). During the 2017 field season, tunnel heads were maintained below 8869 ft AMSL to mitigate the consequences of a debris plug failure during Flow Control Structure (FCS) construction. The operating envelope was implemented early in 2018 to raise and maintain the tunnel water elevation as measured at the relief wells to an elevation between 8871.00 and 8872.00 ft AMSL. The purpose of implementing the operating envelope was to 1) increase flow through the debris plug and maintain debris plug pore pressures and 2) manage turbidity from the relief wells and debris plug in order to optimize wetlands treatment system performance/life. Water levels at RW-2A and RW-2B will be kept within the constraints of the defined operating envelope (8871.0-8872.0 ft AMSL) during data collection and relief well operation as part of this FIP.

Estimation of Storage Volume

The total tunnel volume has been estimated using the tunnel geometry as indicated from historical mapping. The historically mapped elevations for the ceiling and floor were previously utilized to model the impounded volume of the SLT as a function of water elevation and length referenced from the historical 0+00 station at the former tunnel portal (See Attachment A). The SLT water elevation measurements collected at relief wells RW-2A and RW-2B provide the assumed top of the water within the tunnel, currently maintained within the operating envelope of 8871.0 – 8872.0 ft AMSL. The relative volume of water impounded can be inferred using the tunnel geometry and water elevations measured at relief wells RW-2A and RW-2B. With a measured water elevation of 8871.6 ft AMSL, the estimated volume of water is 2.98 million gallons impounded inside the tunnel with the top of the water pool intersecting the floor ending at a distance approximately 5,400 ft from station 0+00 (Table 1). A plot of the stage-storage curve is presented as Figure 1.

Table 1: St. Louis Tunnel Operating Envelope Water Volume Estimates

Water Level	Estimated Water Volume	Length of Water in Tunnel
8,871.00	2.76 MGal	0+00 to 52+50 (5,250 ft)
8,871.50	2.94 MGal	0+00 to 54+00 (5,400 ft)
8,872.00	3.12 MGal	0+00 to 55+25 (5,525 ft)

The current estimated volume calculations assume the following:

1.) The tunnel is open and not obstructed by additional blockages that could similarly impound additional volumes of water at a different head levels beyond the known debris plug(s)
2.) The calculated volume assumes the geometric volume is occupied by free water and movable solids.

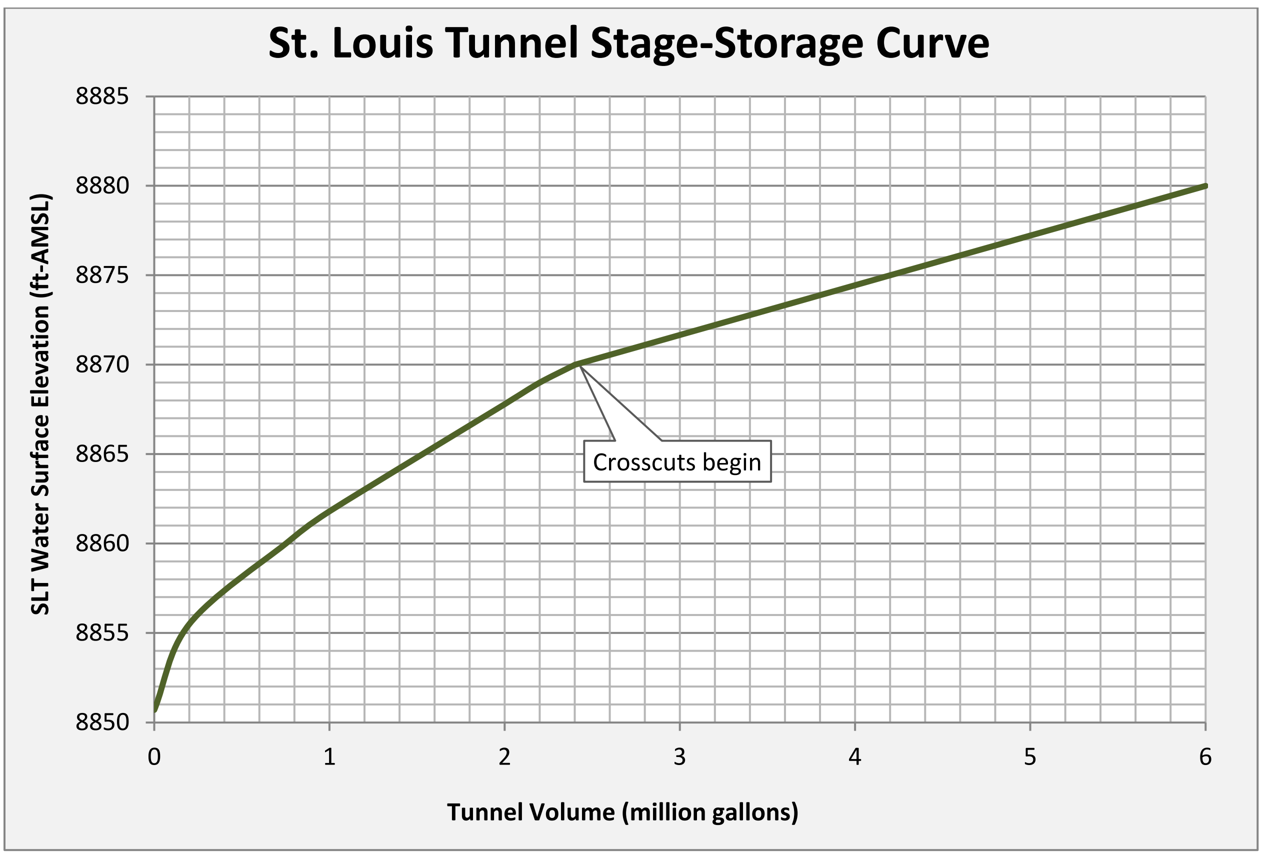


Figure 1. Stage-Storage Curve for the St. Louis Tunnel based on Archival Information on Tunnel Geometry

Discrepancies Between Estimated and Observed Storage Volume

There was an initial attempt made to verify this stage-storage curve in October of 2016 by analyzing telemetry data during a brief period when all of the relief well control valves were fully closed. This analysis resulted in less storage within the elevation range tested than what the stage-storage curve in Figure 1 would indicate. It is thought that this is most likely due to actual loss of a portion of the original storage capacity due to the presence of another debris plug in-by of RW-2A / RW-2B, settling of oxy-hydroxide sludges, sedimentation of rock fines generated during construction and operation of the tunnel, or some combination of these factors. Although thought to be less likely, it is also possible that the stage-storage curve based on archival information is inaccurate within the range of elevations analyzed. The water elevation encountered while drilling relief well RW-2A in 2016 was several feet higher inside the SLT than had been expected based on data from the existing monitoring wells/angled boreholes AT-2 and BAH-01. The discrepancy in water elevation measurement between the 2016 relief wells (RW-2A and RW-2B) and monitoring wells/angled boreholes BAH-01 and AT-2 has been attributed to collapsed reaches of tunnel between the monitoring points which impound water at different elevations. After RW-2A and RW-2B were completed, a camera was inserted down the relief wells, but visual data was obscured due to water turbidity. The current conditions inside the SLT cannot be accurately depicted and the only insights to the SLT conditions and water volume impounded are based on SLT water elevation and flow monitoring observations at the surface. The current conditions in-by of the current relief wells, including any additional collapsed features/blockages, are unknown.

Water elevation and flow data from relief well operations (e.g., relief well cleaning or wellhead modification events, pump testing, etc.) to-date suggest that blockages could exist in-by of relief wells RW-2A and RW-2B, as the volume of water required to reduce the tunnel water elevation appears to vary depending on the flow rate at which the water is removed. Table 2 contains data from drawdown events completed during relief well operations and comparison to the SLT stage-storage curve. Elevation and flow data were selected from periods of drawdown determined to be least affected by flow conditions which compromise measurements. The data collected during relief well operations were gathered incidentally and not with the intent of verifying the SLT storage volume estimate. Data collected incidentally with maintenance operations is variable and contains flow artifacts. The relief well siphon vacuum and flow velocities impact pressure transducers measurements, requiring transducers to be calibrated to a specific flow rate. Changes in flow rate away from the calibrated flow rate, such as short term flow increases or decreases during drawdown or recovery operations, may impact elevation measurements by as much as 1 ft (up to 100% error). However, data from operations to-date consistently suggest that the volume of water stored within the SLT may be less than is modeled by the stage-storage curve (volume removed per change in elevation is less than anticipated), or that a blockage may be present in-by of the existing relief wells (volume removed per change in elevation varies depending on magnitude of flow increase or decrease). To account for flow effects on elevation measurements, a test which controls for these variables is required.

Table 2: Comparison of Stage-Storage Curve to Relief Well Operations

Event	Increase in RW Flow Rate Over Base Flow (GPM)	Start Elevation (ft AMSL)	End Elevation (ft AMSL)	Est. Volume Removed in Excess of Base Flow (gal)	Est. Volume removed per 0.5 ft drawdown (gal)	Total Length of Volume (ft) Assuming 9-ft Width	Relative Percent Difference
SLT Stage-Storage Curve	--	8,871.29	8,870.5	284,400	180,000	5,348	-54%
10/2018 RW Maint. RW-2A	25-30	8,871.29	8,870.5	130,334	82,490	2,451	
SLT Stage-Storage Curve	--	8,871.43	8,870.73	252,000	180,000	5,348	-75%
4/19 RW Maint. RW-2B	40-90	8,871.43	8,870.73	61,966	44,262	1,315	
SLT Stage-Storage Curve	--	8,870.9	8,869.52	398,979	144,557	4,295	-65%
5/19 RW Maint. RW-2B	20-30	8,870.9	8,869.52	141,717	51,272	1,523	
SLT Stage-Storage Curve	--	8,871.9	8,870.76	410,400	180,000	5,348	-99%
6/19 RW2B Pump Flow Test	100-330	8,871.9	8,870.76	2,743	1,203	36	

Relief Well RW-3A

A third relief well (RW-3A) is planned to be installed during the 2021 field season to provide additional and redundant hydraulic control capacity and management of the hydraulic head within the SLT. The increased flow capacity is intended to provide improved control and monitoring of water elevations behind the inferred debris plug(s) and help to minimize the potential of an uncontrolled release from the SLT. The additional relief well will be installed at a point in-by of the current relief wells and is expected to augment the understanding of actual conditions within the SLT including presence of additional collapses, water quality response, and volume of solids contained within the tunnel. A completion size larger than the current relief wells may also improve the ability to deploy additional instrumentation and technology in the future to better understand conditions inside the tunnel.

The presence of collapsed sections inside the tunnel in-by of the existing relief wells could present additional risks and complications for the drilling process such as the following:

- Additional collapses located in-by of RW-2B could impound water at a higher elevation than is measured at RW-2B and RW-2A;

- A blockage or collapse at the proposed intercept of RW-3A could negatively impact the final well completion flow capacity; and
- Increased time and water management capacity may be required during drilling to draw down the SLT water to an appropriate level if the water elevation encountered at the RW-3A intercept is higher than anticipated.

Prior to drilling, an improved understanding of whether collapsed features or additional water impoundments exist in-by of the relief wells RW-2A and RW-2B is needed to aid drilling planning for the proposed 3rd relief well, RW-3A.

TASK OVERVIEW

To gather data necessary to infer if and where blockages exist upstream of relief wells RW-2A and RW-2B, a controlled stepwise drawdown test is proposed.

The objective of this drawdown test is to gather data to improve understanding of hydraulic conditions to be anticipated at the RW-3A intercept during the drilling of RW-3A. The data will be used to determine likely presence and location, or absence, of obstructions in-by of RW-2A and RW-2B that may affect hydraulic conductivity and impound water in-by of the relief wells. This data will also help verify current estimates of storage volume within the SLT.

To minimize previously observed siphon and flow effects that confound water elevation measurements, all flow adjustments will be performed using only relief well RW-2B, while relief well RW-2A will not flow and instead will be utilized as a monitoring well for collecting static water elevation measurements.

The SLT water elevation at the relief wells will be raised to near the top elevation of the existing SLT operating envelope (8872.00 ft AMSL), then rapidly reduced in one 1-ft step. The SLT water elevation will then be held constant near the low elevation of the SLT operating envelope (8871.00 ft AMSL). After determining that the tunnel outflow has equalized to the base flow rate, RW-2B will be shut in to allow the tunnel to rise back to the top of the operating envelope (8872.00 ft AMSL). RW-2B flow will then be re-initiated to hold the water elevation constant until the tunnel outflow equalizes to the base flow rate.

The total volume removed during each rapid drawdown and recovery step will be used in combination with the SLT geometry and the corresponding change in water elevation to estimate the volume and length of the SLT tunnel pool in which the relief wells are located. When holding the water elevation constant after each rapid drawdown or recovery step, the flow rate will be monitored to determine if a restrictive blockage is present. If no blockage exists in-by of the relief wells, the total tunnel outflow rate required to maintain constant elevation after a stepwise reduction or increase will equal the base flow rate prior to initiating the test (accounting for potential changes in base flow rate due to spring runoff and changes in head). If a blockage exists that affects hydraulic conductivity to a measurable extent, the flow rate required to maintain constant elevation between steps will initially change over time before equalizing to the base flow rate.

HEALTH AND SAFETY

All tasks described herein will be performed in accordance with the Task Specific Health and Safety Plan (TSHASP) prepared by Alloy and the Rico HSSE Program Document. Each person who performs work at the site as an employee, contractor, subcontractor, or visitor is expected to read, be trained, and acknowledge understanding of the current HSSE Program Document and applicable TSHASPs, Alloy's Control of Work (CoW) Policies, Practices, Procedures and Guidance (PPPGs), and participate in a process of continuous health and safety improvement. Additionally, the appropriate Task Risk Assessments (TRAs) will be completed prior to initiating any of the work described herein in accordance with site HSSE requirements. Safety precautions will be implemented to preclude unauthorized access to the immediate work area during drawdown and recovery activities to ensure the safety of field personnel and efficacy of the test.

The following sections provide specifics and references for the procedures that will be performed with this work:

Water Management

The procedures outlined in the document *Tunnel Relief Wells Water Management Operations and Procedures* (Atlantic Richfield, 2020) will be followed throughout the test. Key parameters to monitor during testing include:

- SLT Operating Envelope water elevation limits: Relief well water elevations are not to exceed 8872.00 ft amsl or decrease to below 8871.00 ft amsl.
- SLT water elevation rate of change limit: Relief well water elevations are not to be changed by more than 1 ft in 24 hours.

Turbidity increases are expected and will be managed as detailed in the below Stop Work triggers and by diverting around the Wetlands Treatment System described below.

Stop Work

Stop Work triggers have been developed for this work. Stop Work will be implemented by field personnel or others remotely monitoring the drawdown test. The Stop Work triggers will include:

- **Relief well RW-2A water elevation reaches values outside of the SLT Operating Envelope.** Work will be stopped and relief well flow will be adjusted as necessary to return to the operating envelope.
- **Observed changes at debris plug daylight.** Any observed changes at the debris plug that could indicate the test is affecting debris plug stability will trigger an immediate Stop Work and return to steady state flow within the operating envelope. Photos and detailed notes willwill be collected of any anomalous observation.
- **Changed turbidity characteristics at the debris plug daylight.** High turbidity from the relief wells in excess of 100 NTU can be expected whenever large flow adjustments are made. However, any observed changes in turbidity characteristics of SLT discharge coming from the debris plug daylight that could indicate the test is affecting debris plug stability (e.g., change from usual orange iron sludge to a brown mud-like or earthen sediment color at the debris plug daylight) will trigger an immediate Stop Work and return to steady state flow within the operating envelope. Photos and detailed notes willwill be collected of any anomalous observation.

- **Impacts to relief well.** To minimize impacts to the relief wells, RW-2B will be used as the flow well, as this relief well is screened via 1-inch by 3-inch slots in the well casing within the tunnel. Relief well RW-2A does not have a screen, so it will be used as the water elevation monitoring well and will not be flowing during this test. Work will be stopped if any field observations indicate potential entrainment of debris that could compromise the relief well. The site hydrojetting equipment will be kept filled and available throughout the drawdown and recovery test.
- **Any HSSE or Crisis concern requiring Stop Work.**

SCOPE OF WORK

Task 1 - Calibrate Transducers at DR-3, RW-2A, and RW-2B

1.1 Calibrate DR-3 transducer according to Standard Operating Procedure (SOP) *SOP_Rico_10 – DR-3 Cleaning and Calibration* (Attachment C).

1.2 Record base flow rates for relief wells RW-2A and RW-2B, and DR-3.

1.3 Calibrate RW-2B dynamic elevation measurement according to SOP *SOP_Rico_09 – Relief Well Manometer Check* (Attachment C) and initiate siphon flow. Details for adjusting relief wells and switching operational modes are described in Attachment B, *SOP_Rico_08 – Relief Well OM&M.*

   a. Restore flow to RW-2B in siphon mode after complete evacuation of air from the RW-2B discharge piping and wellhead.
   b. Verify no air is present in RW-2B discharge piping.
   c. Adjust RW-2B flow rate to match relief well total flow at base flow.

1.4 Take RW-2A offline and calibrate RW-2A static elevation measurement.

   a. Verify relief well RW-2B flow matches the baseline relief well total flow rate and shut the RW-2A flow control valve (FCV-2A) completely.
   b. Measure the static water elevation at RW-2A using a manometer and calibrate the transducer to match the field measurement.
   c. Secure the manometer to allow field water elevation checks throughout the test.

1.5 Adjust telemetry data record interval to record to telemetry data files every minute for DR-3, RW-2A, and RW-2B transducers, the RW-2A flow meter, and the RW-2B flow meter.

1.6 Maintain steady state base-flow operation for at least one day prior to beginning Task 2.

Task 2 – Raise Tunnel Water Elevation to Top of Operating Envelope

2.1 Raise tunnel water elevation to top of operating envelope. Adjust RW-2B flow down by 50 GPM to raise the tunnel water elevation until RW-2A reaches an elevation of 8871.95. Increase the RW-2B flow rate back to base flow and adjust RW-2B flow as necessary to maintain 8871.95 at least overnight.

   a. Divert SLT discharge to Pond 15 if turbidity rises to more than 100 NTU as measured at water quality sonde WQ-10 (OXINF) throughout the test.

Task 3 – Initiate Drawdown and Recovery Test.

3.1 Initiate stepwise drawdown to 8871.05 at RW-2A. To reduce tunnel head, the total relief well flow rate will be increased via RW-2B to approximately 300 GPM above base flow. The target will be to achieve a 1 ft drawdown step in less than 4 hours as measured at RW-

2A. Reduce the flow rate back to base flow and adjust RW-2B flow as necessary to maintain 8871.05 at RW-2A at least overnight.

3.2 Initiate recovery test to 8871.95. Adjust RW-2B flow down to 0 GPM to raise the tunnel water elevation until RW-2A reaches an elevation of 8871.95. Increase the RW-2B flow rate back to base flow and adjust RW-2B flow as necessary to maintain 8871.95.

CALCULATIONS

The hydraulic behavior of the St. Louis Tunnel (SLT) is based on the mass balance of tunnel flow; i.e., water coming into the tunnel (I) minus the outflow (O) must equal the change in storage in the tunnel with time, as described in Equation 1 below:

$$I - O = dS/dt \qquad \textbf{Equation 1}$$

Inflow cannot be directly measured, but must be estimated by adjusting outflow such that the tunnel head is constant (dS/dt =0). By repeating this at the different stages of the test, any drift in inflow can be estimated between holding periods. Tunnel inflow is believed to be slowly varying per the hydrologic modeling of the tunnel and can be assumed to smoothly vary between calibration points. Equation 1 can be expressed in finite difference form as:

$$(I_i + I_{i+1}) / 2 \ - \ (O_i + O_{i+1}) / 2 = (S_i - S_{i+1}) / D\ t \qquad \textbf{Equation 2}$$

A spreadsheet will be used to solve equation 2. Once tunnel inflow is known, periods of varying tunnel head can be evaluated to solve for differential storage to evaluate the effect of sediment or blockage on the stage storage relationship.

COMMUNICATION PLAN

Project communications will occur according to the roles and responsibilities listed in Table 3.

Table 3. Communication Plan.

Company	Primary Personnel	Role	Responsibility
Atlantic Richfield	Steve Ferry	SLT Liability Manager	Oversee SLT Operations
Alloy	Luke Evans	SLT Relief Wells Lead	Oversee Drawdown Test Operations
Alloy	Alex Wing	Site Operations Manager/ SLT Field Operations Lead	Implement FIP and Lead On-site Operations.
Alloy	Tyler Farrar	Site Operations and HSSE Support	Implement FIP and Support Site Operations Manager
Alloy	Shelby Fortune	Alloy HSSE Manager	HSSE Support
Pioneer	Alan Jewell	Geotechnical SME	Geotechnical Support

EQUIPMENT INVOLVED

Equipment used to execute this plan will include:

- A manometer for measuring water elevation.
- A vacuum pump for initiating siphon flow.
- The Site hydro-jetting equipment in case of blockage.
- The site telemetry system for monitoring flow and water elevations.

SCHEDULE

The tasks included in this plan are anticipated to be completed according to the following schedule:

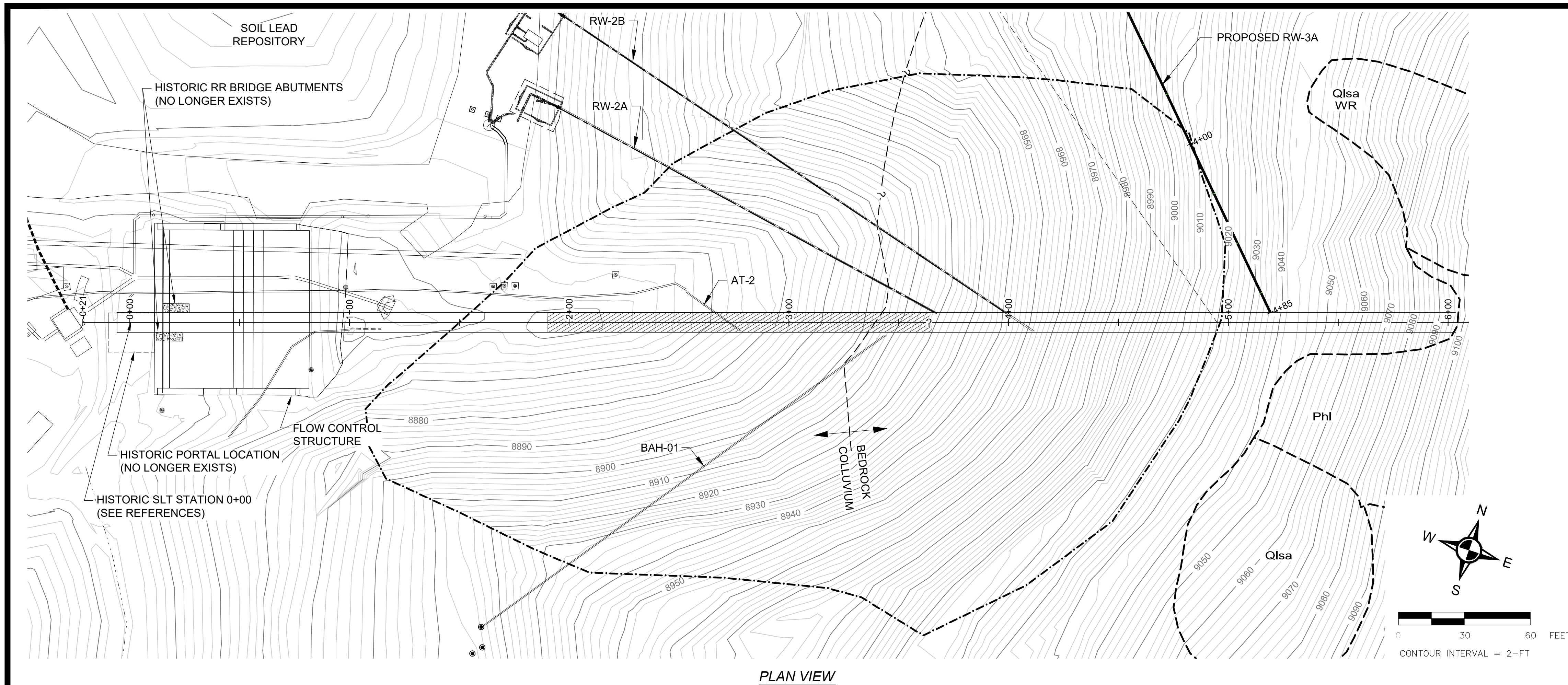
Task 1 – Calibrate Transducers: June 4, 2021.

Task 2 – Initiate Drawdown and Recovery Test: June 7, 2021 – June 9, 2021.

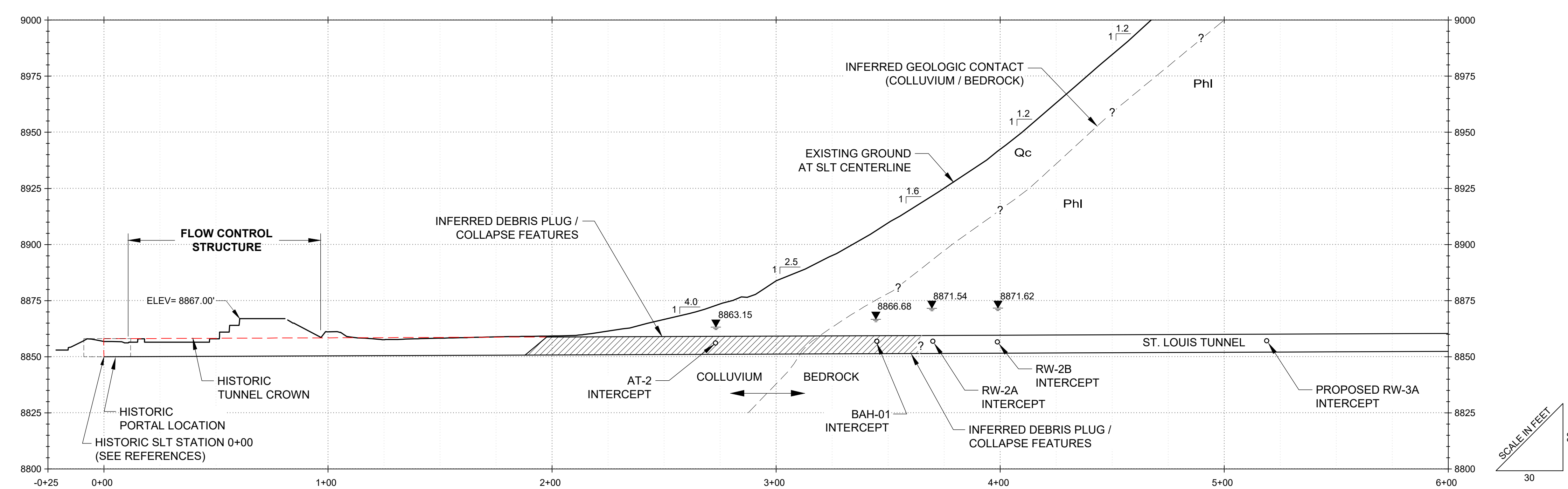
Monitor return to steady state Operation – June 9, 2021 – June 11, 2021.

REFERENCES

Atlantic Richfield, 2020, Tunnel Relief Wells Water Management Operations and Procedures, Revision 3.0.



PLAN VIEW



PROFILE VIEW

LEGEND

- Phl — HERMOSA FORMATION
- Qlsa — ACTIVE LANDSLIDE DEPOSIT
- Qc — COLLUVIUM
- WR — WASTE ROCK
- TERRAIN TRAP AREA
- SITE GEOLOGY BOUNDARY (APPROXIMATE)
- INFERRED DEBRIS PLUG/COLLAPSE FEATURES
- EXISTING CONTOURS
- WATER LEVEL (HEAD) MEASUREMENT DATED 10/27/20 (FT AMSL)

DRAFT

NOT FOR CONSTRUCTION

REFERENCES:

1. HISTORIC SLT STATIONING AND SITE GEOLOGY BASED ON DRAWINGS FROM AECOM'S 'PRELIMINARY DESIGN REPORT, ST. LOUIS TUNNEL HYDRAULIC CONTROL MEASURES' DATED OCT. 30, 2013 AND 1930s HISTORICAL DRAWING 'T3 SHEET 1'.
2. SLT GEOLOGIC INFORMATION TAKEN FROM c. 1930s HISTORICAL DRAWING 'ST. LOUIS TUNNEL, ST. LOUIS SMELTING AND REFINING CO. RICO, COLORADO PLAN T3 SHEET 2.'

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Copper Environmental Consulting
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Tel: (602) 331-3859

Atlantic Richfield Company

TITLE: Conceptual Debris Plug Plan and Profile (Without Aerial Image)

PROJECT: Rico - Argentine Mine Site, Dolores County, Colorado

FIGURE 1

Nov 05, 2020 - 8:13am Patricia
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ATTACHMENT A

St. Louis Tunnel and Crosscut Geometry

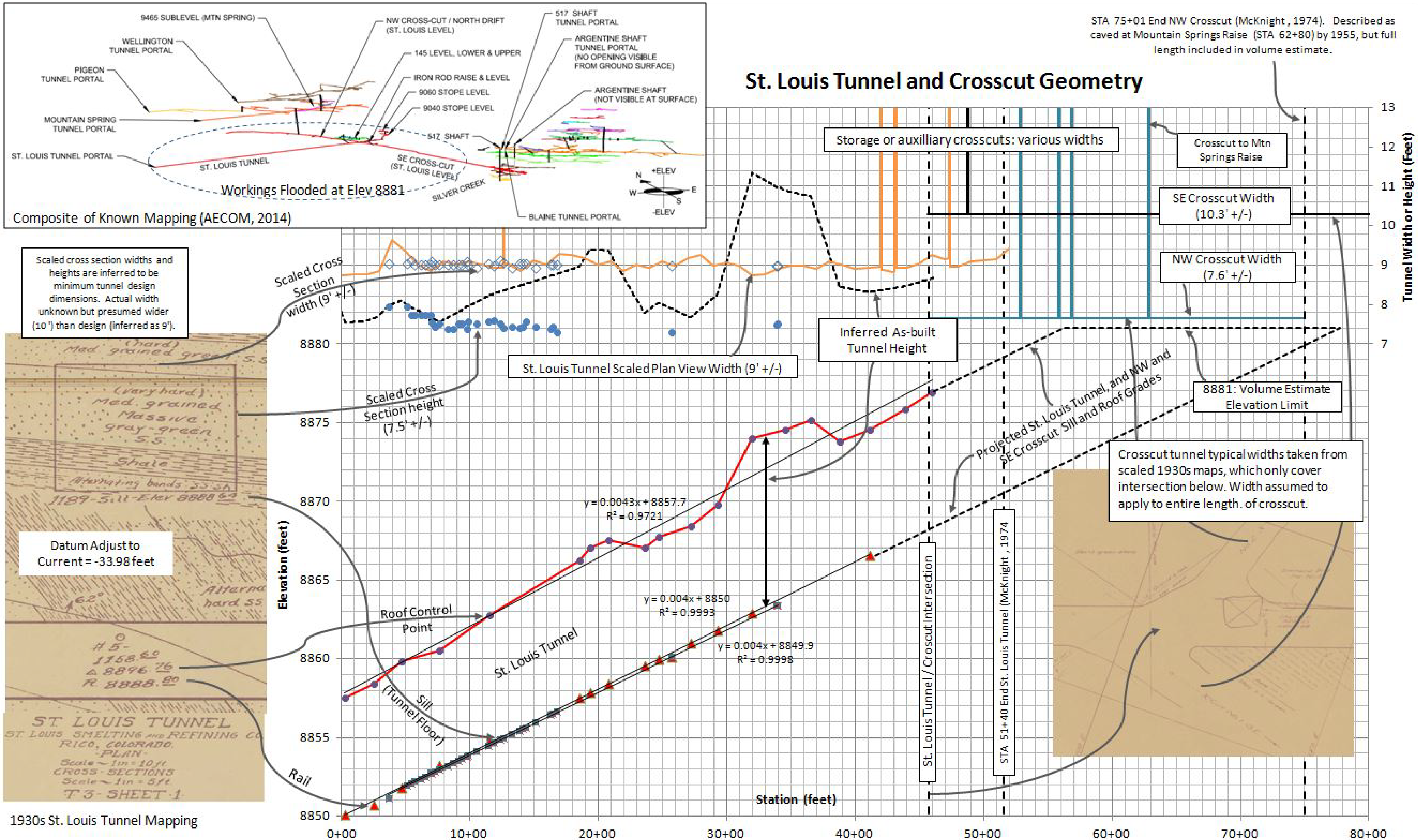


Figure II-1 – St. Louis Tunnel and Crosscut Geometry

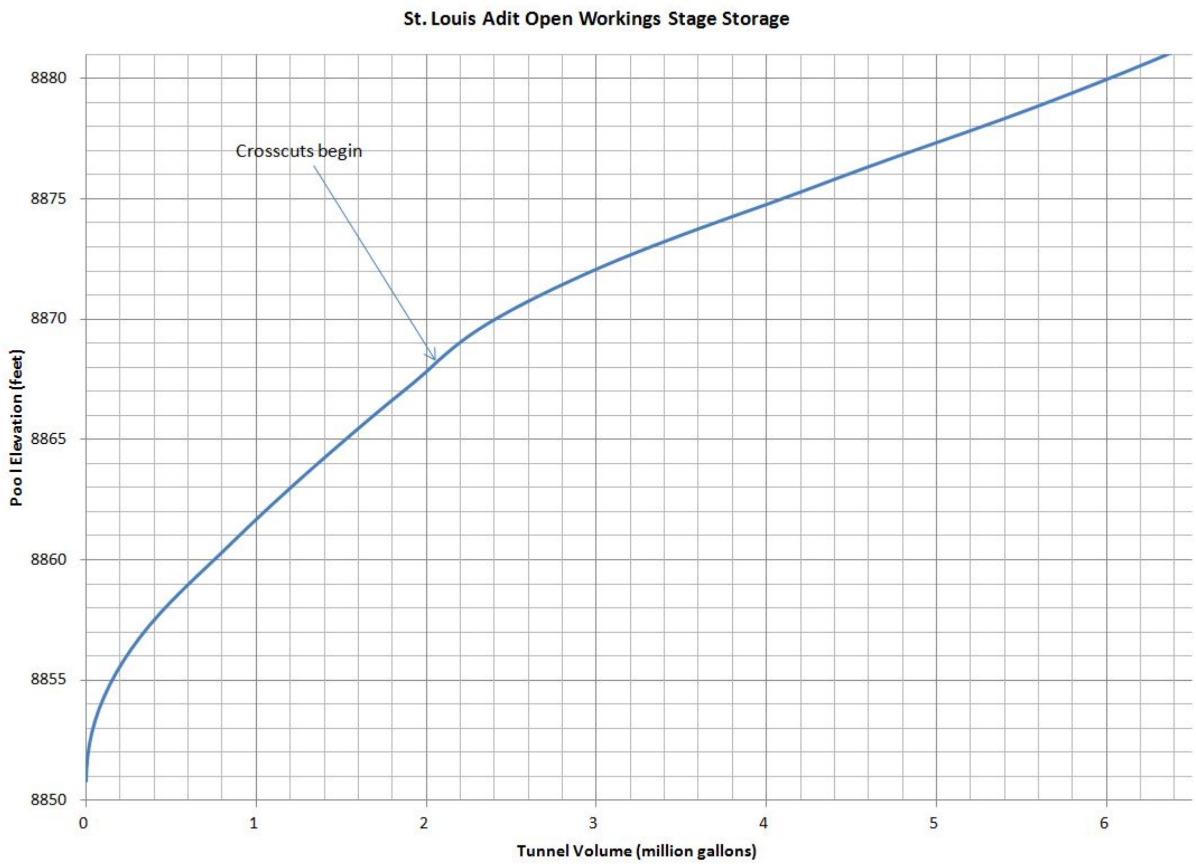
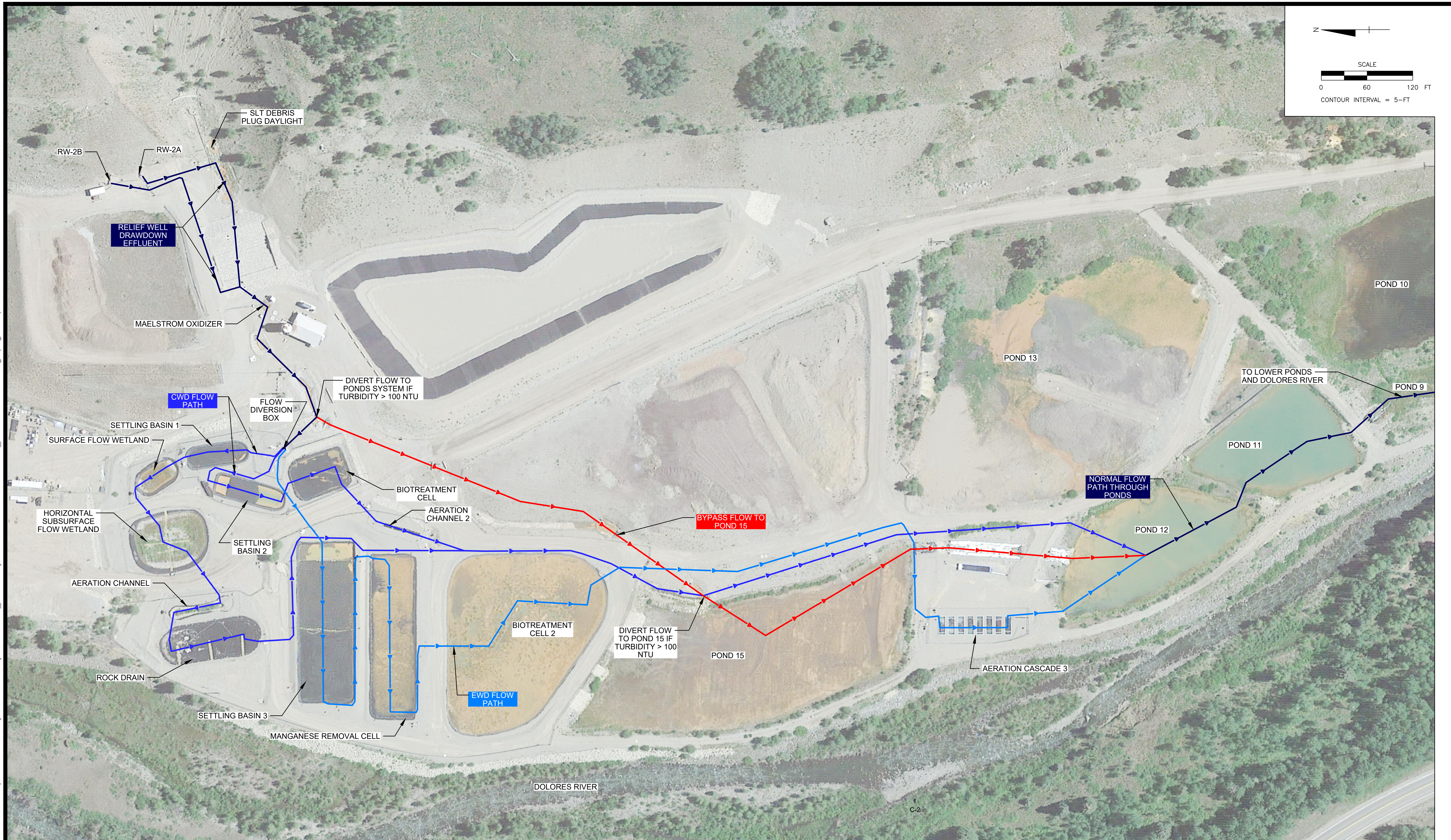


Figure II-2 – St. Louis Tunnel Open Workings Stage Storage Curve

ATTACHMENT B

Site Figures and Relief Well Detail



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Atlantic Richfield Company

TITLE:

Figure 1 - Site Overview

PROJECT:

SLT Drawdown and Recovery Test - FIP
Rico - Argentine Mine Site
Dolores County, Colorado

SHEET

1

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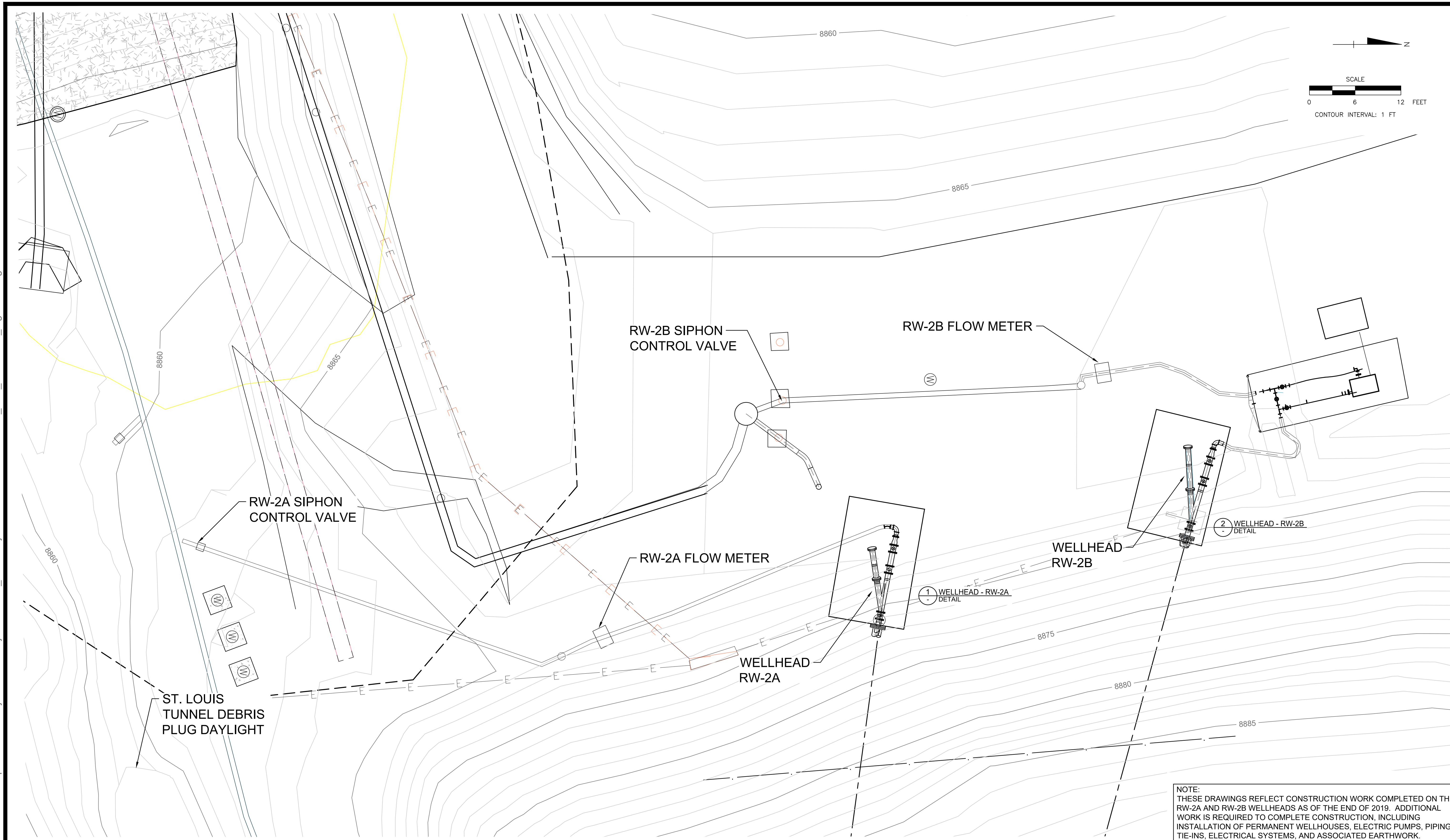

NOTE:
THESE DRAWINGS REFLECT CONSTRUCTION WORK COMPLETED ON THE RW-2A AND RW-2B WELLHEADS AS OF THE END OF 2019. ADDITIONAL WORK IS REQUIRED TO COMPLETE CONSTRUCTION, INCLUDING INSTALLATION OF PERMANENT WELLHOUSES, ELECTRIC PUMPS, PIPING TIE-INS, ELECTRICAL SYSTEMS, AND ASSOCIATED EARTHWORK.

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Tel: (602) 331-3859

Atlantic Richfield Company

TITLE:
Figure 2 - Relief Wellhouse Area Drawdown Test

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

SHEET
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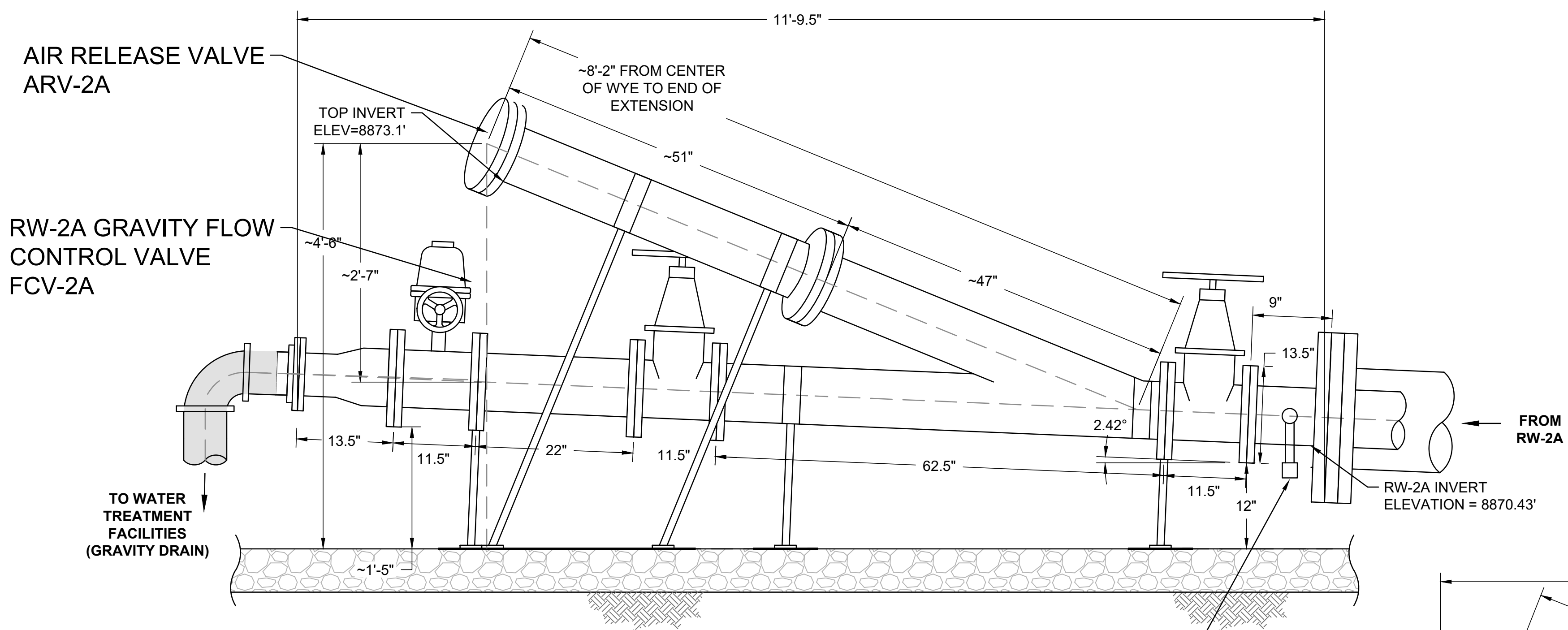
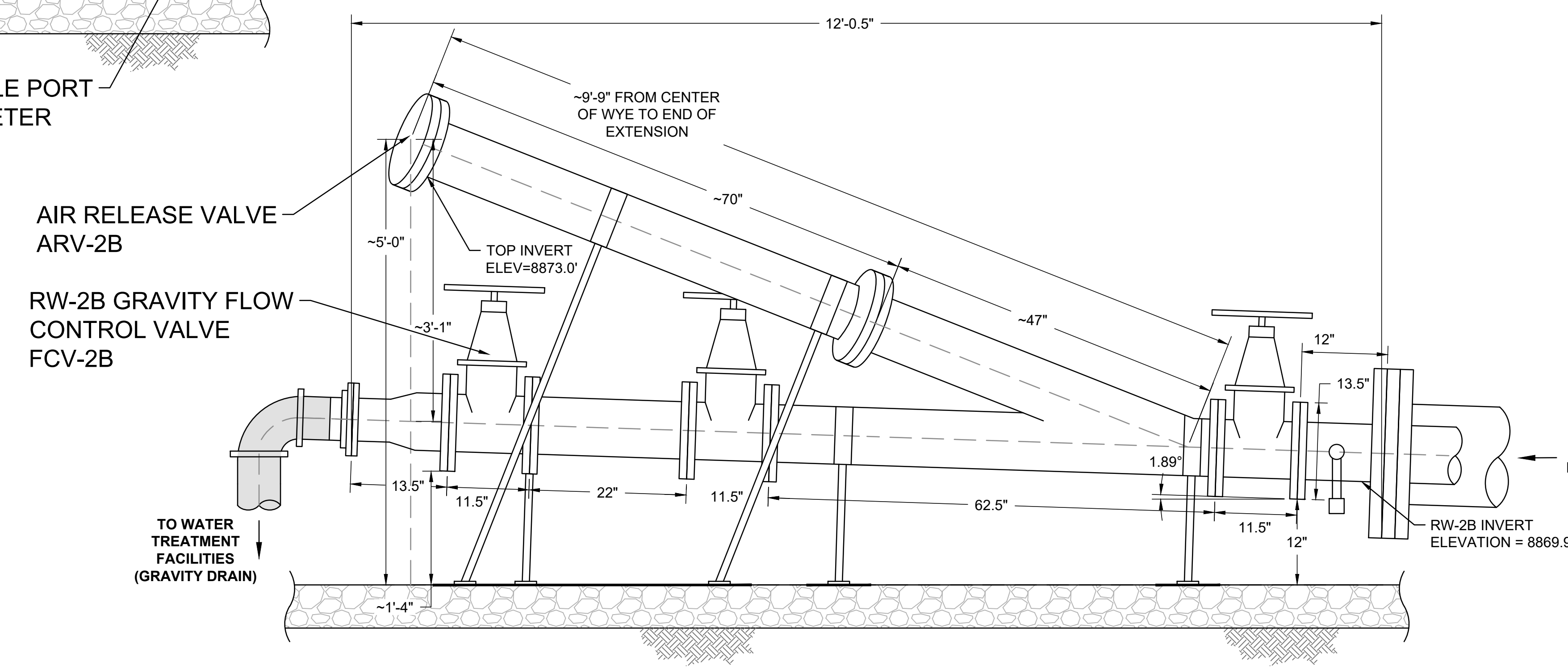


1 WELLHEAD - RW-2A
DETAIL (1"=1')



2 WELLHEAD - RW-2B
DETAIL (1"=1')

NOTE:
THESE DRAWINGS REFLECT CONSTRUCTION WORK COMPLETED ON THE RW-2A AND RW-2B WELLHEADS AS OF THE END OF 2019. ADDITIONAL WORK IS REQUIRED TO COMPLETE CONSTRUCTION, INCLUDING INSTALLATION OF PERMANENT WELLHOUSES, ELECTRIC PUMPS, PIPING TIE-INS, ELECTRICAL SYSTEMS, AND ASSOCIATED EARTHWORK.

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TITLE:
Figure 3 - Wellhead Details
Drawdown Test

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

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ATTACHMENT C

Standard Operating Procedures

SOP – Relief Well OM&M		
Project Name: Rico OM&M		
Name:	Date:	
1.0 INTRODUCTION		
1.1 Purpose and Scope		
This document is meant to act as a Standard Operating Procedure (SOP) for flow adjustment of the two relief wells (RWs), RW-2A and RW-2B. RW-2A intersects the tunnel approximately 35-feet in-by of BAH-01 at an elevation of 8857-feet with an eight-inch HDPE casing, and has an invert elevation of 8870.4-feet. RW-2B intersects the tunnel approximately 66-feet in-by of BAH-01, at an elevation of 8856-feet above mean sea level (amsl). RW-2B features and 8-inch steel casing that necks down to a six-inch steel well casing with one-inch-by-three-inch rectangle slots inside of the tunnel. RW-2B has an invert elevation of 8869.9-feet amsl and is connected to a 6-inch diesel emergency pump located within an adjacent storage container.		
1.2 Minimum Required Equipment		Initials
• Level D PPE in accordance with associated Task Risk Assessments (TRAs), the Copper Environmental Consulting (CEC) Task Specific Health and Safety Plan (TSHASP) and the Rico Program Plan.		
1.3 Pertinent/Required Reference Information		
1.3.1 SOPs/User Manuals		Initials
• 'SLT Relief Well Water Mgt Ops and Procedures' (attached in section 6.0)		
• 'Relief Well Inspection Checklist' (attached in section 6.0) • 'Pump Inspection' (attached in section 6.0)		
• 'Relief-Well-Adjustment-Log' (attached in section 6.0)		
• 'Tunnel and flow Checklist' (attached in section 6.0)		
• 'RW-Wellhead Diagrams' (attached in section 6.0)		
1.3.2 Task Risk Assessments (TRAs)		Initials
• TRA_Rico_02_200305 – Site OMM" (or the most updated version TRA_Rico_02_xxxxxx) – this TRA discusses site hazards in regards to observation and maintenance.		
2.0 INSPECTIONS & NOTES		
RW flowmeters only report values to telemetry when flowrates change by a minimum of 10%. If a RW flowrate as read by the telemetry is not changing by at least 10% it may appear that the flowmeter is not functioning. 'Relief-Well-Adjustment-Log' should be used to record current flow rates, desired flow rates, and flowrate effects of valve turns, which will assist with understanding the effects of valve operations any time a RW adjustment is made.		
2.1 St. Louis Tunnel (SLT) Inspection Checklist		Initials
The 'Tunnel and Flow Condition Checklist' (attached) is intended to be completed every day of field operations and should be completed prior to making any RW adjustments.		
2.2 Relief Well Inspection Checklist		Initials
The 'Relief Well Inspection Checklist' (attached) is completed weekly, or biweekly during winter operations. If a RW inspection hasn't been completed for the week, complete the RW Inspection Checklist after flow adjustments to ensure all equipment is locked/sound/secure after adjustments have been made.		

2.2.1 Pump Inspection	
The 'Pump Inspection Checklist' (attached) incorporates an inspection of the temporary pump at RW-2B, which should be run for a minimum of 15 minutes and inspected for fluid leaks. This inspection should be performed monthly or before operating the RW-2B pump.	Initials
3.0 FLOW ADJUSTMENTS	
Two operational modes exist for the RWs: gravity and siphon. Each has separate methods for controlling flow. Flow control valves located on the wellheads are used to control RW flow in gravity operation and discharge flow control valves are used to control flow during siphon operations. Discharge valves are located downstream of flowmeters. The RW-2A discharge valve is located south of the RW-2A wellhouse near the SLT channel, and the RW-2B discharge valve is located immediately north of MH-1.	
3.1 Adjusting Flow Rate in Gravity Flow	
Flow rate adjustments should be done utilizing the buddy system, with one person acting as the valve operator while the other monitors the flowmeter to guide flow adjustment. All flow changes should be noted in a field log book and in the daily report. Depending on which RW is to be adjusted, the flowmeter operator will monitor the flowmeter of interest. The RW-2A flowmeter is located on the south side of the RW-2A housing near the relief well power panel. The RW-2B flowmeter is located on the west side of the RW-2B well housing.	
1. The valve operator will unlock the flow control valve of interest (FCV-2A for RW-2A, FCV-2B for RW-2B) using code "6222," and radio the flowmeter operator to confirm they are prepared to record changes made. Once operator locates the valve, radio the flowmeter operator to confirm they are prepared to record the changes in flow rate.	
2. The valve operator will open (turn counterclockwise as viewed from above) or close (turn clockwise as viewed from above) the flow control valve slowly, while the flowmeter operator observes the appropriate flowmeter for changes in flowrate.	
3. The flowmeter operator should inform the valve operator when a change in flowrate is observed. Changes made to the flow control valve may take some time to be reflected in the flowmeter.	
4. Once flowmeter measurements have stabilized, the flowmeter operator will inform the valve operator and further adjustments will be made in maximum ⅓ turn increments until the desired flowrate is attained.	
5. Once changes have been made, the valve operator will lock and secure the valves.	
6. The flowmeter operator will ensure that the flowmeter housing is closed and sound/secure.	
3.2 Adjusting Flow Rate in Siphon Flow	
Siphon mode can be controlled by opening or closing the discharge valves of each RW. RW-2A discharge valve is located in an enclosure south of the RW wellhouse near the debris plug. RW-2B discharge valve is located in a manhole south of the RW-2B flowmeter housing. The 'Relief-Well-Adjustment-Log' is used to record current flow rates, desired flow rates, and flowrate effects of valve turns, which will assist with understanding the effects of valve operations.	Initials
1. The flowmeter operator will monitor the flowmeter of interest. The RW-2A flowmeter is located in an enclosure on the south side of the RW-2A wellhouse. RW-2B flowmeter is located in an enclosure west of the RW-2B wellhouse.	

2. If the adjustment is needed on RW-2A, the valve operator will open the discharge valve enclosure, unlock the valve using code “6222,” and radio the flowmeter operator to confirm they are prepared to record changes made. For RW-2B, the valve operator should retrieve the 5’ extended valve key located in the RW-2B wellhouse. The valve operator will then locate the flush-mount monument labeled “RW-2B” located just north of MH-1, take the lid off, and attach the valve key to the RW-2B discharge valve. Once the valve operator locates the valve, the operator will radio the flowmeter operator to confirm they are prepared to record the changes in flow rate.	
3. The discharge valve operator will open or close the appropriate discharge valve. Valve position is displayed on the top of the valve for RW-2A. Small rotations (~1/16 of a turn) of the butterfly valve can greatly affect flow rates (~5-gpm). Be conservative with flow changes. For RW-2B, make small rotations with the valve key as well to ensure no drastic changes in flow rate occurs. • Air pockets can drastically affect flow rates and will likely be noticeable in flowmeter readings. Indicators of air pockets in the line can be noticed as extreme variations in flow rates when monitoring the flowmeter, or as flow rates that do not increase as the discharge valve is opened. If air pockets are suspected in the line, siphon should be re-initiated (Section 4.2). • Maximum flow rates should never exceed 400 gpm for RW-2A.	
4. The flowmeter operator should inform the valve operator when a change in flowrate is observed. Changes made to the discharge valve may take some time to be reflected in the flowmeter.	
5. Once flowmeter measurements have stabilized, the flowmeter operator will inform the valve operator and further adjustments will be made until the desired flowrate is attained.	
6. Once changes have been made, the valve operator will lock the valve and close the discharge valve enclosure. For RW-2B, remove the valve key and secure the manhole lid.	
7. Once changes have been made, the flowmeter operator will close and secure the flowmeter enclosure.	

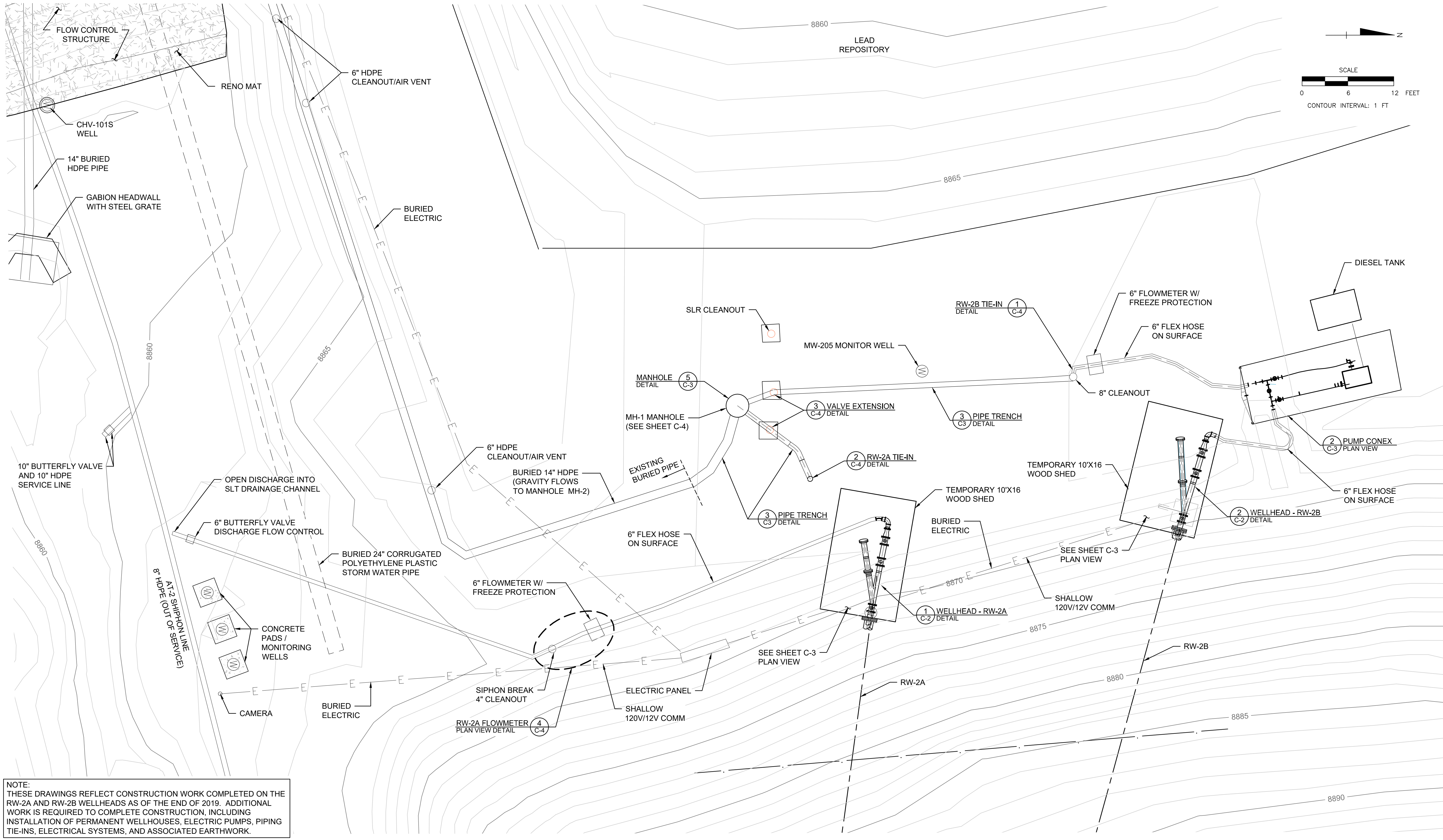
4.0 TRANSITIONING BETWEEN FLOW METHODS

There are multiple operational modes that can be utilized to manage flow from the St. Louis Tunnel. Gravity mode is a method used that generally self regulates based on changes in tunnel inflows, but the maximum flow rate is limited by available head at the maximum operating envelope elevation of 8872 ft amsl. Siphon flow allows higher flow rates than gravity flow within the SLT operating envelope, and can allow flow below the wellhead invert elevations. For gravity flow, the water elevation must be above the well invert elevation. For RW-2A the invert elevation is 8870.4 feet amsl, and for RW-2B the invert elevation is 8869.9 feet amsl. Siphon and Pump modes can be utilized when additional flow capacity is required, or when the tunnel elevation is lower than levels required for gravity flow (below wellhead inverts). The following sections detail the series of operations required to switch between operational modes.

4.1 Transitioning from Siphon Mode to Gravity Mode	
While tunnel water is at an elevation of 8869.9 feet amsl for RW-2B or 8870.4 feet amsl for RW-2A, gravity flow is possible. If water levels are less than required for gravity flow, transitioning from siphon to gravity will terminate flow.	Initials
1. The discharge valve operator will open the discharge valve enclosure near the debris plug for RW-2A, unlock the valves using code “6222,” and radio the flowmeter operator to confirm they are prepared to record changes made. For RW-2B, the valve operator should retrieve the 5’ extended valve key located in the RW-2B wellhouse. The valve operator will then locate the flush-mount monument labeled “RW-2B” located just north of MH-1, take the lid off, and attach the valve key to the RW-2B discharge valve.	
2. The wellhead valve operator will shut the wellhead flow control valve very slowly at ½ turn per every few seconds (FCV-2A for RW-2A, FCV-2B for RW-2B). After the wellhead valve operator confirms the flow control valve is shut, they should radio the discharge valve operator to confirm.	
3. The discharge valve operator will open the discharge valve 100% to drain the discharge line and lock the discharge valve in the open position.	
4. The wellhead valve operator will then open both the siphon break and the wellhead air release valve (ARV-2A or ARV-2B depending on which RW is being transitioned into gravity mode).	
5. Adjust flow rate according to Section 3.1.	
6. Open the freeze-protection ball valve.	
7. Upon completion of the preceding tasks, the following valve positions should be verified for the RW being transferred into gravity mode: • Discharge valve: open • Siphon breaks: open with cap/plug removed • Freeze protection valve: open • RW flow control valve: fully or partially open • RW isolation valve: open • RW wellhead air release valve: open with plug removed.	
8. To adjust flows in gravity mode, refer to Section 3.1.	
4.2 Transitioning from Gravity Mode to Siphon Mode	
Siphon mode is used to passively achieve higher flow rates than with gravity flow or to allow flow at water elevations below the wellhead invert elevations. To transition to siphon flow, all air must be purged from the relief well discharge line, vents must be closed, and flow must be controlled by the discharge valve.	Initials
1. For RW-2A, the discharge valve operator will open the discharge-valve enclosure, unlock the valve, and radio the wellhead valve operator to confirm that the discharge valve is ready to operate. For RW-2B, the valve operator should retrieve the 5’ extended valve key located in the RW-2B wellhouse. The valve operator will then locate the flush-mount monument labeled “RW-2B” located just north of MH-1, take the lid off, and attach the valve key to the RW-2B discharge valve.	
2. The flowmeter operator will open the flowmeter enclosure and inform the wellhead valve operator of the current (initial) flowrate.	

3. The FCV operator will slowly close the relief well flow control valve of interest (FCV-2A for RW-2A, or FCV-2B for RW-2B) until the flowmeter operator verifies that flow is less than 75 GPM. The flowmeter operator will radio the discharge valve operator to continue slowly closing the discharge valve until fully closed. This step will purge air from the discharge piping by filling the line with water.	
4. The discharge valve operator will fully close the discharge valve and radio the flowmeter operator when the valve is closed.	
5. The flowmeter operator will then close the freeze-protection ball valve.	
6. The flow meter operator will monitor the flow rate. When the flow meter reads “zero”, the flow meter operator will close the siphon break butterfly valve (vertical is open, horizontal is closed) for the relief well of interest and insert threaded plug/cap.	
7. The wellhead valve operator will then monitor the relief well air release valve for positive air flow. The air release valve may be closed up to 75% to aid in audible monitoring of positive air flow.	
8. When air flow stops, indicating the discharge line has completed filling, the wellhead valve operator will close the air release valve completely and insert threaded plug.	
9. The wellhead valve operator will fully open the flow control valve, allowing complete flow control at the discharge valve. The well is now in siphon mode, and operator should manage flow rates by opening/closing discharge valve to desired flow rate according to Section 3.2. If operation indicates air may be present in the line, evacuate the air with a vacuum pump according to Section 4.3.	
10. Upon completion of the preceding tasks, the following valve positions should be verified and initialed: • Discharge valve: fully closed • Downstream air break: closed and plugged • Upstream air break: closed and plugged • RW isolation valve: fully open • RW flow control valve: fully open • Freeze protection valve: closed • RW air release valve: closed and plugged	
11. The discharge valve operator will adjust the discharge valve to the appropriate flow rate setting. To adjust flows in siphon mode, refer to section 3.2.	
4.3 Initiating Siphon Mode from “No-Flow” State	
When tunnel water elevation is below the invert of the well, siphon flow must be initiated by inducing a vacuum in the RW of interest. The following steps detail a list of tasks required to initiate siphon flow from a “no-flow” state in a RW of interest.	Initials
1. Close the discharge valve of interest.	
2. Close and plug the downstream siphon breaks of interest.	
3. Open the RW wellhead air release valve of interest.	
4. Fully open the RW flow control valve of interest.	
5. Fully open the RW isolation valve of interest.	

6. Connect the vacuum pump to the RW wellhead air release valve using a barb fitting and ½" poly tubing. A water check valve should be connected between the air release valve and the vacuum pump to prevent water from entering the vacuum pump.	
7. Start the vacuum pump and allow to run until water enters the ½" poly tubing; approximately several minutes. **NOTE**: be careful not to allow water to enter the vacuum pump, as it will foul the pump and require maintenance.	
8. Immediately close the RW wellhead air release valve of interest when water is observed, then turn off the vacuum pump. Disconnect the vacuum pump from the ½" poly tubing.	
9. Initiate siphon flow by opening the discharge valve. Refer to section 3.2 to adjust siphon flow.	
4.4 Use of Pump at RW-2B	
A 6-inch diesel emergency pump is stationed at RW-2B. This pump could be used, in case of emergency, to increase the flow rate of RW-2B beyond siphon flow rates when required.	Initials
1. A flowmeter operator will open the flowmeter enclosure and record the initial flowrate at RW-2B.	
2. Inspect the following locations, ensuring valve positions match the following list: • RW-2B discharge valve: fully open • RW-2B air break: fully closed; • RW-2B wellhead air release valve: fully closed.	
3. The pump operator will open both doors of the RW-2B pump conex, and inspect the influent and effluent piping and valving for leaks or loss of integrity.	
4. If integrity of the piping has not been compromised begin to slowly open valve "B" until it is fully open.	
5. The pump operator will slowly open valve "C" until it is fully open.	
6. The pump operator will turn the pump on by turning the key on the east-side of the conex. Hearing protection is necessary and the operator should allow the pump to run for one-minute before proceeding to the next step.	
7. The pump operator will begin to slowly close valve "A" until it is fully closed.	
8. The flowmeter operator will observe the flow rate at the RW-2B flowmeter.	
9. The pump operator will increase or decrease the pump throttle accordingly to reach the desired flowrate, while the flowmeter operator informs the pump operator of the effects of the changes.	
5.0 ATTACHMENTS	
See End of Document	
6.0 NOTES	
Notes:	



NOTE:
THESE DRAWINGS REFLECT CONSTRUCTION WORK COMPLETED ON THE RW-2A AND RW-2B WELLHEADS AS OF THE END OF 2019. ADDITIONAL WORK IS REQUIRED TO COMPLETE CONSTRUCTION, INCLUDING INSTALLATION OF PERMANENT WELLHOUSES, ELECTRIC PUMPS, PIPING TIE-INS, ELECTRICAL SYSTEMS, AND ASSOCIATED EARTHWORK.

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Copper Environmental Consulting
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2211 East Highland Avenue, Suite 215
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Atlantic Richfield Company

TITLE:
Relief Well House
Site Plan

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

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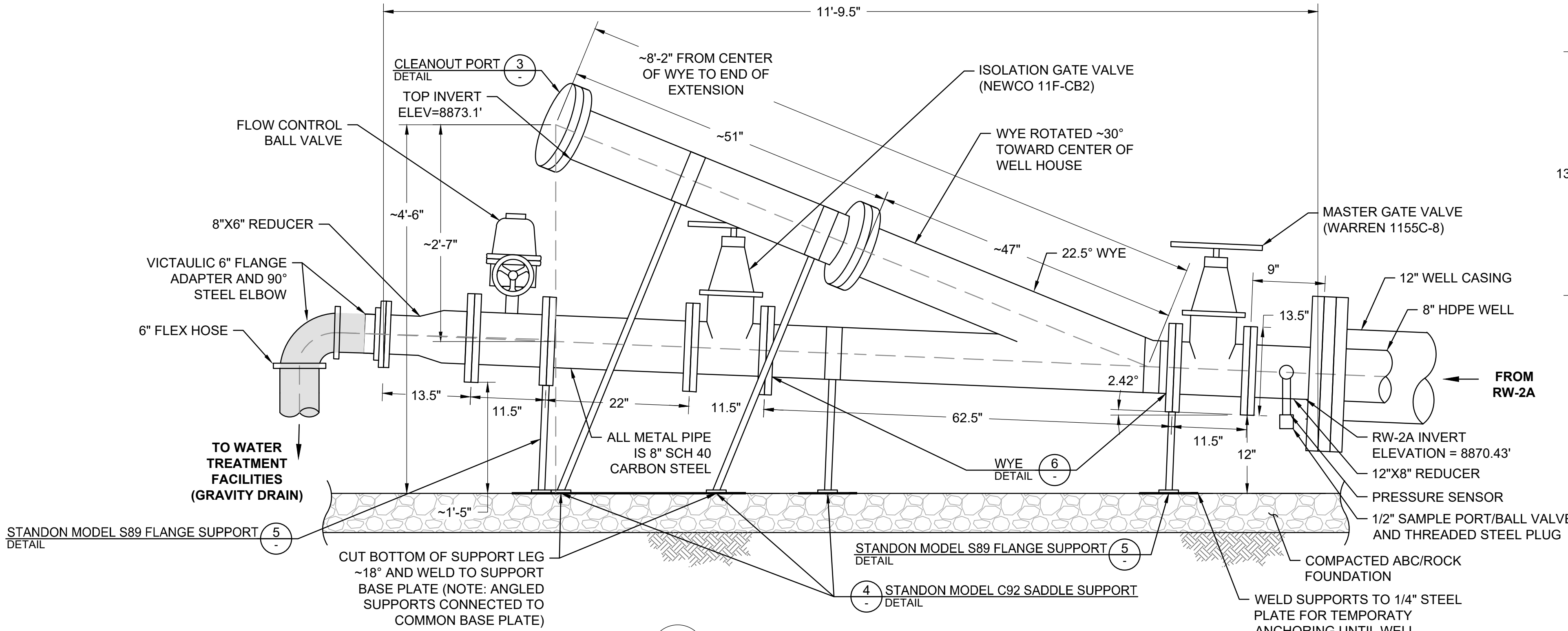
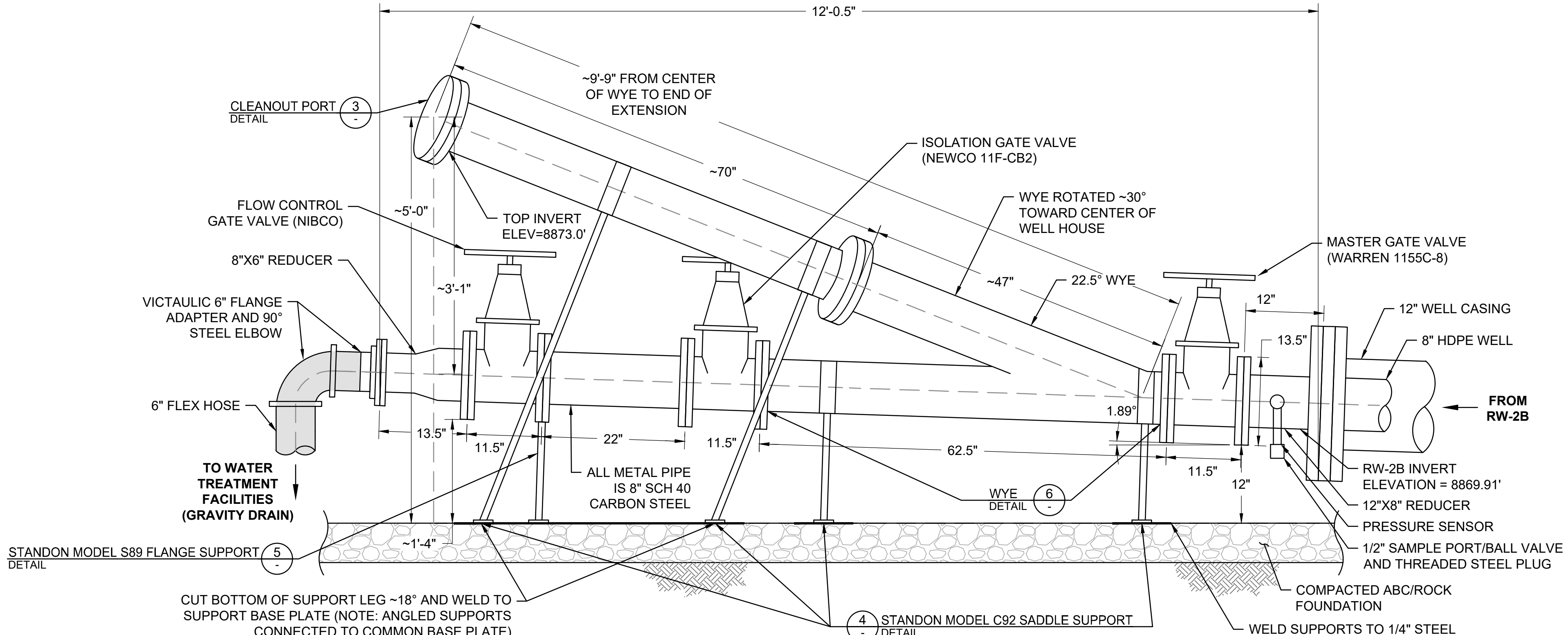


1 WELLHEAD - RW-2A
DETAIL (1"=1')



NOTE:
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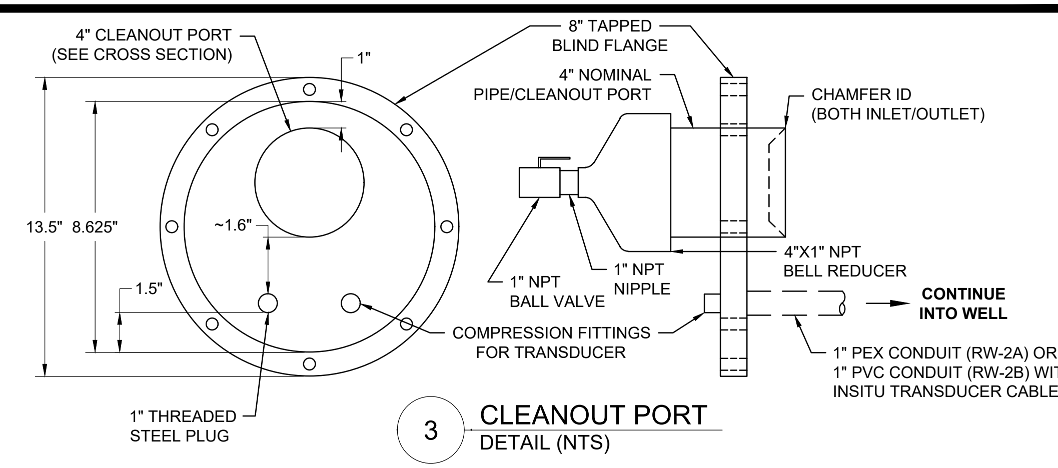
2 WELLHEAD - RW-2B
DETAIL (1"=1')



3 CLEANOUT PORT
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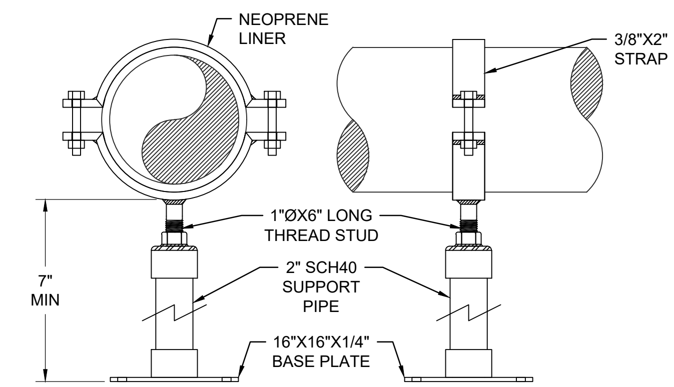

4 STANDON MODEL C92 SADDLE SUPPORT
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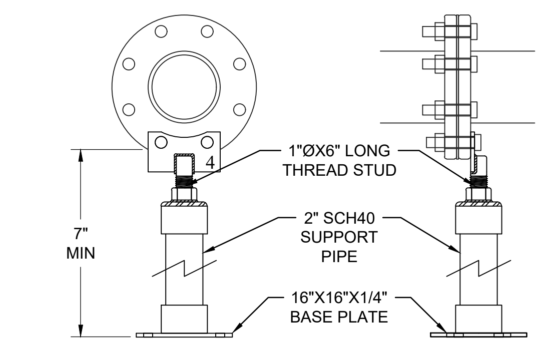
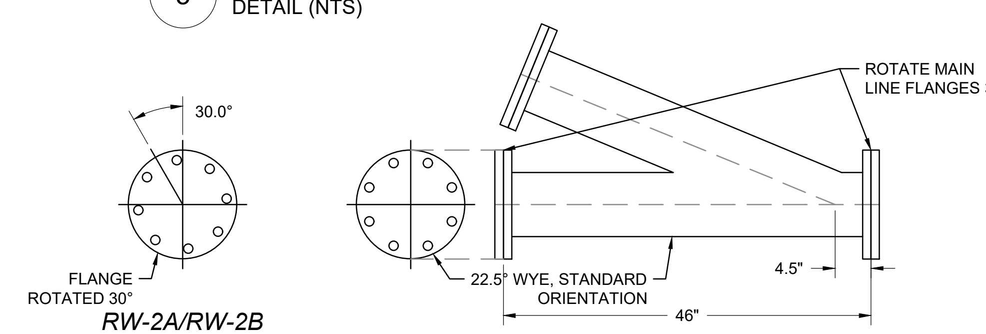


5 STANDON MODEL S89 FLANGE SUPPORT
DETAIL (NTS)



6 WYE
DETAIL (NTS)

NOTE:
1. WYE FLANGES ARE LAP JOINT FLANGE TYPES.

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Copper Environmental Consulting
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2211 East Highland Avenue, Suite 215
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Tel: (602) 331-3859

Atlantic Richfield Company

TITLE:
As-built RW-2A/2B Wellhead Improvement Details

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

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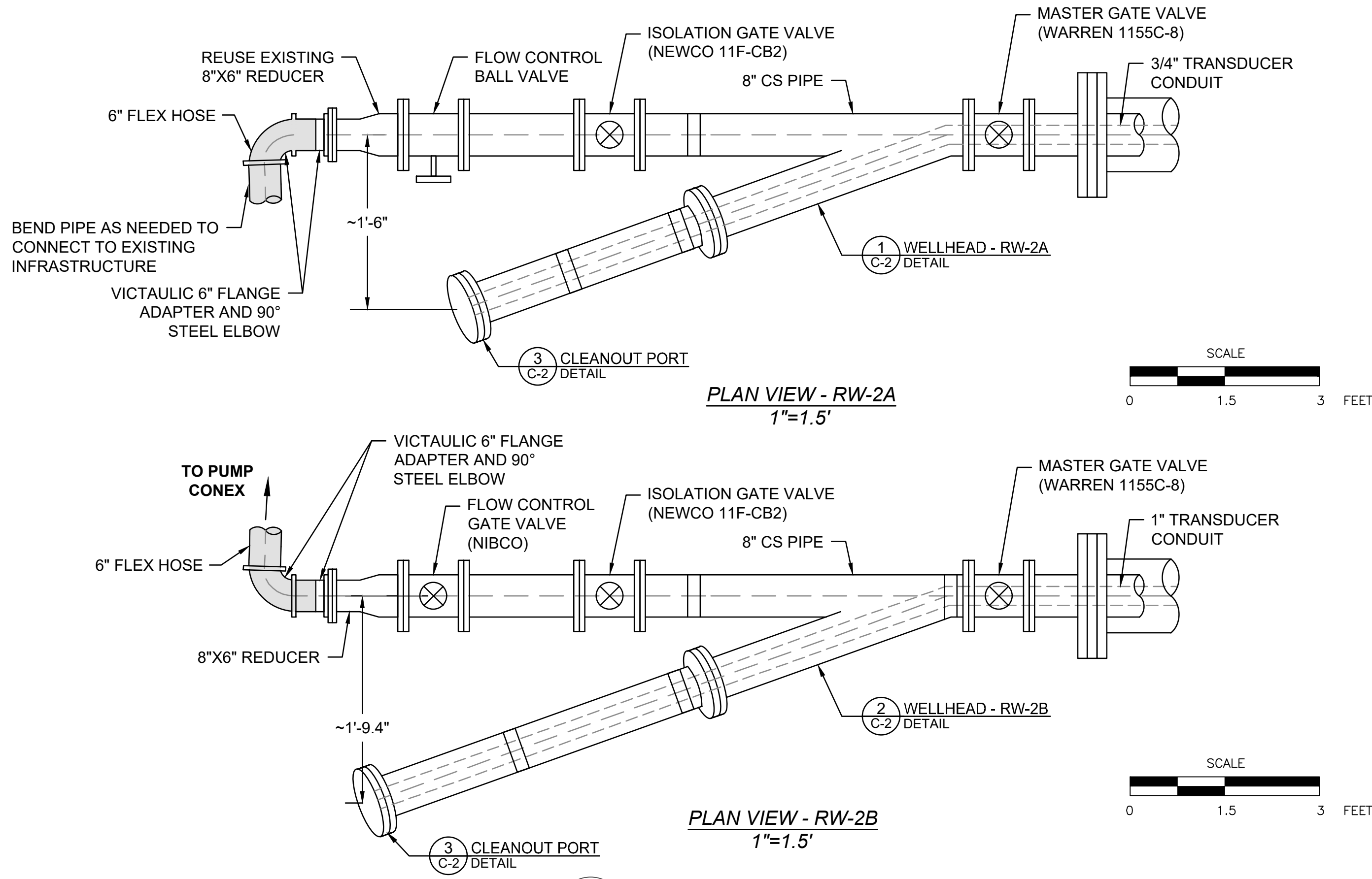
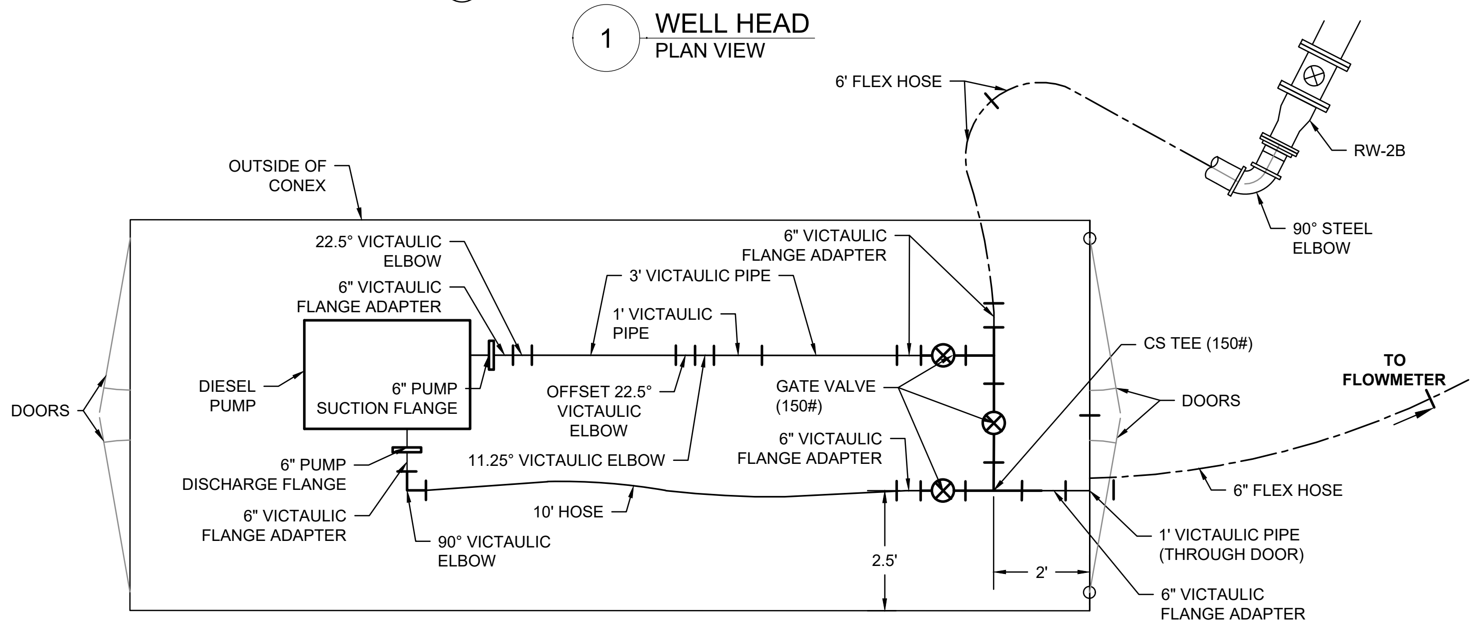


1 WELL HEAD
PLAN VIEW



2 PUMP CONEX
PLAN VIEW

NOTE:
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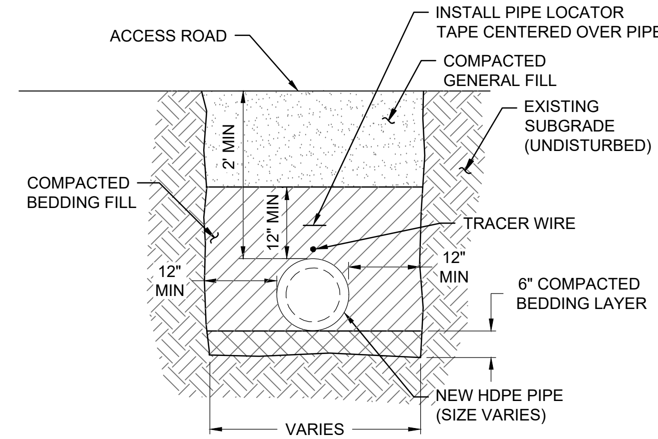
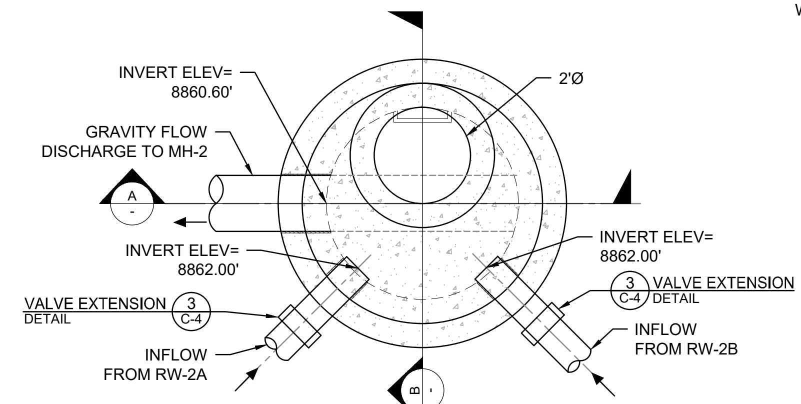
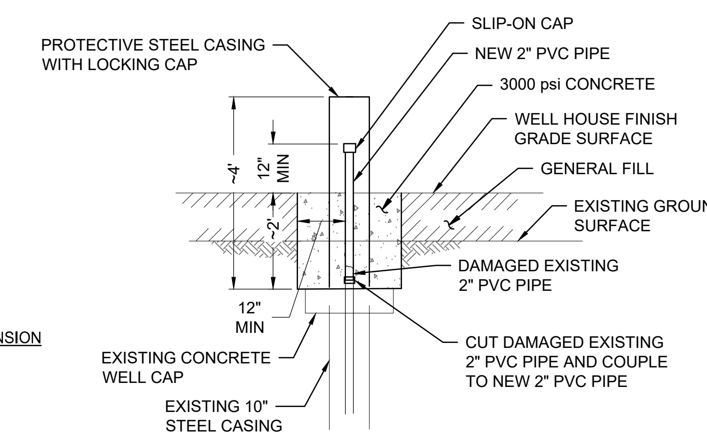


NOTE:
1. IN AREAS WERE PIPE BEDDING CANNOT BE PLACED/COMPACTED PRIOR TO PIPE PLACEMENT (i.e. AROUND THE MANHOLE), USE FLOWABLE FILL.

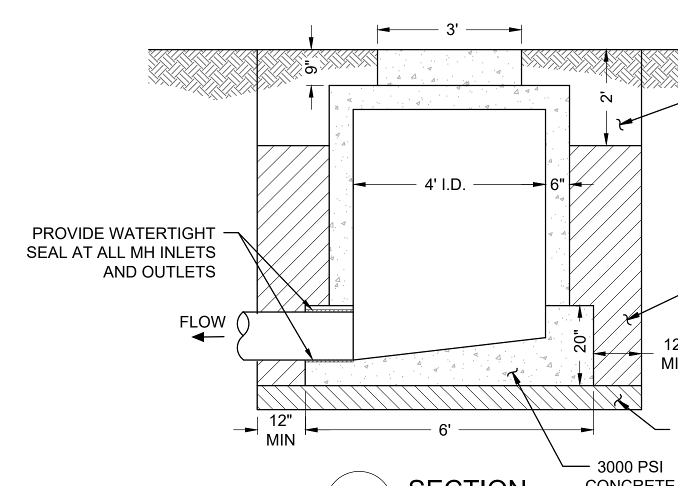
3 PIPE TRENCH
DETAIL (NTS)



5 MANHOLE
DETAIL (NTS)



4 WELL REPAIR
DETAIL (NTS)



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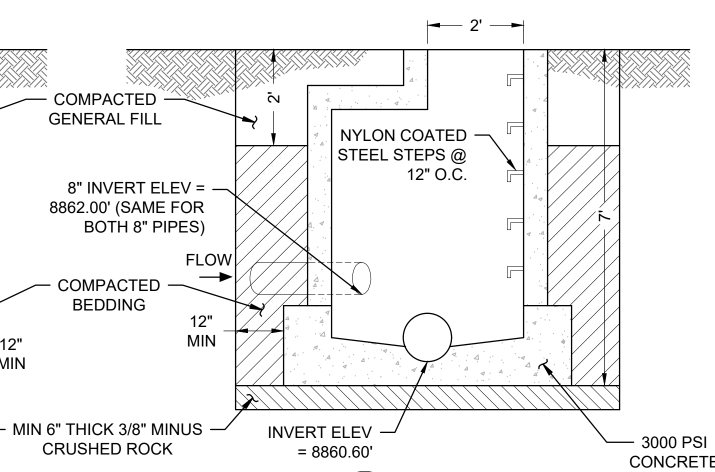

B SECTION
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Tel: (602) 331-3859

Atlantic Richfield Company

TITLE:
RW-24/2B
Details

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

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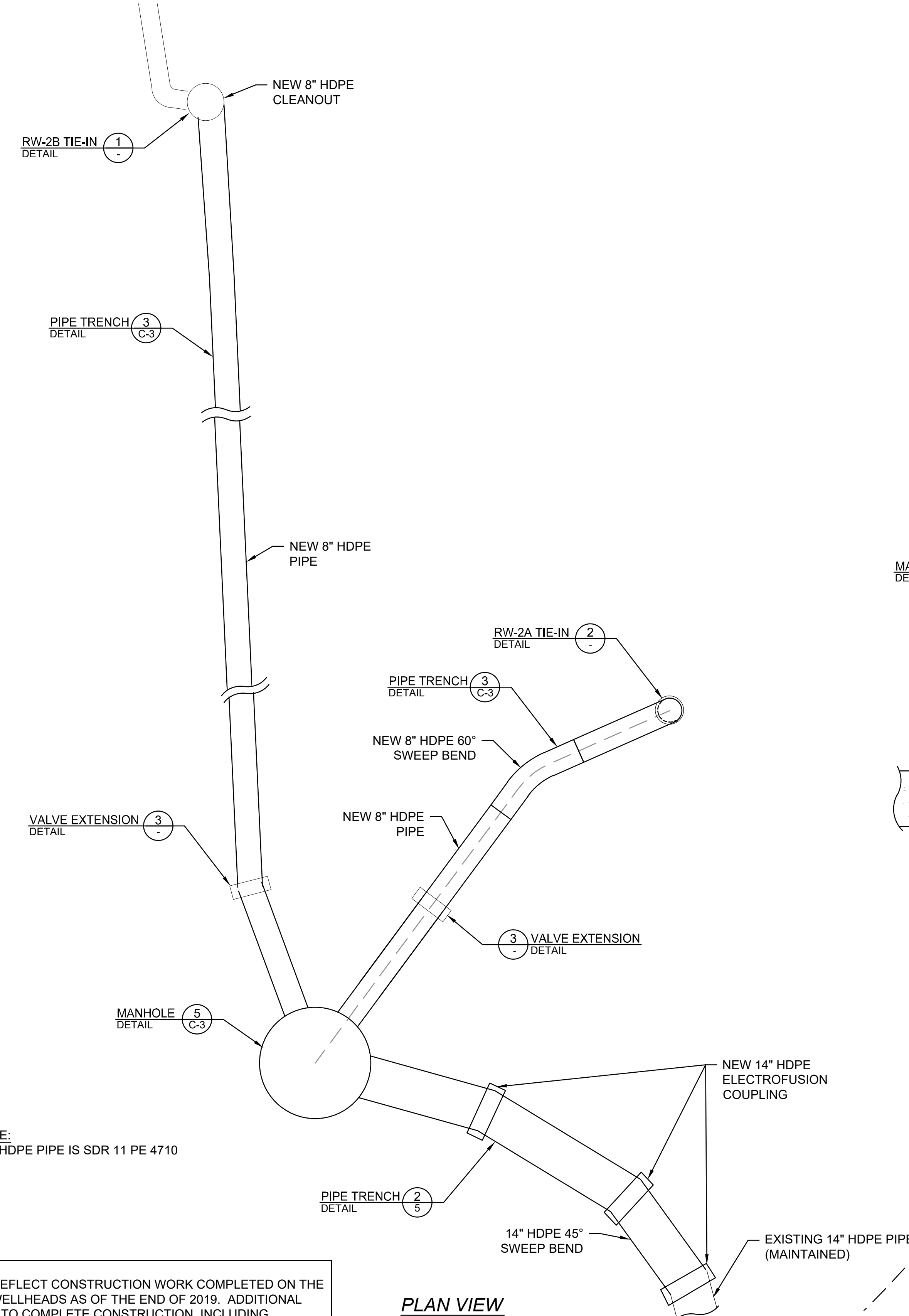

NOTE:
ALL HDPE PIPE IS SDR 11 PE 4710

NOTE:
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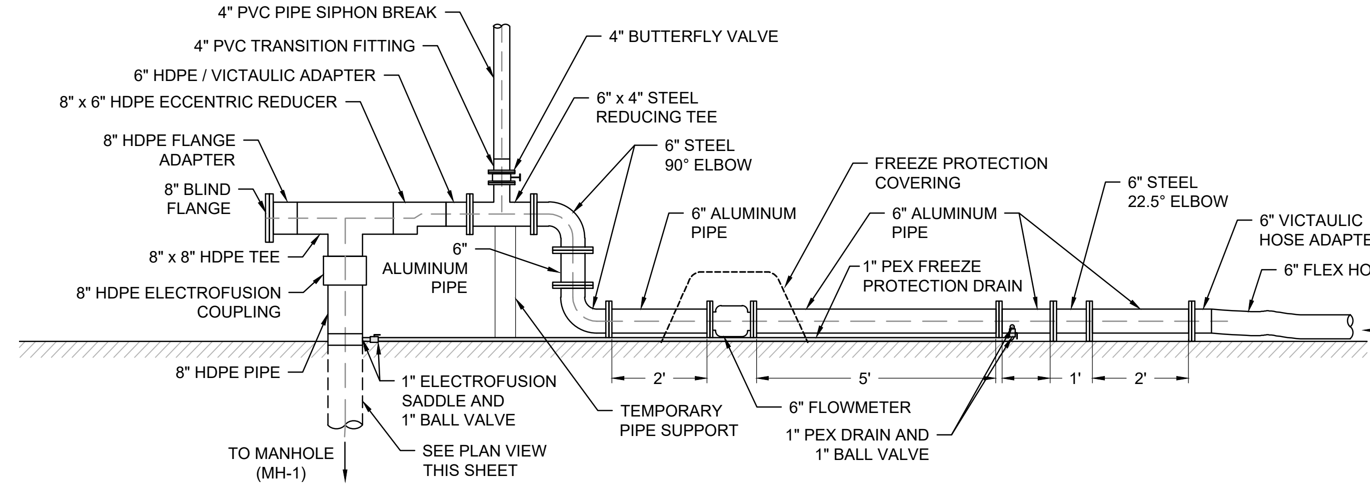
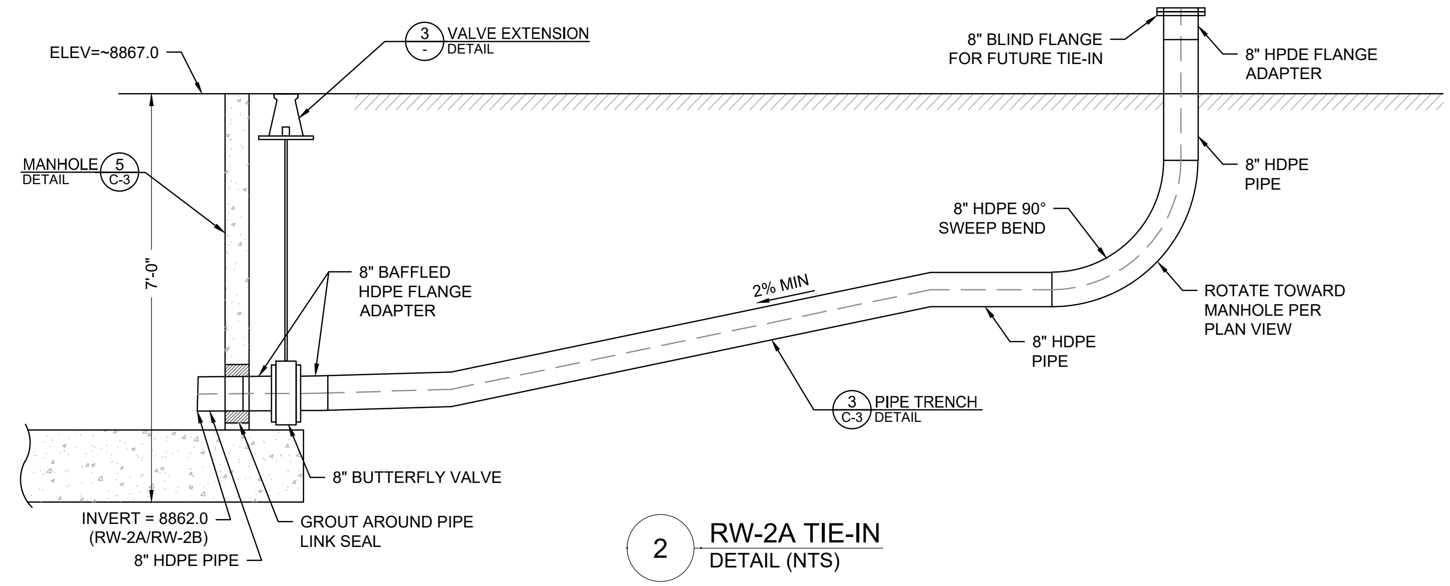
PLAN VIEW
1"=2'



NOTE:
1. ALL ALUMINUM PIPE AND HOSE CONNECTIONS ARE VICTAULIC TYPE

1 **RW-2B TIE-IN**
DETAIL (NTS)



2 **RW-2A TIE-IN**
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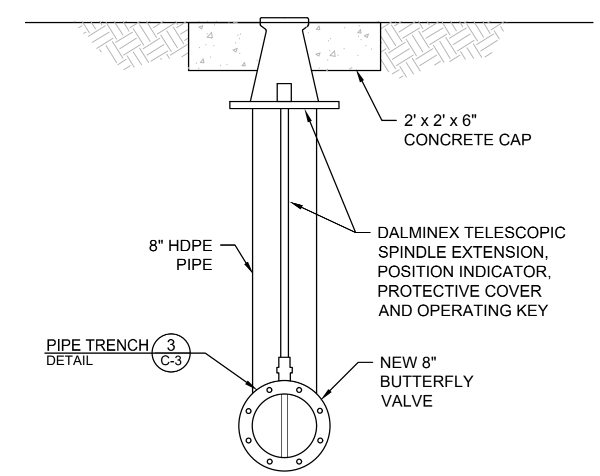
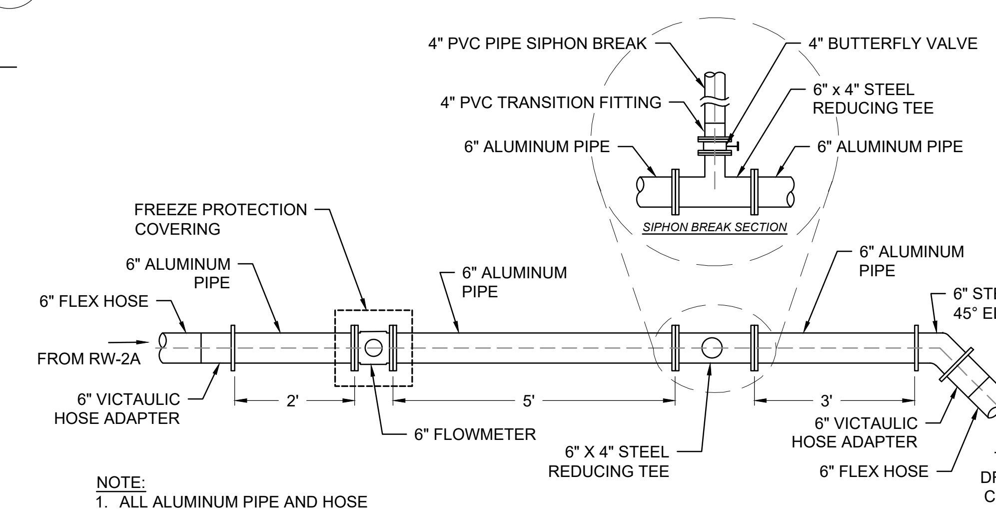


3 **VALVE EXTENSION**
DETAIL (NTS)



NOTE:
1. ALL ALUMINUM PIPE AND HOSE CONNECTIONS ARE VICTAULIC TYPE

4 **RW-2A FLOWMETER**
PLAN VIEW DETAIL (NTS)

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Atlantic Richfield Company

TITLE:
RW-2A/2B Manhole Relocation
Details

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

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Copper Environmental Consulting
A PRISM SPECTRUM COMPANY

St. Louis Tunnel and Flow Condition Inspection Checklist

Project Name: St. Louis Tunnel	**Inspector Name(s):**	**Date:**

		DR-3 (a)	AT2 (b)	Total SLT flow (a + b)	BAH-01	PP-2	RW-2A	RW-2B
TELEMETRY INSPECTION	**Flow Rate (gpm)**				-----	-----		
	Elevation (feet amsl)	------		-----				
	Pressure (PSI)	-----	-----	-----	-----	-----		
	Operating Mode	-----	-----	-----	-----	-----		

WQ10 (Adit Channel): **Turbidity**: ________ (NTU) **pH:** __________

Calculated **Debris Plug** Flow Rate: _____________ (gpm)

Is the Safety Factor Threshold Elevation (**8870' amsl**) exceeded?
BAH-01: [ ] YES [ ] NO AT-2: [ ] YES [ ] NO If YES, notify PM, Engineer, and Atlantic Richfield PM

Do the water level elevations exceed the Geotechnical Stability Limit of **8873' amsl**?
RW-2A: [ ] YES [ ] NO RW-2B: [ ] YES [ ] NO If YES, notify PM, Engineer, and Atlantic Richfield PM

Are the **RW-2A** and **RW-2B** water level elevations within the operating envelope **of 8871' amsl** to **8872' amsl?**
RW-2A: [ ] YES [ ] NO RW-2B: [ ] YES [ ] NO If NO, notify PM, Engineer, and Atlantic Richfield PM

Have the daily weather and avalanche forecasts, and potential impacts, been reviewed? **[ ] YES [ ] NO**
[ ] Freeze [ ] Thaw [ ] Rain [ ] Snow [ ] Snowmelt [ ] Saturated Soils [ ] High Winds
Avalanche Conditions: [ ] No Hazard [ ] Low Hazard [ ] Moderate Hazard [ ] High Hazard

ONSITE INSPECTION

Are any construction activities causing vibrations near the Terrain Trap? **[ ] YES [ ] NO**

Are there any unusual sounds (e.g. rockfall)? **[ ] YES [ ] NO**
If yes, do not occupy the terrain trap, and immediately notify the On-Site Engineer

Visual Inspection of Discharge flow:

Flow Depth:	**[ ] NO CHANGE**	**[ ] UP _____ ft (+/- 0.1')**	**[ ] DOWN _____ ft (+/- 0.1')**
Flow Turbidity:	**[ ] NO CHANGE**	**[ ] INCREASED**	**[ ] DECREASED**
Sediment Build up:	**[ ] NO CHANGE**	**[ ] INCREASED**	**[ ] DECREASED**

Visual Inspection of **Condition of Debris Plug: [ ] NO CHANGE [ ] CHANGE**
Description of Change: ____

Are there any visible indications of recent bulging (base), sloughing, rolling, sliding, of soils or rock materials?
[ ] YES [ ] NO If YES Describe:____

Are there any observed changes in the normal activity, such as landscape or storm water drainage patterns, in the SLT vicinity?
[ ] YES [ ] NO If YES Describe: ____

Are there any developing or widening cracks on the soil or rock slopes?
[ ] YES [ ] NO If YES Describe: ____

Are there any visible signs of changes in water flow, trickling or mud/soil movement, from either surface water or possible ground water penetration near the SLT?
[ ] YES [ ] NO If YES Describe:____

Is there, in the judgement of the inspector, any reason for a professional geotechnical review of the SLT conditions?
[ ] YES [ ] NO If YES Describe:____

PHOTOS

Photos were taken at the following locations and included in this inspection report along with appropriate captions:
[ ] DEBRIS PLUG [ ] CHANNEL LOOKING WEST [ ] CHANNEL LOOKING EAST

NOTES

____
____
____

St. Louis Tunnel Relief Wells Inspection Checklist

Project Name: Relief Wells	**Inspector Name(s):**	**Date:**

PRE-INSPECTION DATA FROM SCADA SYSTEM	RW-2A Flow Rate: gpm	RW-2B Flow Rate: gpm
	DR-3 Flow Rate: gpm	Calculated Debris Plug Flow: gpm
	RW-2A Elevation: ft	RW-2B Water Elevation: ft
	RW-2A Pressure: psi	RW-2B Pressure: psi
	PP-1 Water Elevation: ft	PP-2 Water Elevation: ft
	Weather Station Outdoor Temperature: °F	Battery voltage of telemetry panel (Pack 8): Volts
	RW-2A Anticipated Flow condition: [ ] Gravity [ ] Siphon [ ] No Flow	
	RW-2B Anticipated Flow condition: [ ] Gravity [ ] Siphon [ ] No Flow	
	Pumps	
	Temperature inside temporary pump conex: °F	Fuel level of diesel tank: %
	Is the temporary pump conex sound, secure and in good working order? [ ] Yes[ ] No	Is the temporary pump fuel tank in good condition? [ ] Yes [ ] No
	What are the valve positions inside the temporary pump conex?	
	Valve "A": [ ] Open [ ] Closed Valve "B": [ ] Open [ ] Closed Valve "C": [ ] Open [ ] Closed	
	Is the pump drain valve in the open position? [ ] Yes [ ] No	
	Is the solar trickle charger charging the pump battery? [ ] Yes [ ] No	
	Relief Well Pipeline	
	Is the conveyance pipeline in good condition? [ ] Yes [ ] No If answered "No", notify site engineer and project manager.	
	RW-2A	
	Air vent in what position? [ ] Open [ ] Closed	
	Air vent: Clear and free of debris [ ] Treaded plug in and in good condition [ ] Attention needed [ ]	
	Is the sampling port in the closed position? [ ] Yes [ ] No	
	Master valve open 100%? [ ] Yes [ ] No If answered "No", notify site engineer and project manager	
	Isolation valve open or closed and in good condition? [ ] Open [ ] Closed : % / [ ] Yes [ ] No	
	Flow control valve open or closed and in good condition? [ ] Open [ ] Closed : % / [ ] Yes [ ] No	
	Air breaks open or closed? [ ] Open [ ] Closed	
	Telemetry solar panel unit sound and secure? [ ] Yes [ ] No	
	RW-2B	
	Air vent in what position? [ ] Open [ ] Closed	
	Air vent: Clear and free of debris [ ] Threaded plug is in and in good condition [ ] Attention needed [ ]	
	Is the sampling port in the closed position? [ ] Yes [ ] No	
	Master valve open 100%? [ ] Yes [ ] No If answered "No", notify site engineer and project manager	
	Isolation valve open or closed and in good condition? [ ] Open [ ] Closed : % / [ ] Yes [ ] No	
	Flow control valves open or closed and in good condition? [ ] Open [ ] Closed : % / [ ] Yes [ ] No	
	Air breaks open or closed? [ ] Open [ ] Closed	
	Hot Tap	
	Is the Hot Tap housing sound and secure? [ ] Yes [ ] No	
	Position of air valve? [ ] Open [ ] Closed	
	Flow Control Structure	
	Is the FCS in good condition? [ ] Yes [ ] No If answered "No", notify site engineer and project manager.	
	Is the FCS berm in good condition? If "No", notify the site engineer and project manager. [ ] Yes [ ] No	
	Photo Log:	
	Well Heads & Conex: [ ] Yes [ ] No | Pipeline: [ ] Yes [ ] No | Flow Meters & Discharge: [ ] Yes [ ] No	
DISCHARGE FLOW EQUIPMENT CONDITION INSPECTION	RW-2A flowmeter reading (gallons/gpm):	RW-2B flowmeter reading (gallons/gpm):
	Is the flowmeter housing sound and secure? [ ] Yes [ ] No	
	Flowmeter heat trace operational? [ ] Yes [ ] No	
	Is the flowmeter freeze-protection-valve housing sound and secure? [ ] Yes [ ] No	
	Flowmeter freeze-protection-valve position: RW-2A: [ ] Open [ ] Closed / RW-2B: [ ] Open [ ] Closed	
	Flowmeter freeze-protection-valve heat trace operational? [ ] Yes [ ] No	
	Is the discharge-valve housing sound and secure? [ ] Yes [ ] No	
	Discharge-valve heat trace operational? [ ] Yes [ ] No	
	Discharge-valve position: RW-2A: %	RW-2B: %
	Stormwater slide-gate valve operated and current position? [ ] Yes [ ] No / [ ] Open [ ] Closed	
NOTES		

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SOP – Relief Well Manometer Check (SOP_Rico_09)	
Project Name: Rico OM&M	
Name:	Date:
1.0 INTRODUCTION	
1.1. Purpose and Scope	
This document is meant to act as a Standard Operating Procedure (SOP) for checking the accuracy of the pressure transducers at RW-2A and RW-2B.	
1.2. Minimum Required Equipment	Initials
• Level D PPE in accordance with associated Task Risk Assessments (TRAs), the Copper Environmental Consulting (CEC) Task Specific Health and Safety Plan (TSHASP), and the Rico Program Plan.	
• 5-gallon bucket	
• Nitrile gloves	
• Adjustable wrench	
• 3/8” inner-diameter silicone flexible tubing	
• 3/8” barb	
• 1” to 3/8” barb	
• Leveling rod	
• Thread seal tape	
• Vacuum pump	
• Extension cord	
• PVC check valve	
1.3. Pertinent/Required Reference Information	
1.3.1. Sops/User Manuals	Initials
• ‘SLT Relief Well Water Mgt Ops and Procedures’	
• ‘RW-Wellhead Diagrams’	
• ‘Tunnel and flow Checklist’	
• ‘Relief Well Inspection Checklist’	
2.0 METHOD	Initials
1. Record all valve positions and flow rates. RW2A Flow Control Valve Position (% open): RW2A Discharge Valve Position (% open): RW2A Flow Rate (GPM): RW2B Flow Control Valve Position (% open: RW2B Discharge Valve Position (% open):	
2. Remove threaded plug from relief well the sampling port and replace with a 3/8” barb with thread seal tape on threads.	
3. Attach 3/8” silicone tubing to barb.	
4. Determine if the relief well is in gravity (a) or siphon (b) flow	
a. If in gravity flow mode, shut the isolation valve. Shut the valve slowly to minimize water hammer.	
b. If in siphon flow mode, shut the discharge valve to stop flow and break siphon vacuum by opening air release valves in the following order: Shut the discharge valve	

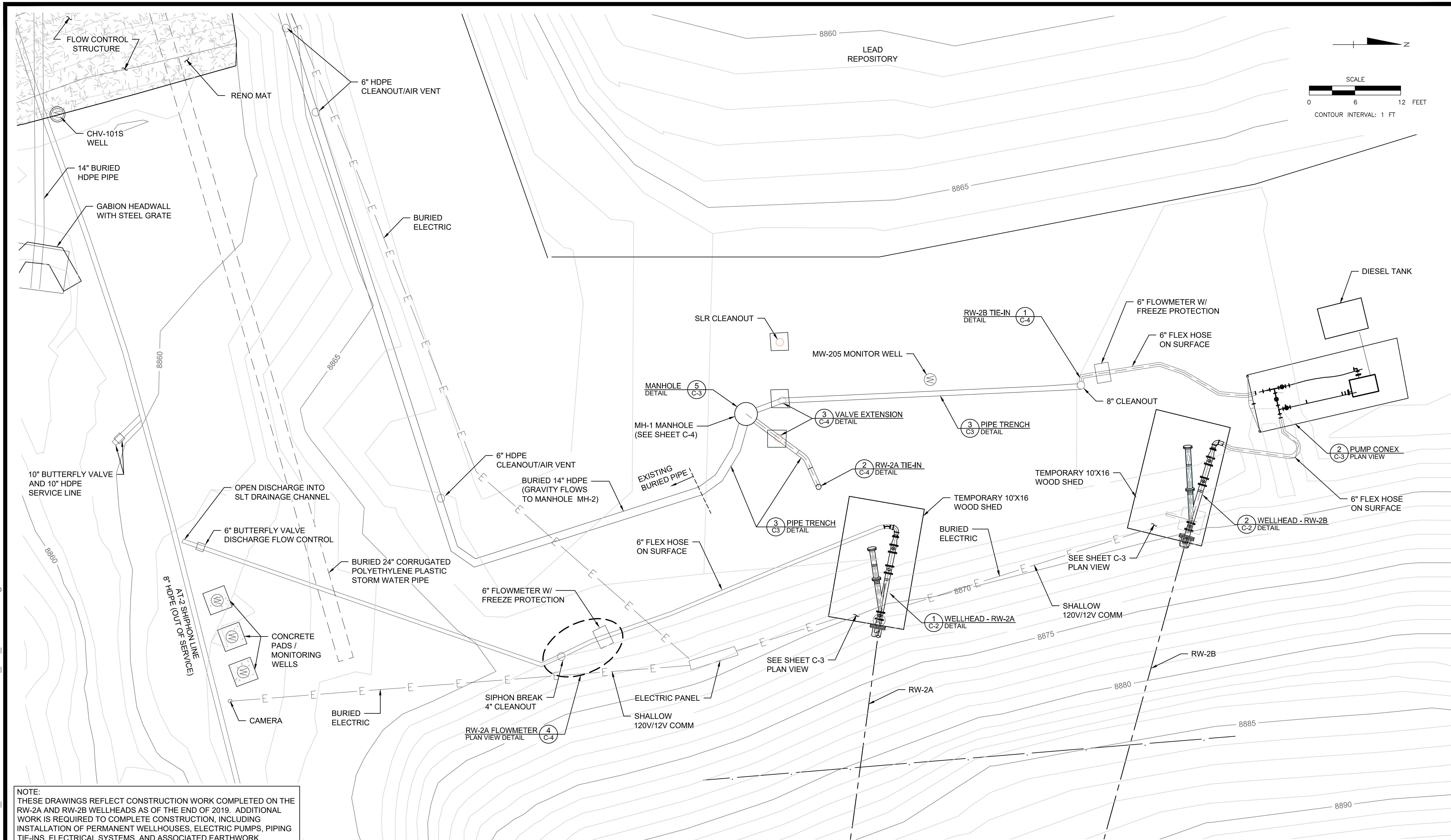
slowly to prevent water hammer. After flow is stopped, shut the flow control valve completely. Partially open the air release valve to break siphon vacuum at the wellhead, while maintaining a closed system for discharge piping.	
5. Hold the open end of the sample port tubing higher than the wellhead and turn the sampling port valve to the open position	
6. Purge water into the bucket until the water sample tubing is clear and free of air bubbles (about 500 mL) by lowering the tubing to below the SLT water elevation.	
7. Place the leveling rod on the reference point and hold plumb.	
8. Hold the sample port tubing up to the leveling rod and record the measurement where the water level rests. Leveling Rod Measurement = _________ ft.	
9. Record the value and add the reference point elevation to the leveling rod measurement (8869.01 ft for RW-2A and 8868.25 ft for RW-2B).	
10. Close sampling port and empty remaining water in tubing into the bucket, then remove tubing from the nipple	
11. Restore flow to the relief well per SOP_Rico_08 – Relief Well OM&M.	
12. Remove nipple and replace cap; if necessary, apply new thread seal tape	
13. Monitor flow and adjust as needed	
14. Make any needed offsets in the telemetry system	
a. If no change is needed make an annotation that a manometer check was completed	
i. Historic trend > today > scaling 8871 to 8872 > make annotation	
b. If an offset is required	
i. Click on well oval icon on telemetry Aid Wells page to adjust offset	
ii. EX. Field measurement 8871.80, telemetry 8871.50. Need to increase offset by 0.30 ft. Current offset + required change = new offset	
iii. Annotate telemetry offset log and transducer elevation historic trend to document changes made.	
c. Send email to project manager and field manager if any changes were made.	

4.0 ATTACHMENTS

See Pages Below

5.0 NOTES

Notes:



NOTE:
THESE DRAWINGS REFLECT CONSTRUCTION WORK COMPLETED ON THE RW-2A AND RW-2B WELLHEADS AS OF THE END OF 2019. ADDITIONAL WORK IS REQUIRED TO COMPLETE CONSTRUCTION, INCLUDING INSTALLATION OF PERMANENT WELLHOUSES, ELECTRIC PUMPS, PIPING TIE-INS, ELECTRICAL SYSTEMS, AND ASSOCIATED EARTHWORK.

NO:	DATE	CADD	CHECK	APP'D	ISSUE / REVISION DESCRIPTION
0	11/12/20	PAF	SPB	AW	ISSUED FOR 2019 AS-BUILT DRAWINGS
1	12/02/20	DCC	SPB	AW	ISSUED FOR 2019 AS-BUILT DRAWINGS

Copper Environmental Consulting
A PRISM SPECTRUM COMPANY
2211 East Highland Avenue, Suite 215
Phoenix, AZ 85016
Tel: (602) 331-3859

Atlantic Richfield Company

TITLE: Relief Well House Site Plan

PROJECT: Rico - Argentine Mine Site, Dolores County, Colorado

SHEET C-1

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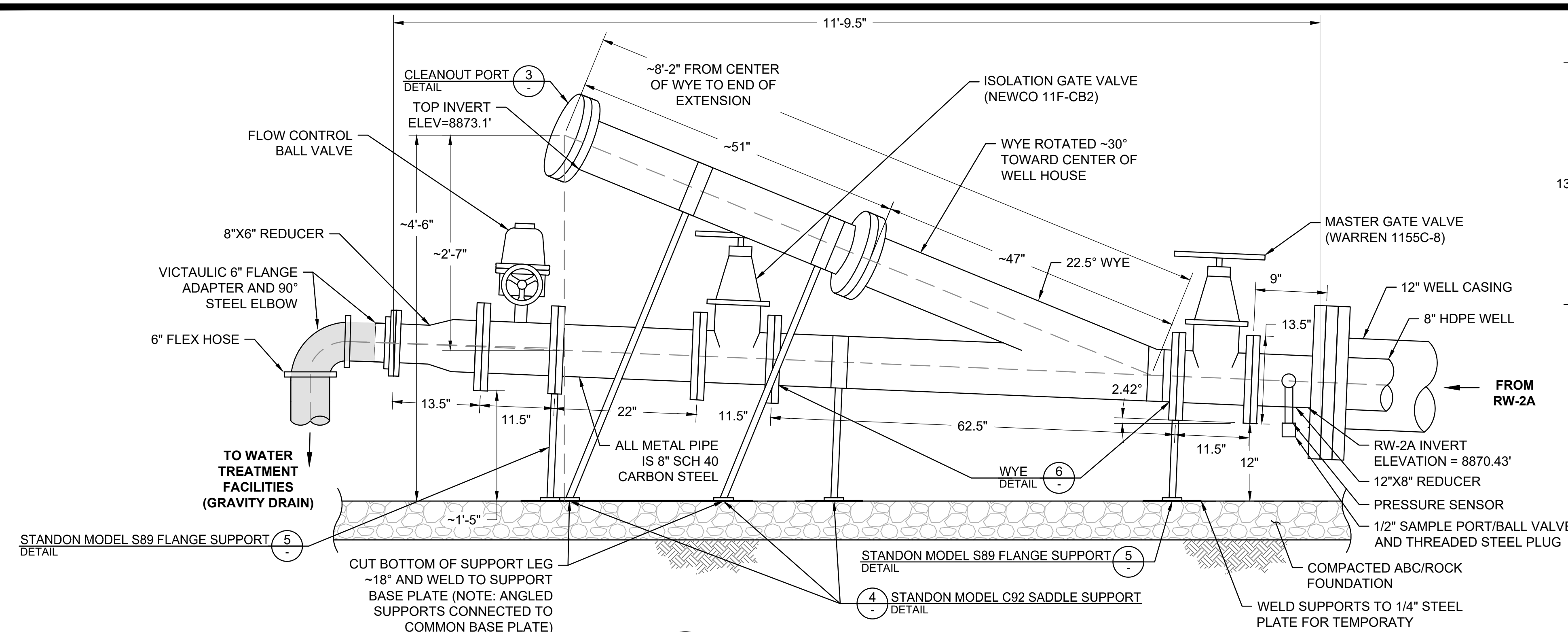
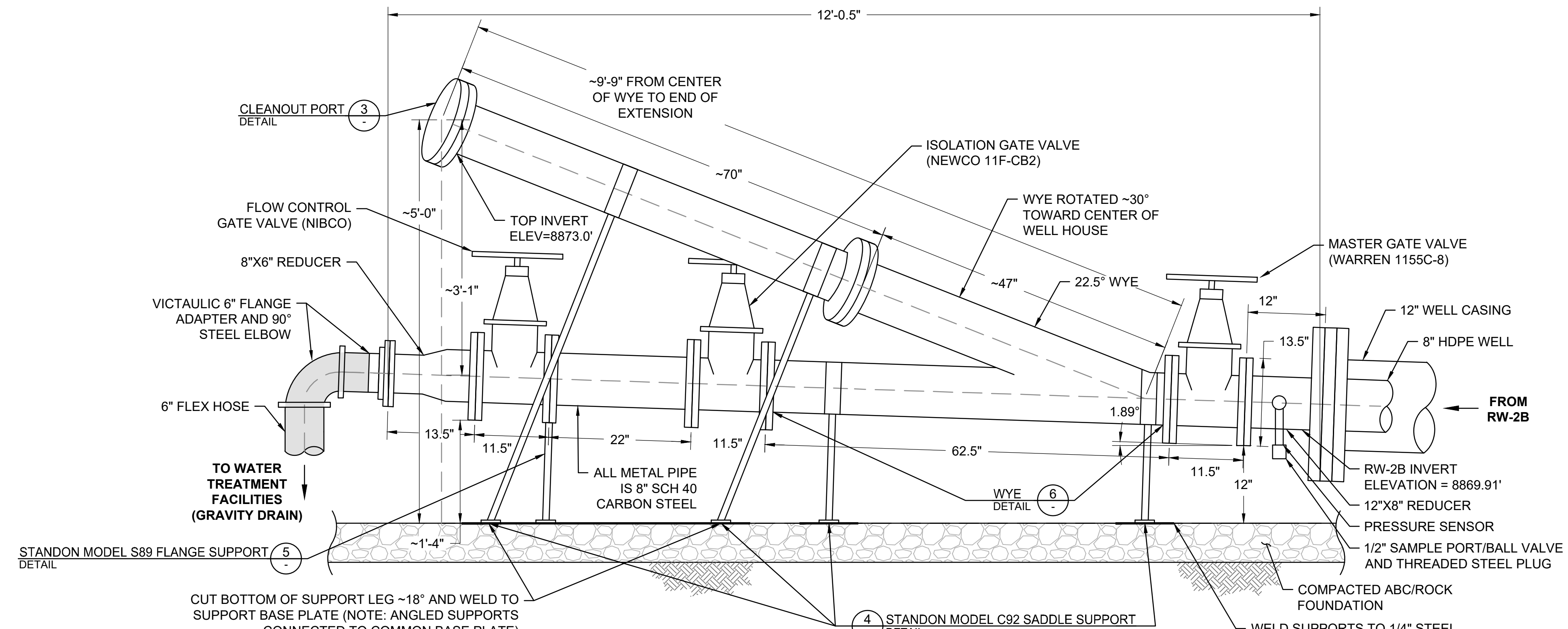


1 WELLHEAD - RW-2A
DETAIL (1"=1')



2 WELLHEAD - RW-2B
DETAIL (1"=1')

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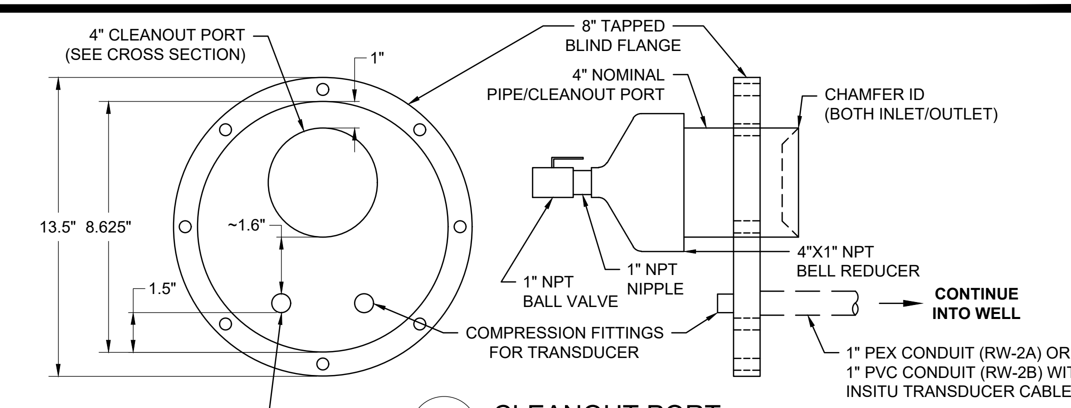
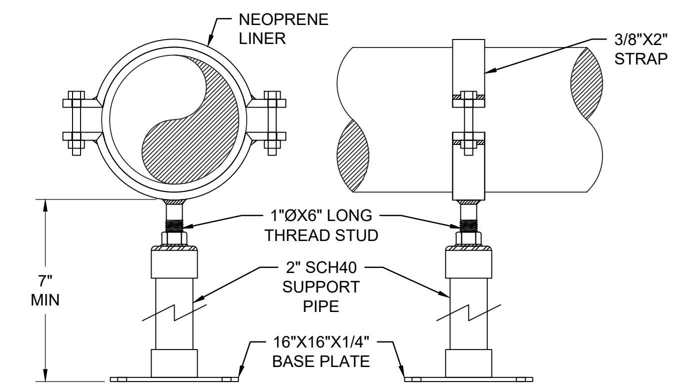
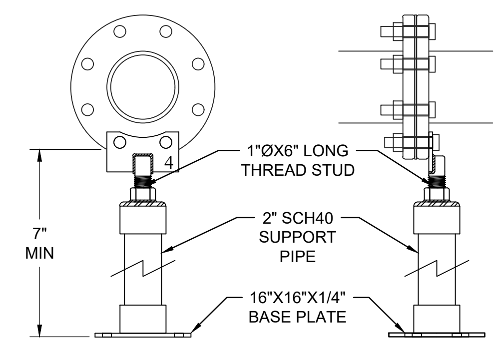


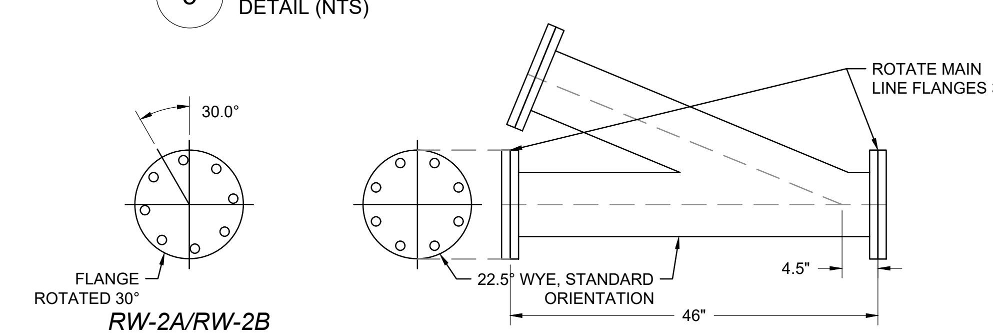
3 CLEANOUT PORT
DETAIL (NTS)



4 STANDON MODEL C92 SADDLE SUPPORT
DETAIL (NTS)



5 STANDON MODEL S89 FLANGE SUPPORT
DETAIL (NTS)



6 WYE
DETAIL (NTS)

NOTE:
1. WYE FLANGES ARE LAP JOINT FLANGE TYPES.

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Tel: (602) 331-3859

Atlantic Richfield Company

TITLE:
As-built RW-2A/2B Wellhead Improvement Details

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

SHEET
C-2

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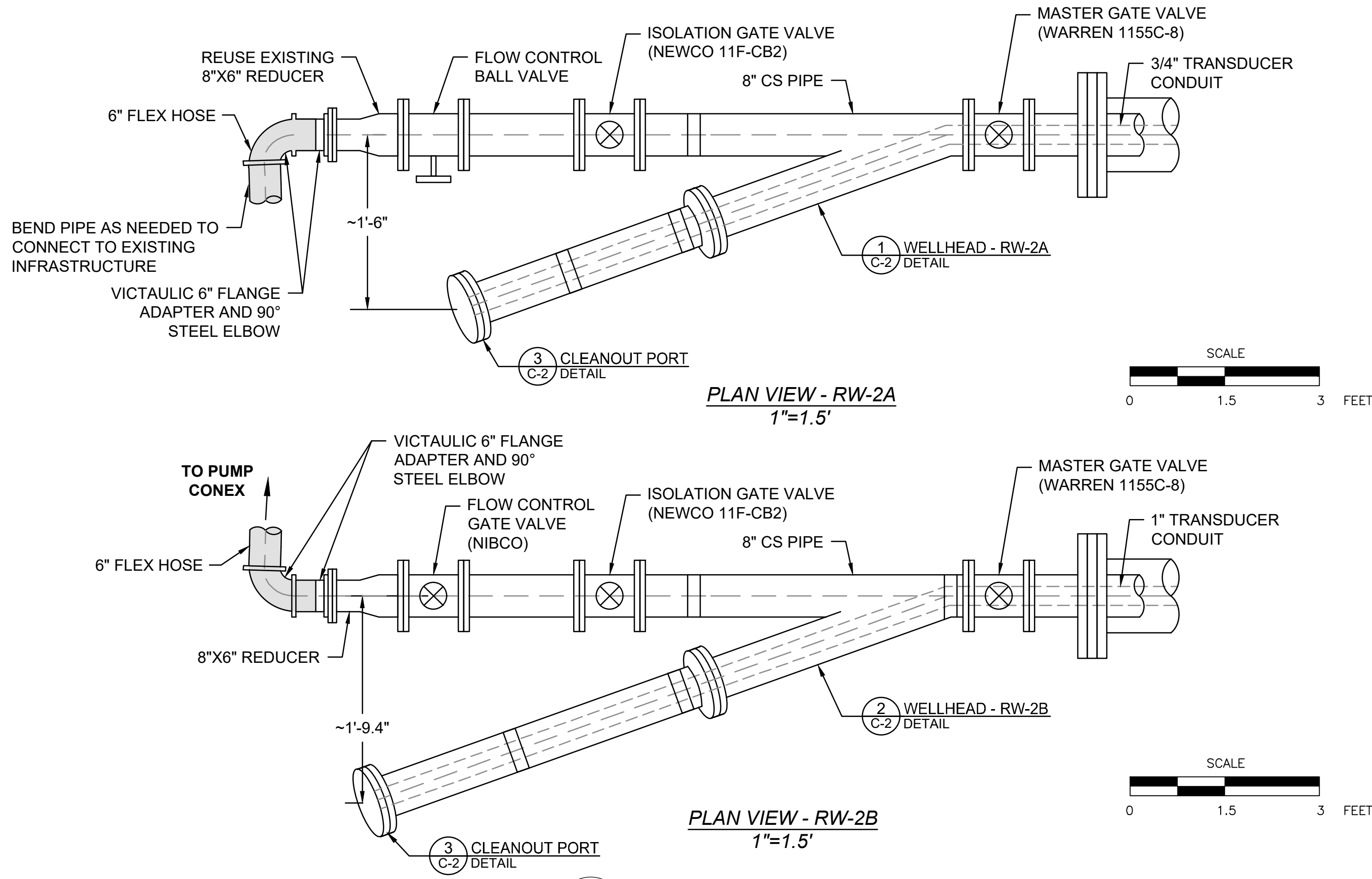
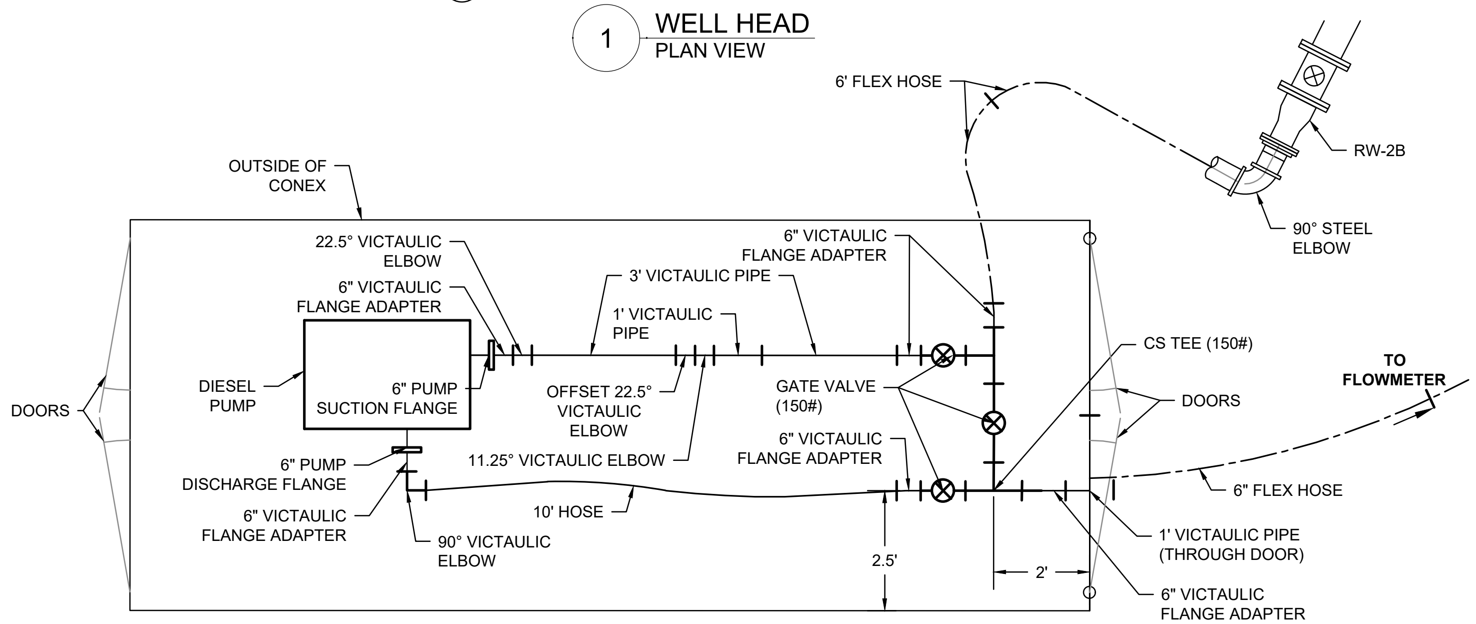


1 WELL HEAD
PLAN VIEW



2 PUMP CONEX
PLAN VIEW

NOTE:
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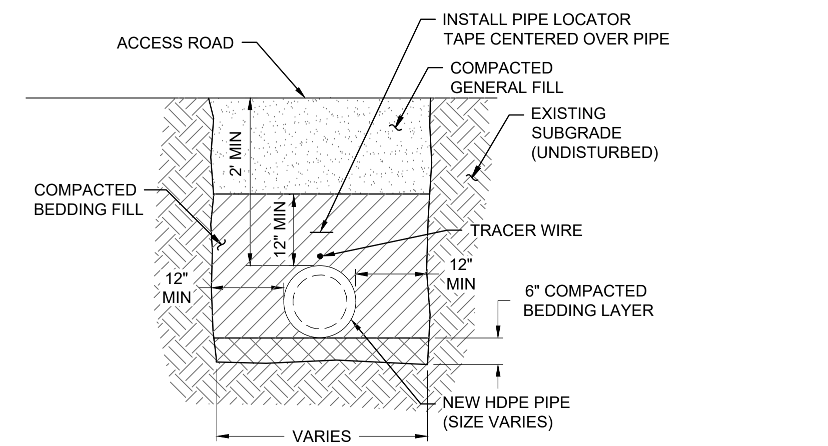
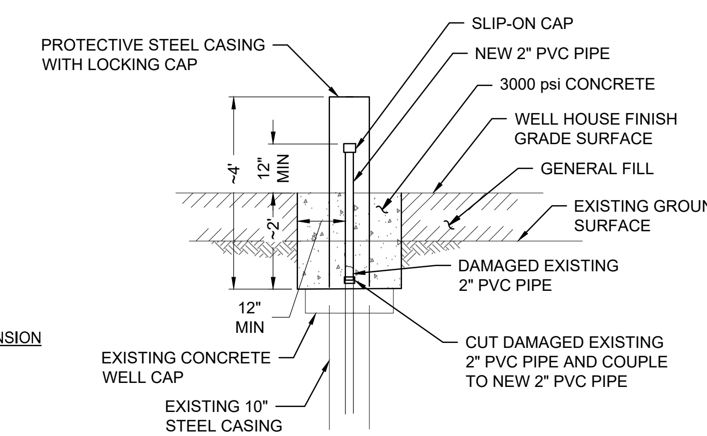
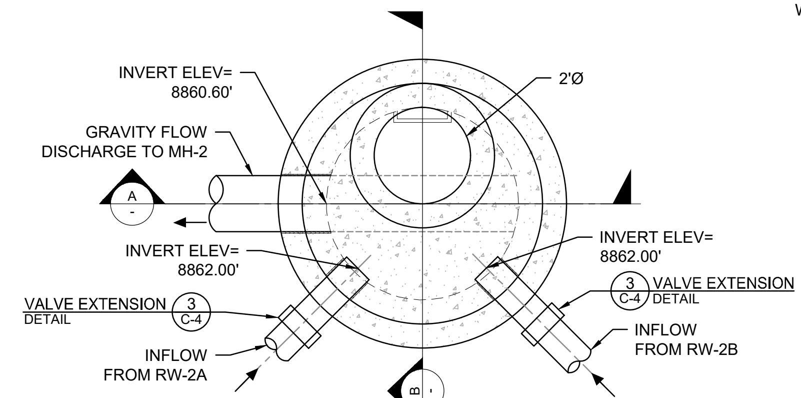


NOTE:
1. IN AREAS WERE PIPE BEDDING CANNOT BE PLACED/COMPACTED PRIOR TO PIPE PLACEMENT (i.e. AROUND THE MANHOLE), USE FLOWABLE FILL.

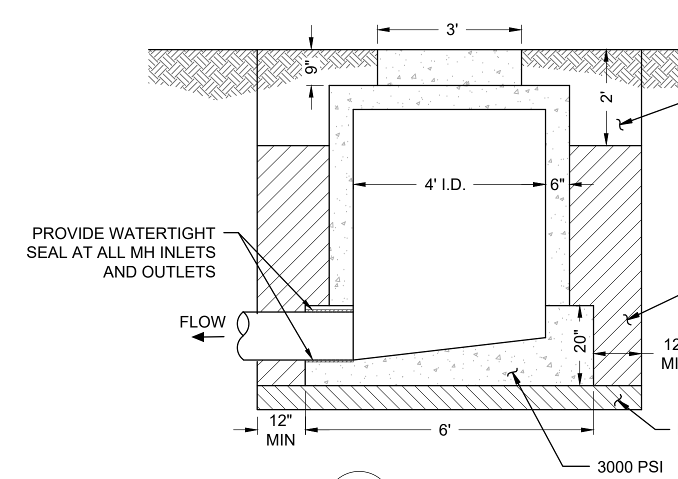
3 PIPE TRENCH
DETAIL (NTS)



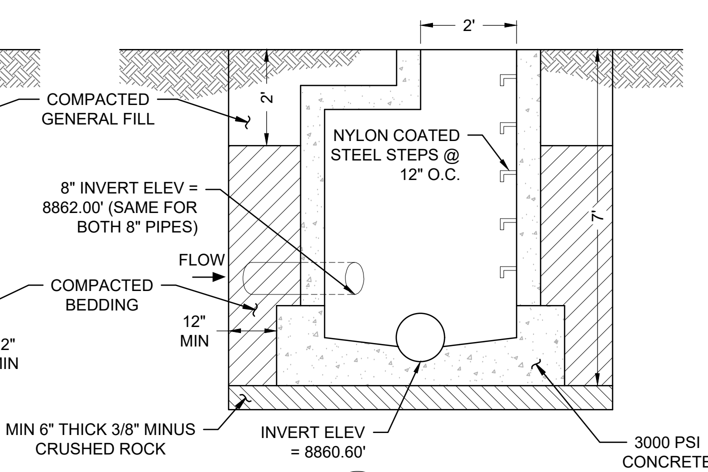
4 WELL REPAIR
DETAIL (NTS)



5 MANHOLE
DETAIL (NTS)



A SECTION
(NTS)



B SECTION
(NTS)

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1	12/02/20	DCC	SPB	AW	ISSUED FOR 2019 AS-BUILT DRAWINGS

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Tel: (602) 331-3859

Atlantic Richfield Company

TITLE:
RW-24/2B
Details

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

SHEET
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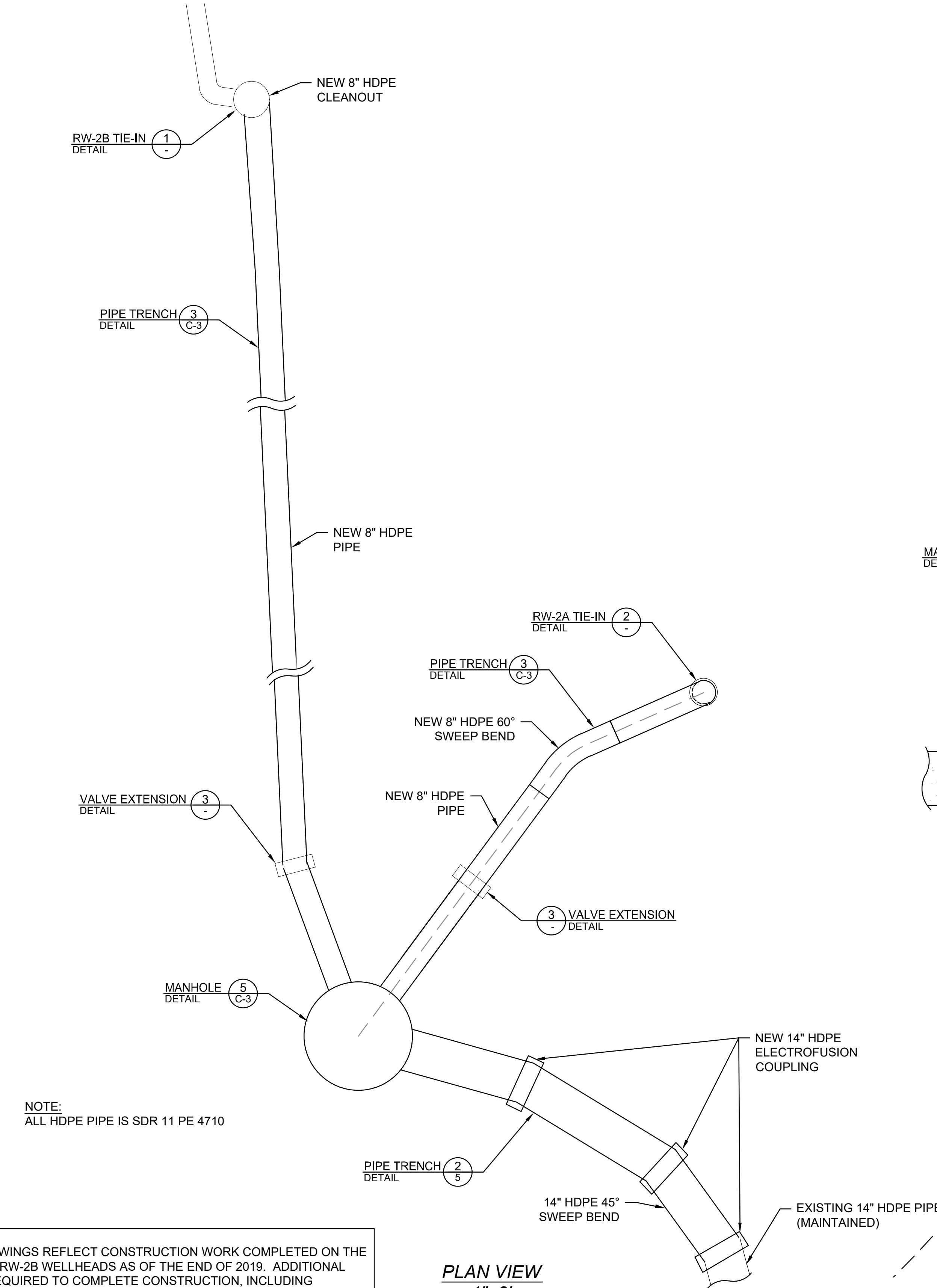

NOTE:
ALL HDPE PIPE IS SDR 11 PE 4710

NOTE:
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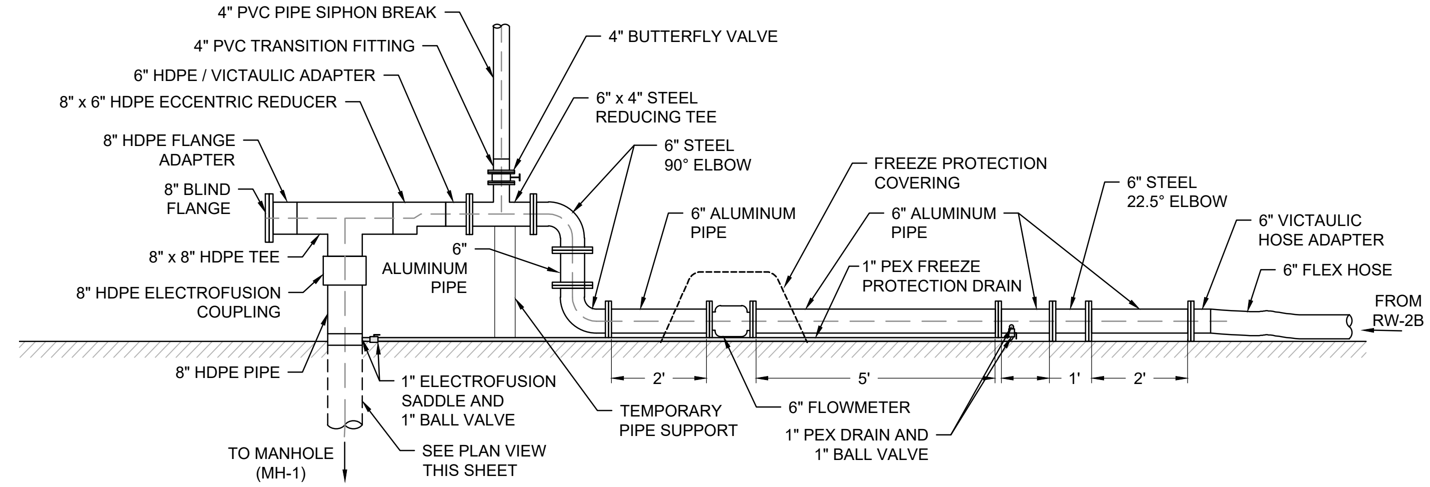
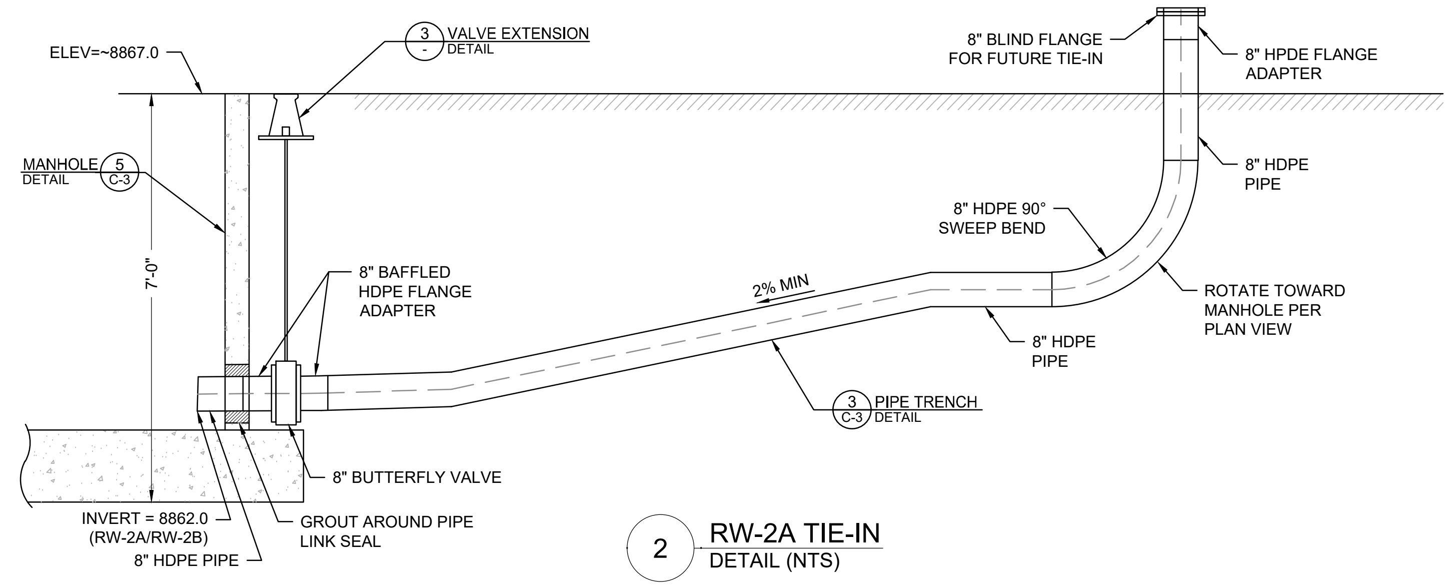
PLAN VIEW
1"=2'

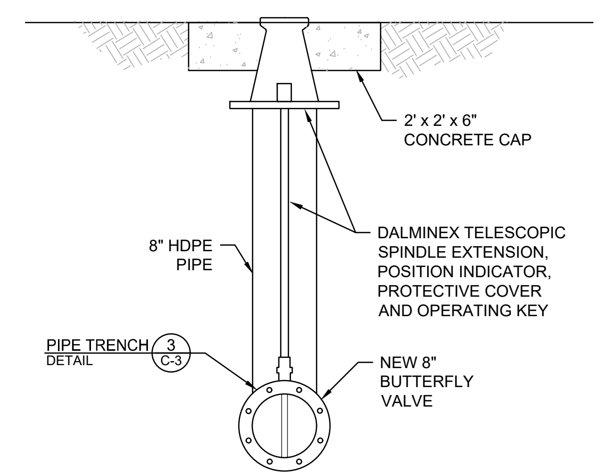


NOTE:
1. ALL ALUMINUM PIPE AND HOSE CONNECTIONS ARE VICTAULIC TYPE

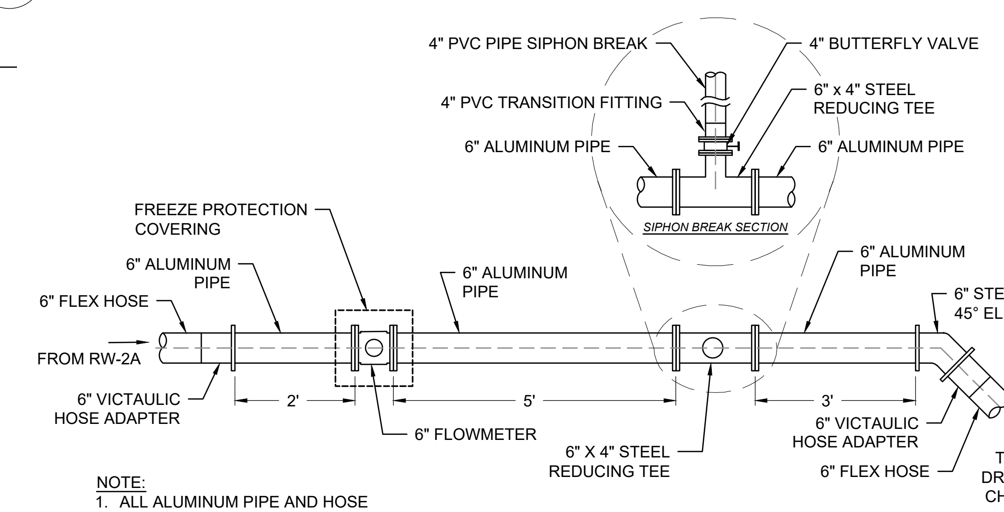
1 **RW-2B TIE-IN**
DETAIL (NTS)



2 **RW-2A TIE-IN**
DETAIL (NTS)



3 **VALVE EXTENSION**
DETAIL (NTS)



NOTE:
1. ALL ALUMINUM PIPE AND HOSE CONNECTIONS ARE VICTAULIC TYPE

4 **RW-2A FLOWMETER**
PLAN VIEW DETAIL (NTS)

NO:	DATE	CADD	CHECK	APP'D	ISSUE / REVISION DESCRIPTION
0	11/12/20	PAF	SPB	AW	ISSUED FOR 2019 AS-BUILT DRAWINGS
1	12/02/20	DCC	SPB	AW	ISSUED FOR 2019 AS-BUILT DRAWINGS

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Atlantic Richfield Company

TITLE:
RW-2A/2B Manhole Relocation
Details

PROJECT:
Rico - Argentine Mine Site
Dolores County, Colorado

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SOP – DR-3 Measurement, Cleaning and Calibration	
Project Name: Rico – Wetlands Treatment Systems Operations	
Name:	Date:
1. INTRODUCTION	
1.1. Purpose and Scope	
This document is meant to act as a Standard Operating Procedure (SOP) for the measurement, cleaning and calibration of DR-3 transducer. ***CALIBRATION MUST BE PERFORMED AND RECORDED ANY TIME THE TRANSDUCER IS PULLED.** DR-3 should be measured every two weeks. Cleaning should be performed once monthly unless otherwise directed by the Site Engineer. Measurement should be repeated 48 hours after each cleaning.	
1.2. Minimum Required Equipment	Initials
• Level D PPE in accordance with associated Task Risk Assessments (TRAs), the Copper Environmental Consulting (CEC) Task Specific Health and Safety Plan (TSHASP), and the Rico Program Plan.	
• Nitrile Gloves	
• Water Level Meter	
• 1 Gallon distilled water sprayer bottle	
• Paper Towels	
1.3. Pertinent/Required Reference Information	
1.3.1. Sops/User Manuals	
• N/A	
1.3.2. Task Risk Assessments (TRAs)	Initials
• TRA_Rico_02_201210 (or the most updated version) – Discusses the associated risks of all on-site maintenance and monitoring activities including Pulling/Placing, Cleaning, and Calibrating transducers.	
2. MEASURING AND CLEANING –	Initials
1. **Gather and mobilize equipment.** Take supplies needed (listed in 1.2 above) to DR-3 location. Briefly look at how everything is positioned so that you can place everything back in the same position after cleaning.	
2. **Clean Transducer.** **The transducer should not be cleaned more frequently than monthly unless otherwise directed by the Site Engineer. If the transducer is cleaned, a measurement and calibration should be performed after 48 hours.** With Nitrile gloves on, pull the DR-3 Transducer from the standpipe it is located in. Use distilled water sprayer to completely spray and clean off sediment and debris from transducer. Make sure to spray transducer over the SLT channel to ensure sediment and water is contained in the channel.	
3. **Clean standpipe.** After spraying and cleaning off the transducer, place it in a safe location before pulling and spraying off the 1-inch perforated well screen located in the standpipe. Pull the perforated well screen from the standpipe and spray it in the same manner with the sprayer as done with the transducer. After spraying the well screen, place it in a secure location before obtaining a water level measurement.	
4. **Measure depth to water (DTW).** Verify the Water Level Meter is on and place in the standpipe of the flume. Collect a DTW measurement on the north side of the standpipe. Listen for the sound of the Water Level Meter to beep when it hits water. Due to turbulence in the flume, if the meter is too high it will beep intermittently. If it is too low,	

it will make a constant sound. The level is correct when the sound is mostly constant with an occasional break. Record the correct DTW measurement.	
5. **Measure depth to bottom (DTB)**. Lower the Water Level Meter down until it has touched the bottom of the flume. Pull the slack out of the measuring tape until it is taught, but ensuring the meter is still on the bottom of the flume. Record the DTB measurement. DTB should be 3.20 ft. If measurement is not 3.20, notify Site Engineer.	
6. **Calculate flume height**. Subtract DTW from DTB to calculate height of flow. DTB (ft)__________ - DTW (ft)__________ = __________________. Time:____________	
7. **Clean Water Level Meter**. Spray Water Level Meter off as you reel it in to prevent any cross contamination with future use.	
8. **Insert well screen and transducer.** Insert the perforated well screen back into the standpipe, and then take the DR-3 transducer and place it gently back into the PVC in its original location at the bottom of the standpipe. Ensure the transducer cable at the top of the screen has a slight bend in it to help keep the transducer on the bottom of the flume.	
9. **Demobilize.** Go to Chemical Feed Building and put away equipment.	
10. **Proceed to calibration. Each time the transducer has been lifted from the bottom of the flume, calibration must be performed.**	
3. CALIBRATION	INITIALS
1. **Verify new read**. Log into the telemetry server at the chemical feed building. Allow at least 15 minutes from the time of measurement so the transducer has time to collect a reading in its new position at the bottom of the flume.	
2. **Record latest reading.** Navigate to the "DR-3" screen and verify that the transducer has collected a measurement since it was replaced in the standpipe per Step 2.8. Record the flume height. Flume height (ft):___________	
3. **Calculate new offset.** Record the current offset from the DR-3 screen: Offset (ft)________. Subtract the most-recent telemetry reading (Step 3.2) from the field-measured reading collected in Step 2.6. Add this value to the existing offset value. Field-measured flume height ________ - Telemetry flume height _________ + existing offset ________ = new offset _________.	
4. **Enter new offset.** Click on the offset value on the telemetry screen to enter the new offset. The telemetry software will prompt that the password is re-entered. The new offset will show as orange font until the next 15-minute read interval, when the offset will be applied. Once the new offset has been applied, the font will turn green.	
5. **Annotate telemetry.** Navigate to the DR-3 screen and use the ruler function to enter an annotation at time of offset. Include the field measurement and calibration details.	
6. **Send email.** Send an email to Telemetry Watch (Heather Boese), Project Manager (Kevin Pfeifer), Site Engineer (Alex Wing), and SLT Lead (Luke Evans) indicating the previous telemetry flume height and flow rate, field reading, new flow rate, and calibration offset adjustment.	
4. NOTES	
Notes:	