

# Rock Dump Area Seep Water Treatment at the Jerritt Canyon Mine

Presented by:  
Debbie Johnston, PE  
Morrison-Maierle, Inc.

# Project Coordination

Mine Owner:



JERRITT CANYON GOLD

Government Agencies:

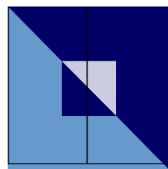


State of Nevada  
Department of Conservation & Natural Resources  
Nevada Division of Environmental Protection



# Project Coordination

Consultants:



**Apex Engineering, PLLC**



**SOVEREIGN  
CONSULTING** INC  
science. service. solutions.

# Jerritt Canyon Mine Location





# Project Background

- Issue: Rock dump areas (RDAs) presenting high sulfate seepage
- Seepage is not ARD, reports as pH neutral
- NDEP and USEPA required treatment for sulfate and TDS

# Consent Decree – December 2013

1 CATHERINE CORTEZ MASTO  
 2 Attorney General  
 3 CASSANDRA P. JOSEPH  
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 15 *Attorneys for Plaintiff*  
 16 *State of Nevada*

17 IN THE FOURTH JUDICIAL DISTRICT COURT OF THE STATE OF NEVADA  
 18 IN AND FOR THE COUNTY OF ELKO

19 STATE OF NEVADA, DEPARTMENT OF  
 20 CONSERVATION AND NATURAL  
 21 RESOURCES, DIVISION OF  
 22 ENVIRONMENTAL PROTECTION,  
 23 Plaintiff,  
 24  
 25 x.  
 26 QUEESTAKE RESOURCES, USA, INC.,  
 27 Defendant.

28 Case No. CV-C-09-86  
 Dept. No. II

**SECOND MODIFIED CONSENT DECREE**

Plaintiff State of Nevada, on behalf of the Nevada Department of Conservation and Natural Resources, Division of Environmental Protection ("NDEP") settled all claims alleged in the Amended Complaint in this action, originally filed on January 30, 2009, and amended on May 31, 2009; filed pursuant to Nevada Revised Statutes (NRS) 445A.300-.730, 445B.100-.640 and 459.400-.600, alleging that Veris Gold USA, Inc. (formerly known as Queenstake Resources, USA, Inc.) ("VERIS") violated State Environmental Laws at its Jerritt Canyon Mine in Elko County, Nevada (the "Facility") and to address various other related administrative matters involving NDEP.

Office of the Attorney General  
 100 North Carson Street  
 Carson City, NV 89701-4717

# Consent Decree Orders

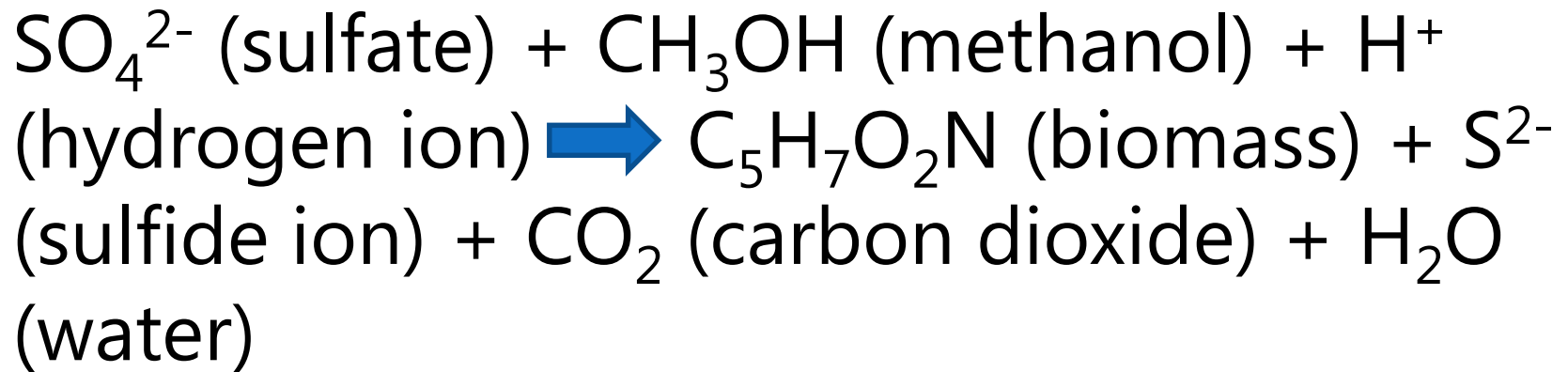
- Treat seep water at three RDAs
  - Marlboro Canyon (rejuvenation allowed)
  - Snow Canyon
  - Gracie
- Seep water discharge limits:
  - <250 mg/L sulfate
  - <500 mg/L TDS

# Rock Dump Areas





# Bioreactor Chemistry



# Bioreactor Media



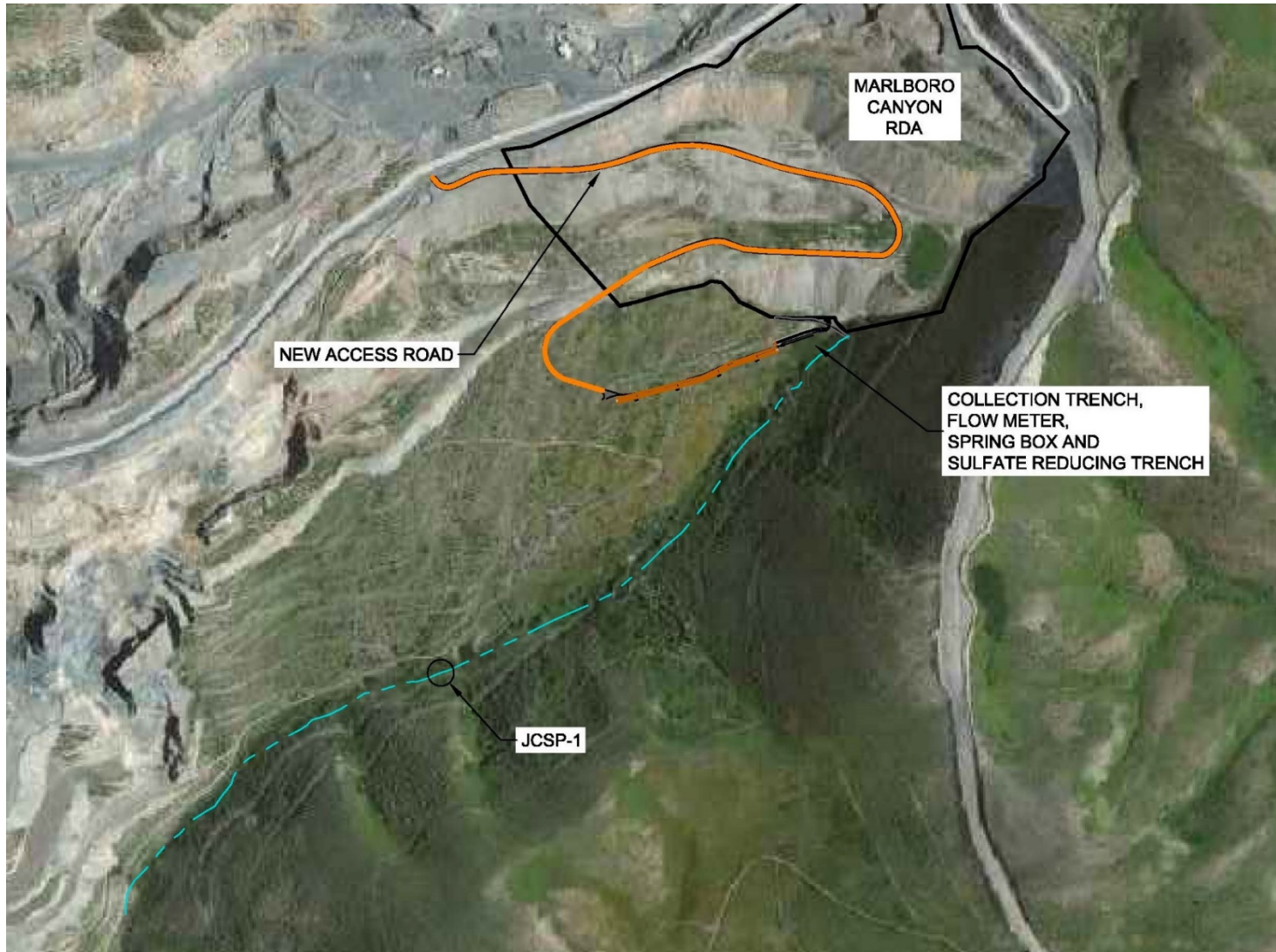


# Media Mixing



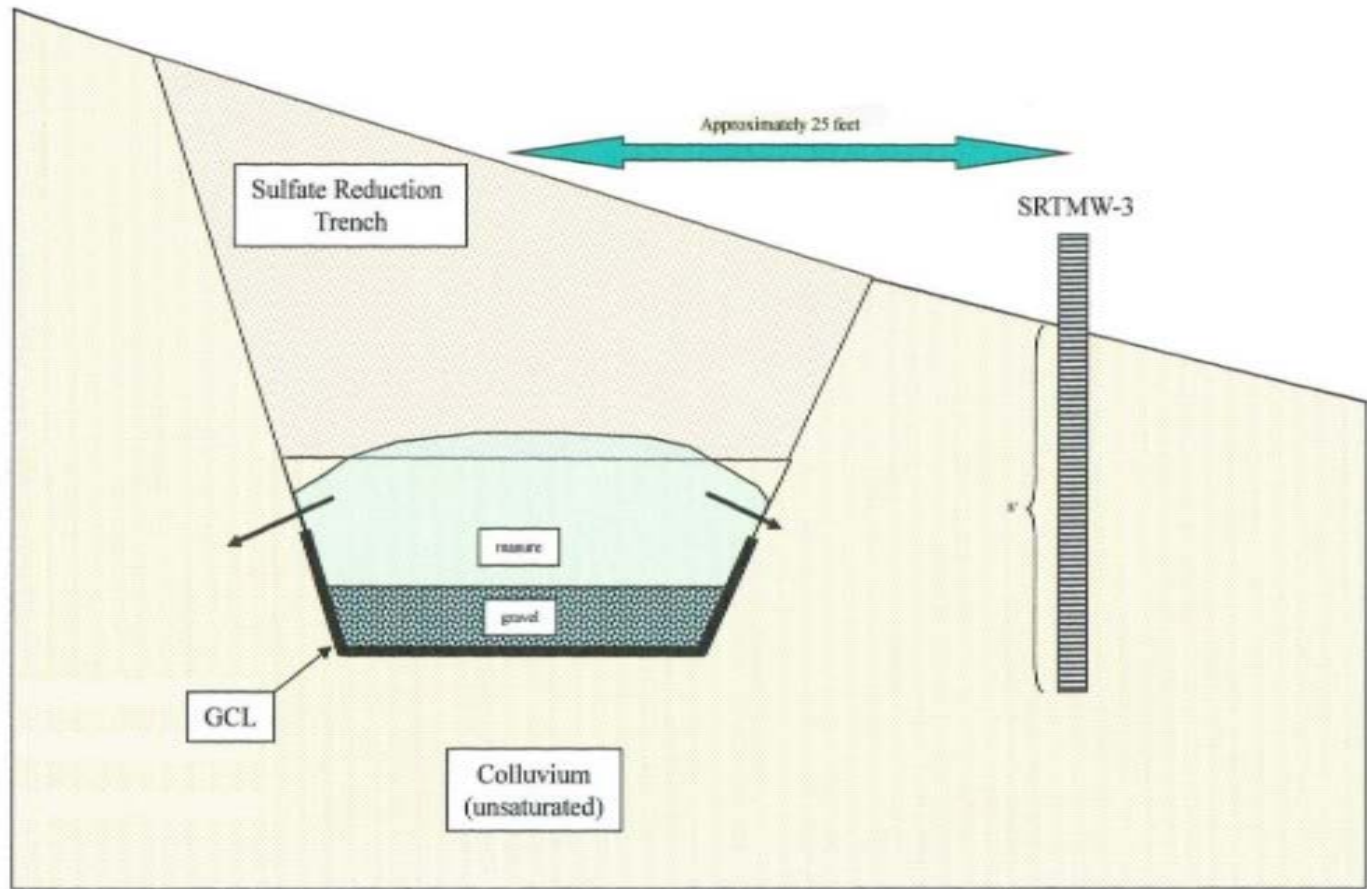


# Marlboro Canyon



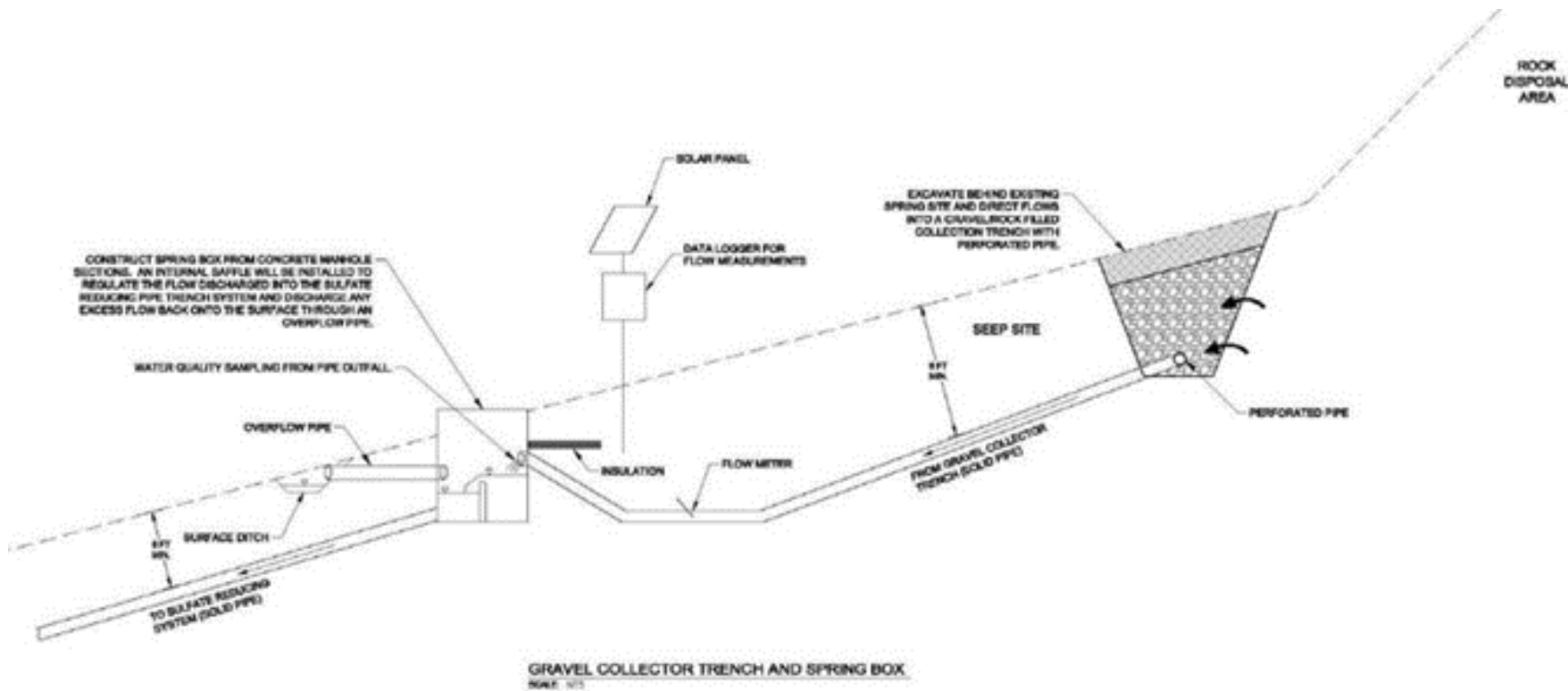


# Marlboro Canyon



2002 – MCDSRT Schematic

# RDA Toe Collection Trench

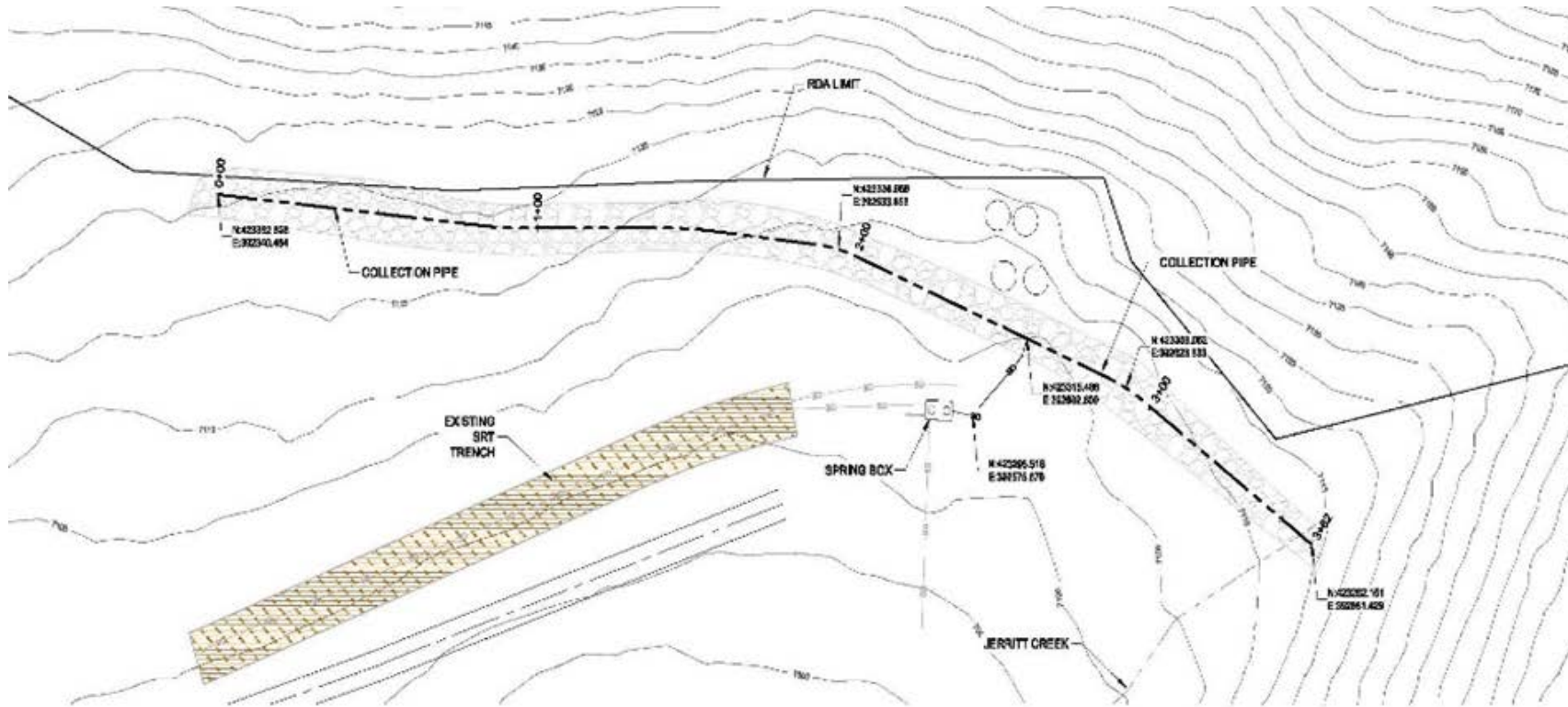


# Marlboro Collection Trench Construction





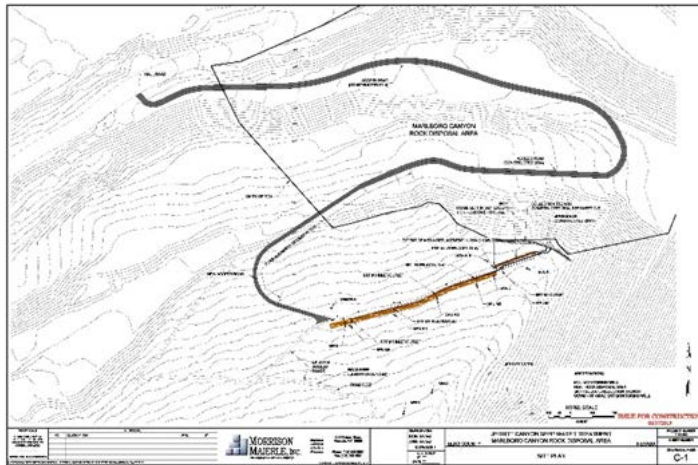
# Marlboro Canyon 2014 Construction



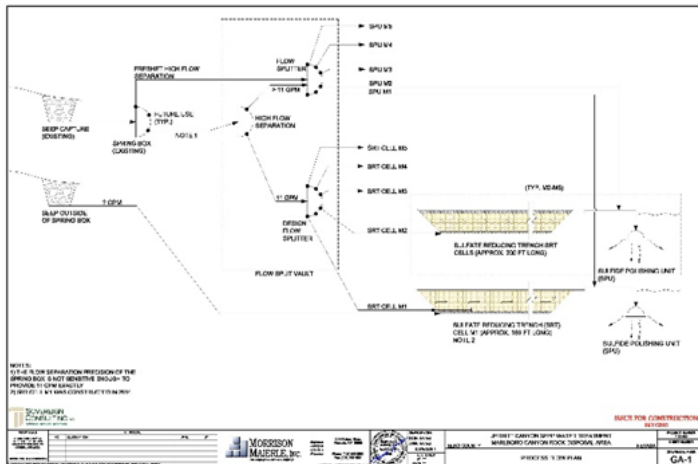
- Toe seep collection trench
- Collection box and flow meter
- Trench media rejuvenation



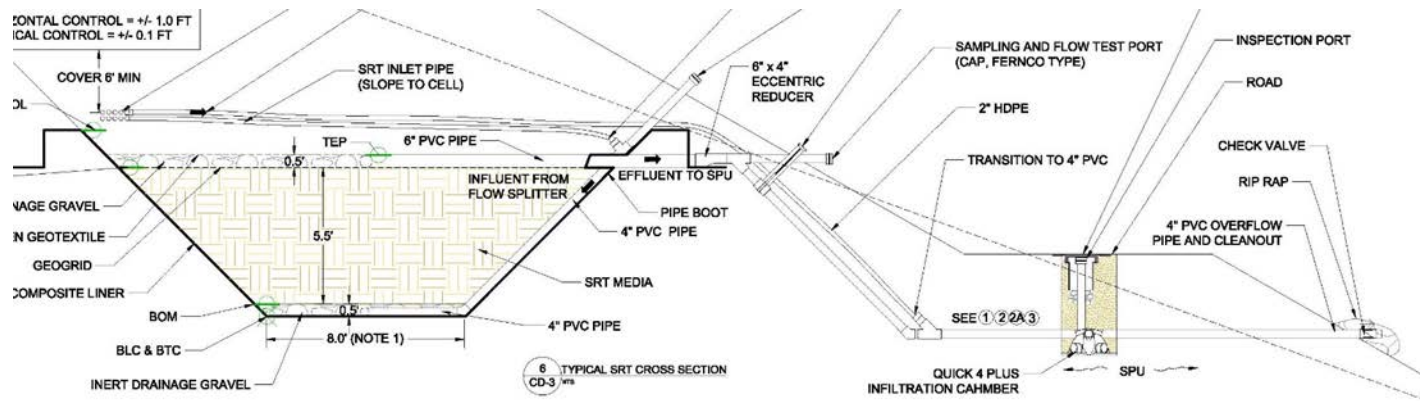
# Marlboro Canyon 2015 Construction



- Media Volume = 2,910 yd<sup>3</sup>
- Footprint Area = 13,200 ft<sup>2</sup>
- Total Trench Length = 1,000 ft
  - Trench 1 (EX) – 1 cells
  - Trench 2 – 4 cells



# Marlboro Canyon 2015 Construction



Typical Section



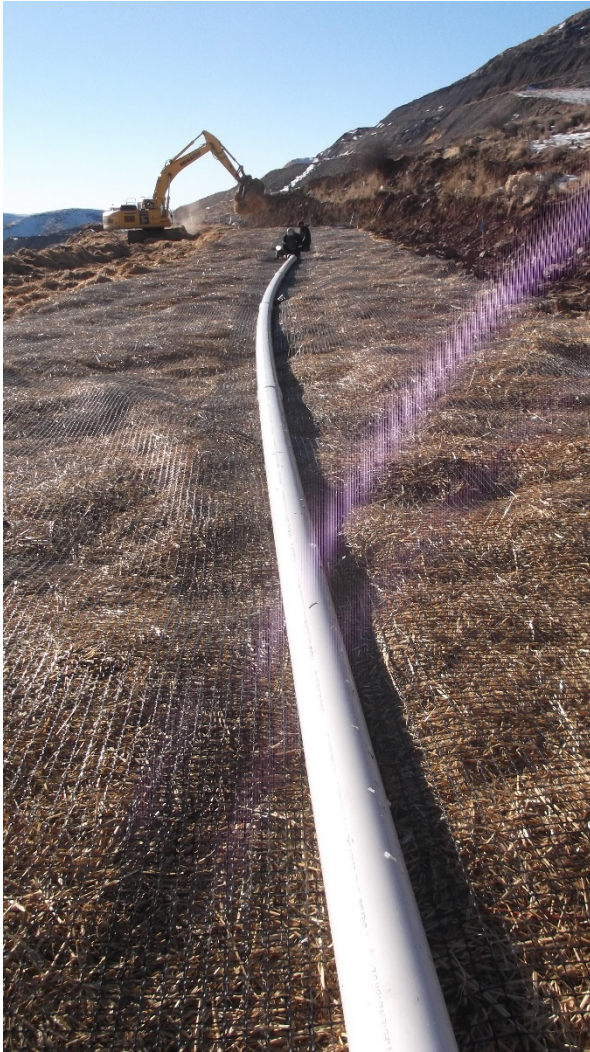


# Marlboro Canyon 2015 Construction



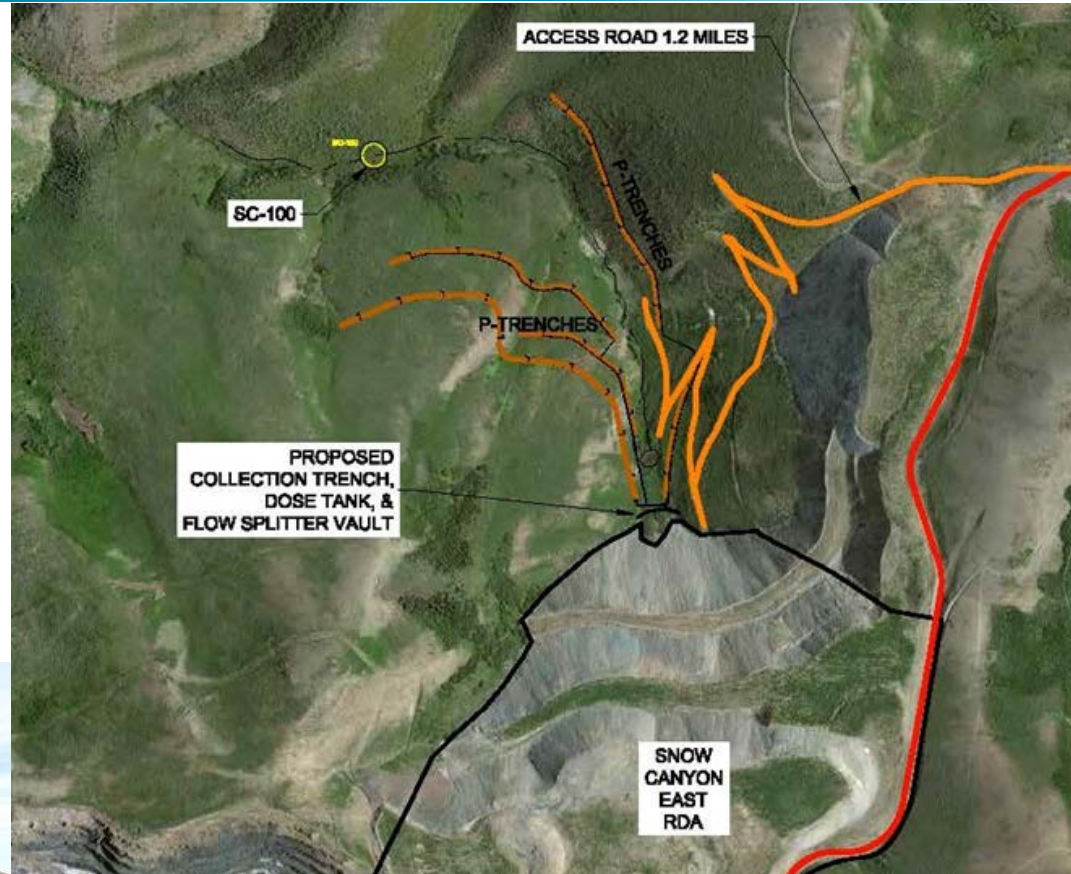


# Marlboro Canyon 2015 Construction

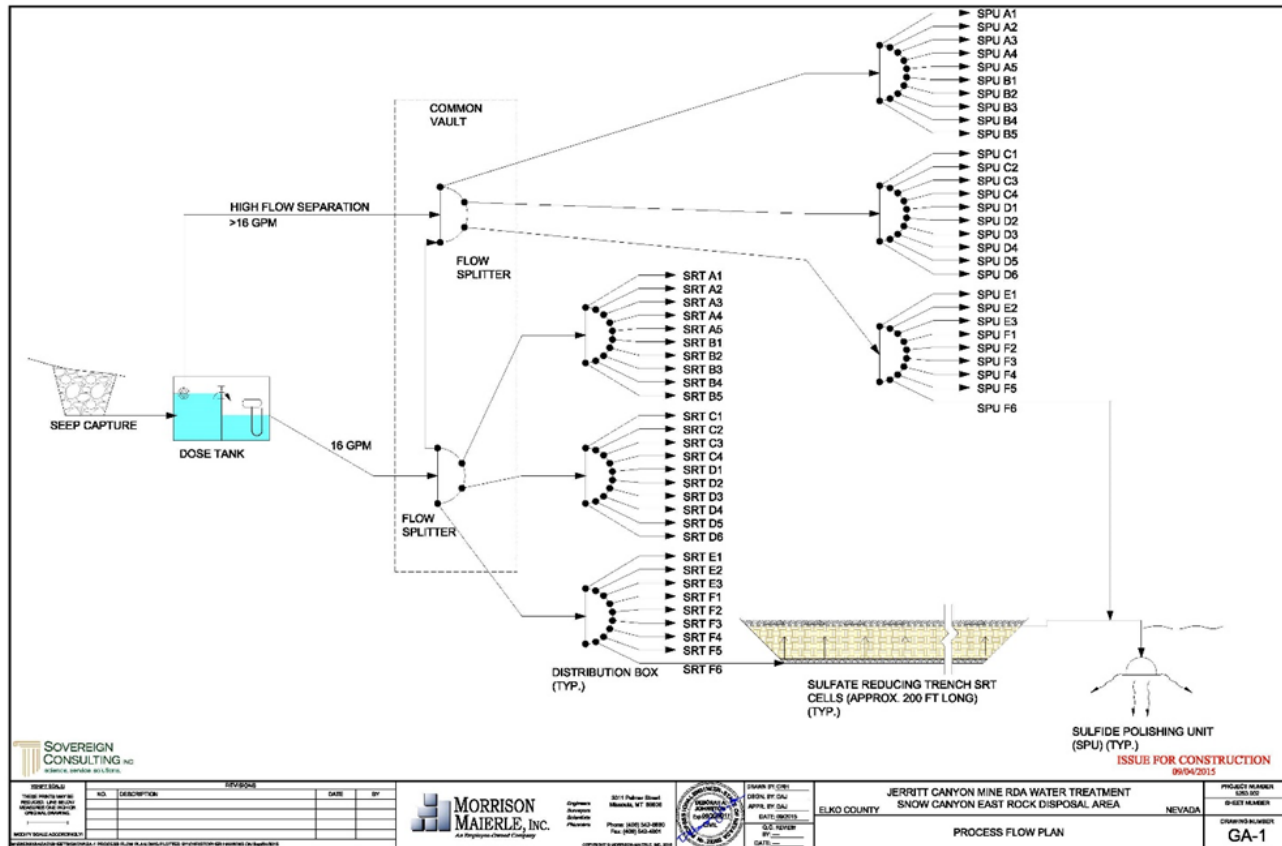




# Snow Canyon

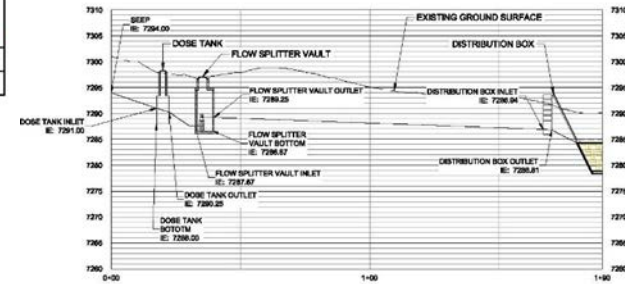
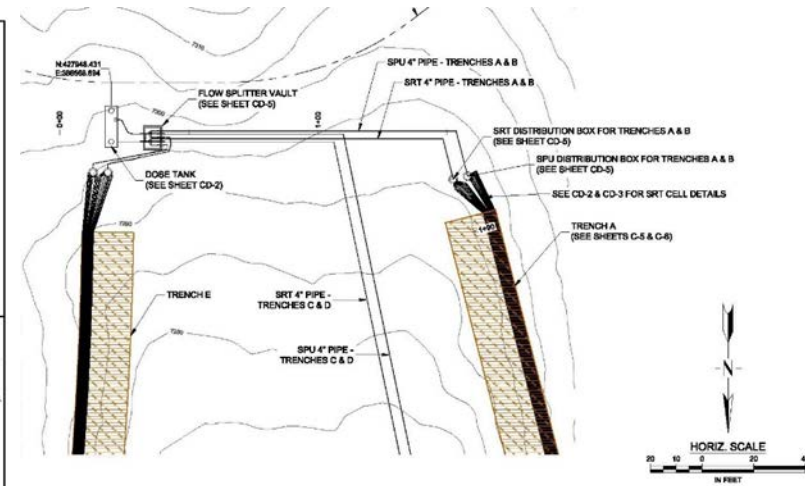
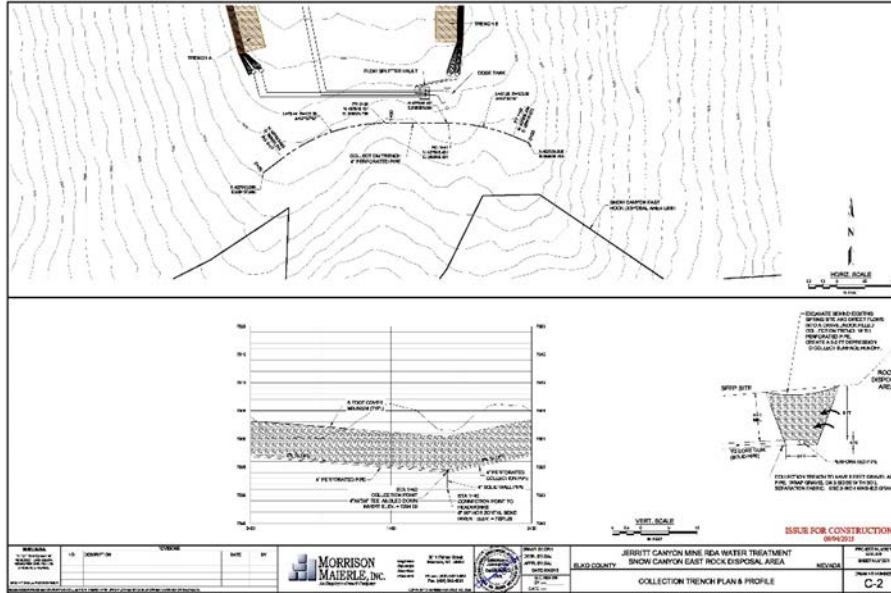


# Snow Canyon



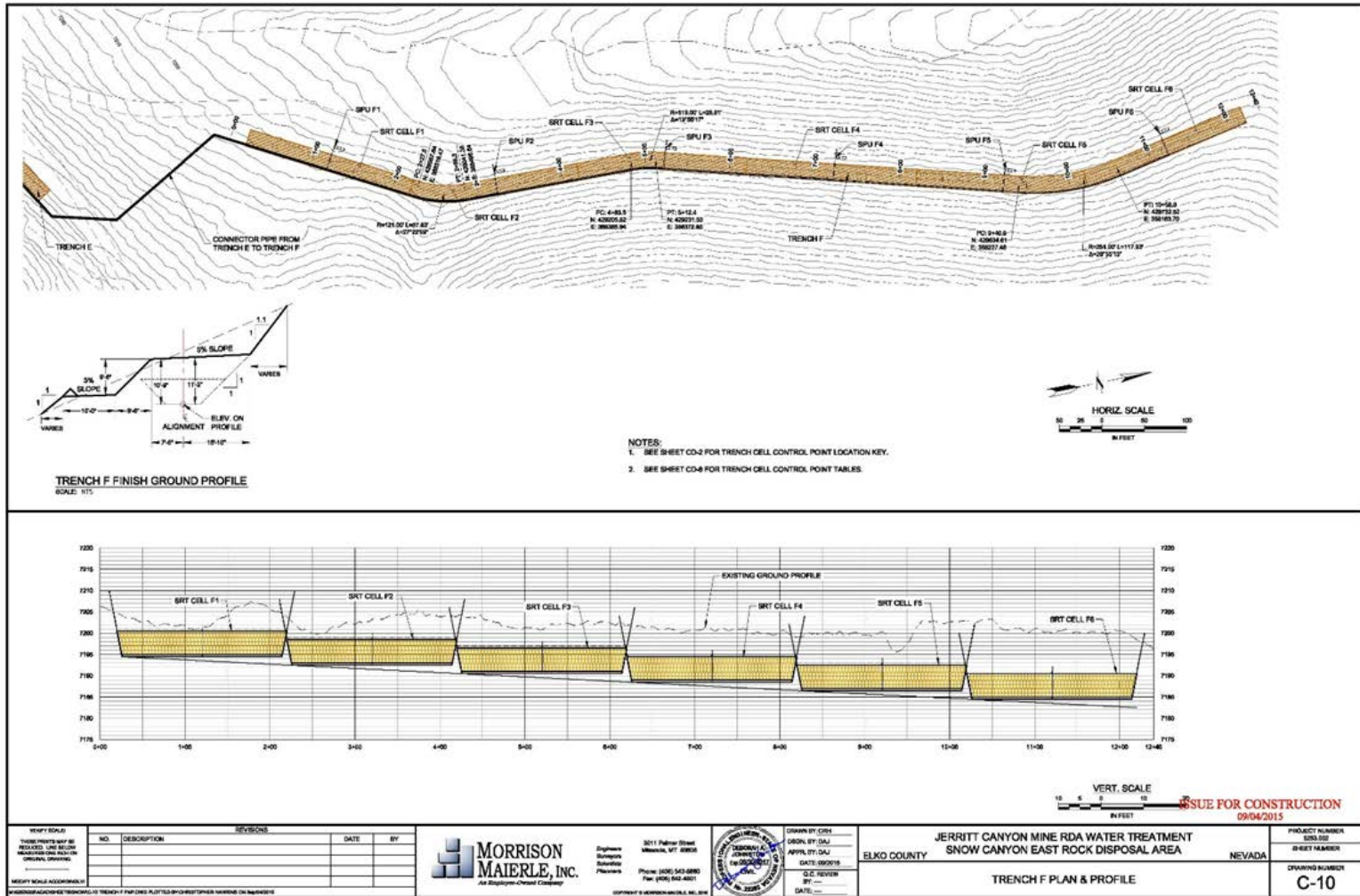
- Sulfate concentrations higher than Marlboro Canyon
- Removal rate (design): 0.9 mol/m<sup>3</sup>/day
- Flow rate 48.8 gpm w/ 4,250 mg/L sulfate

# Snow Canyon



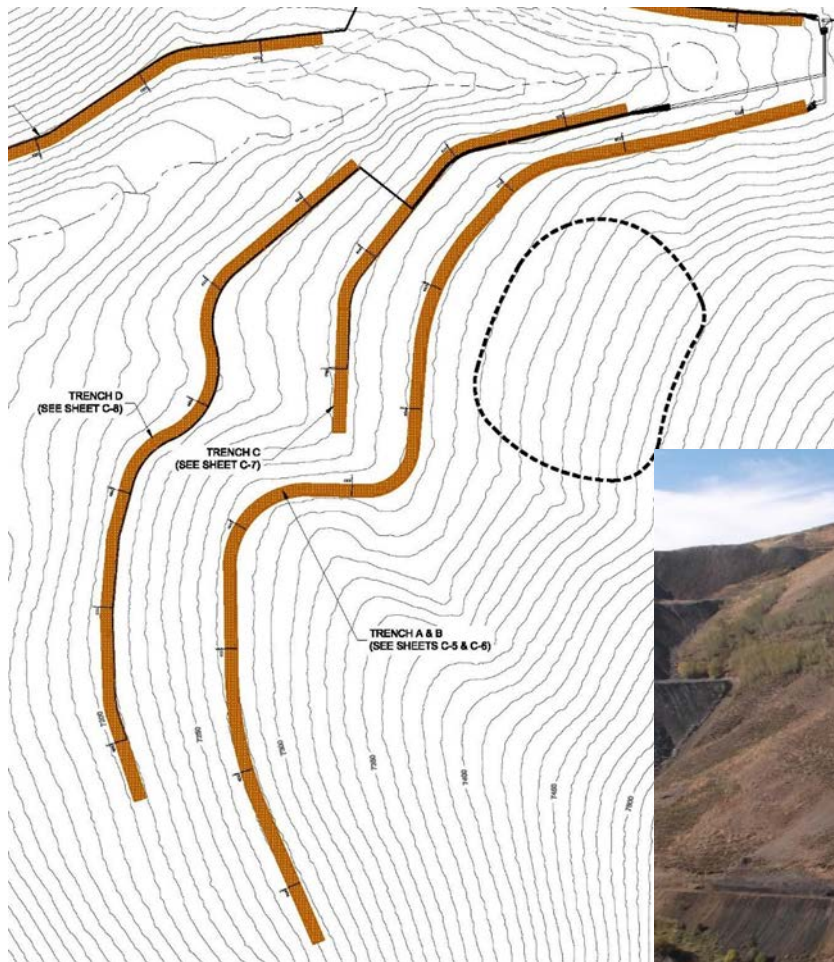


# Snow Canyon Trench Layout





# Snow Canyon Trench Layout



- Media Volume = 34,300 yd<sup>3</sup>
- Footprint Area = 154,000 ft<sup>2</sup>
- Total Trench Length = 5,800 ft
  - Trench A – 5 cells
  - Trench B – 5 cells
  - Trench C – 4 cells
  - Trench D – 6 cells
  - Trench E – 3 cells
  - Trench F – 6 cells



# Snow Canyon 2016



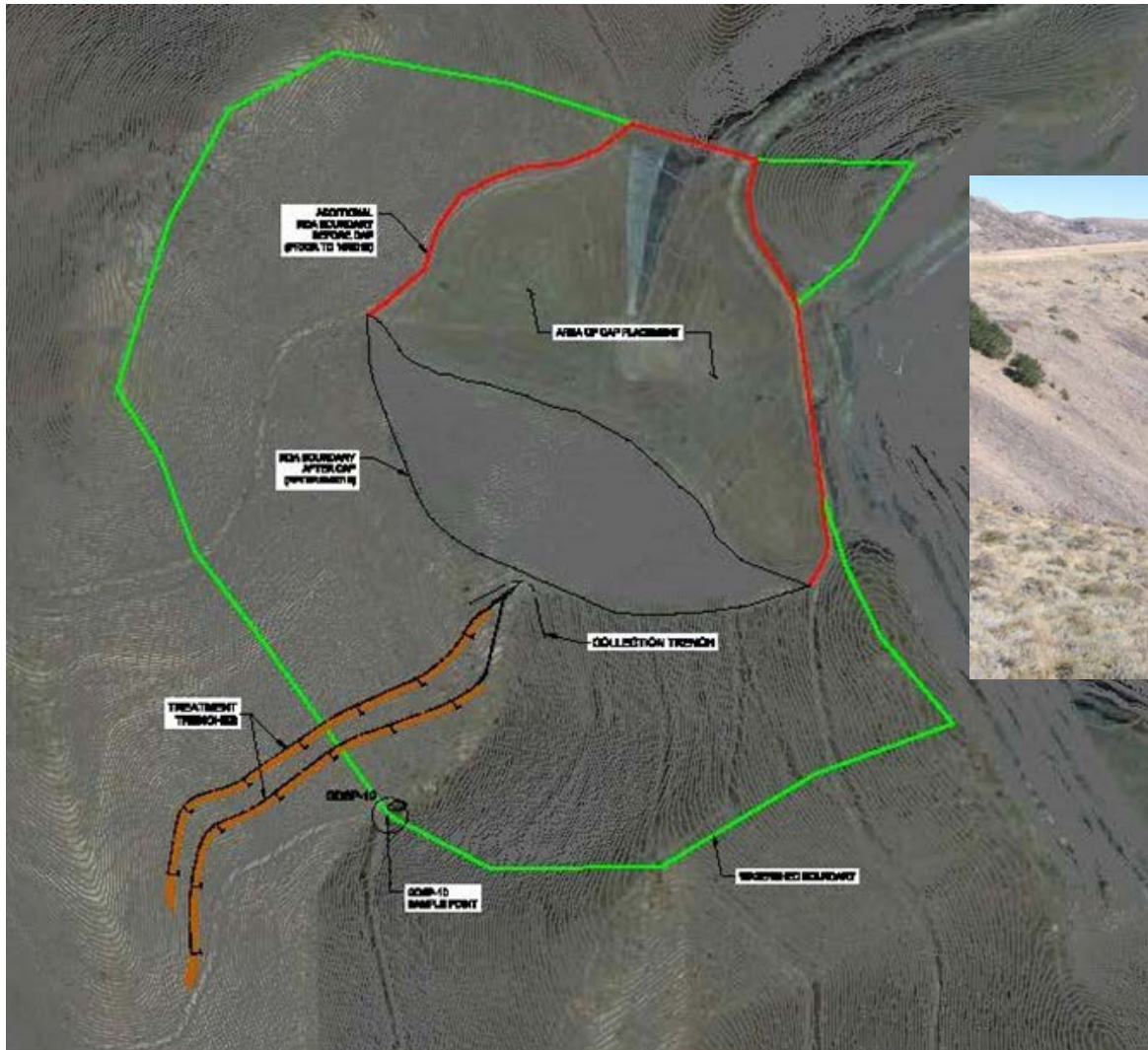
Treatment trench  
full of water



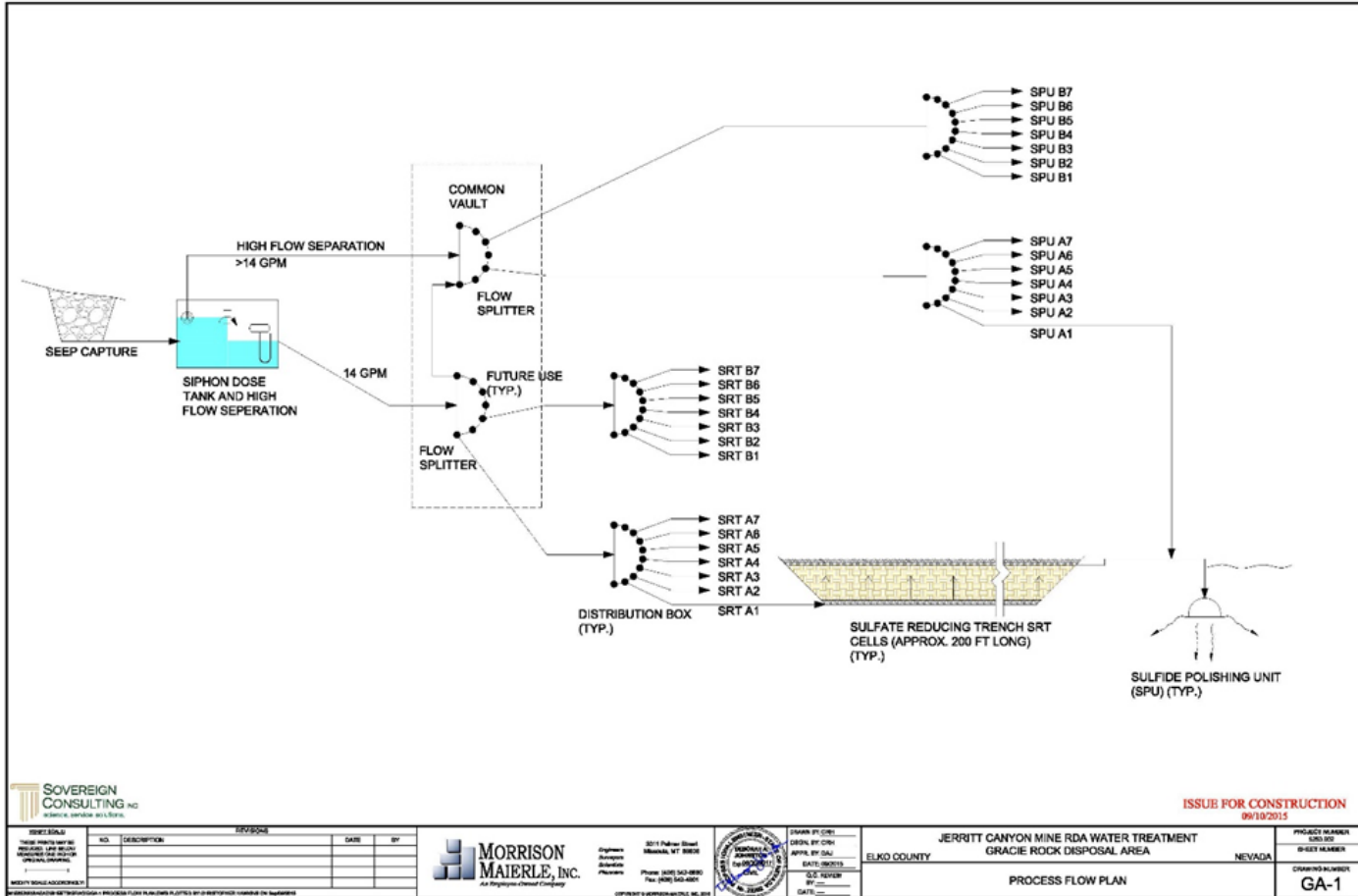
Flow from the  
toe collection



# Gracie RDA



# Gracie RDA

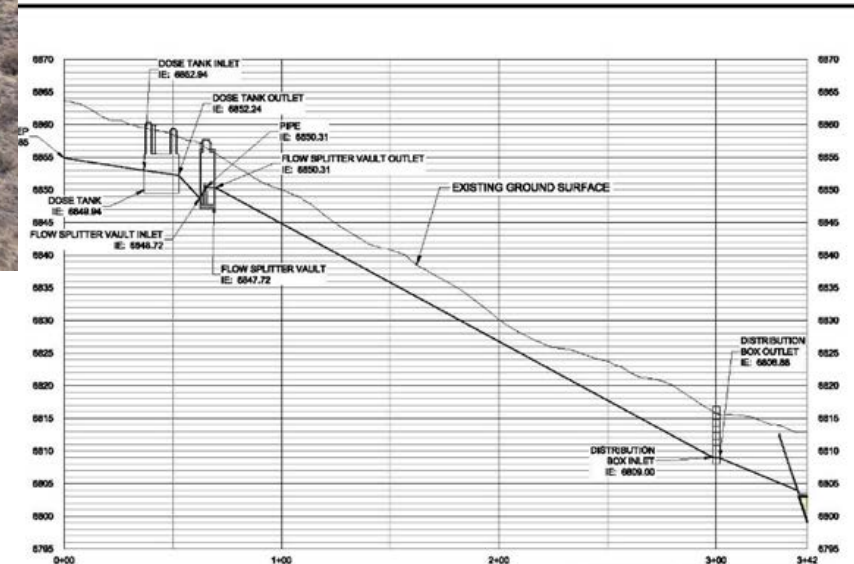
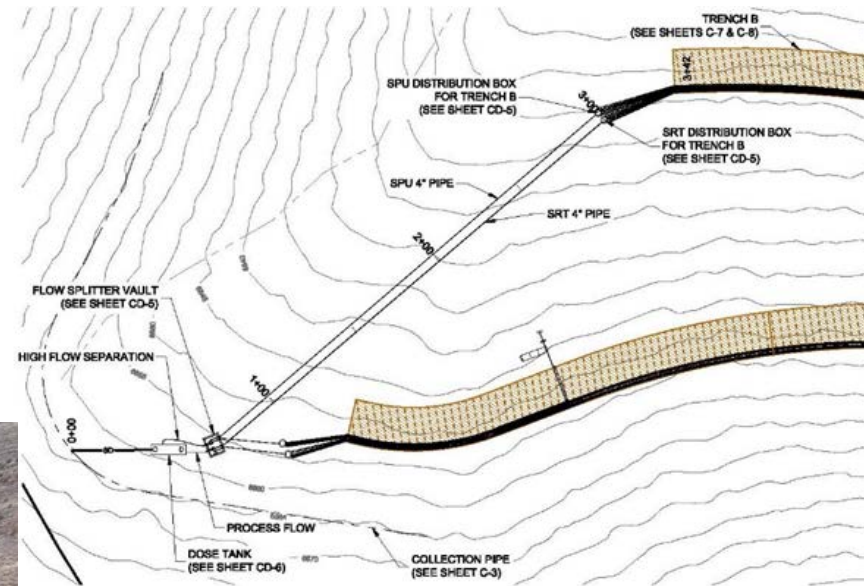


- Removal rate (design): 0.9 mol/m<sup>3</sup>/day
- Flow rate 14 gpm w/ 8,550 mg/L sulfate

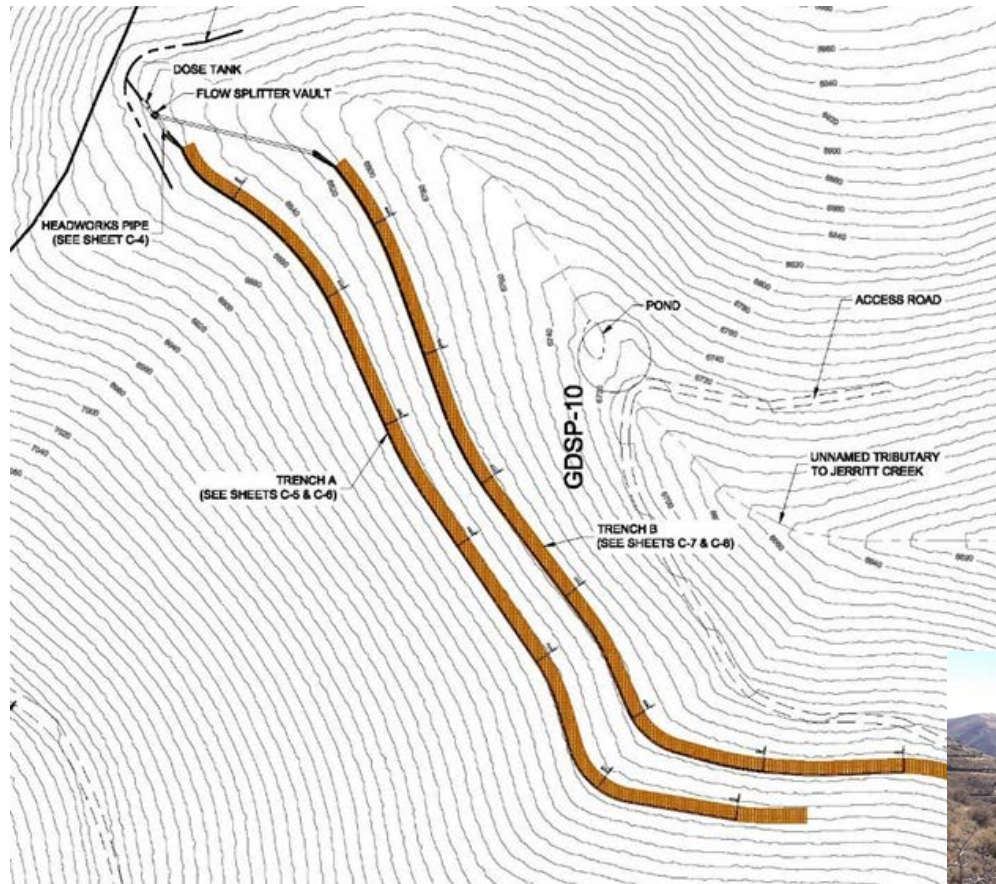


# Gracie RDA

- Syphon dosing tank
- Flow splitter for baseline and peak flows
- 360-foot collection trench



# Gracie RDA Trenches



- Media Volume = 8,150 yd<sup>3</sup>
- Footprint Area = 37,000 ft<sup>2</sup>
- Total Trench Length = 2,800 ft
  - Trench A – 7 cells
  - Trench B – 7 cells





# Gracie RDA Trenches 2016







# Questions?

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