

Technical Advisory Committee Meeting  
2015 RI/FS Summary  
Leviathan Mine Site, Alpine County, California

January 28, 2016



# Presentation Outline

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- ▶ Overview of Study Areas
- ▶ 2015 RI/FS On-Going Monitoring Activities
- ▶ 2015 RI/FS Investigation Activities
- ▶ RI Data Collection Status
- ▶ 2016 RI/FS Activities

# Study Areas

## On-Property:

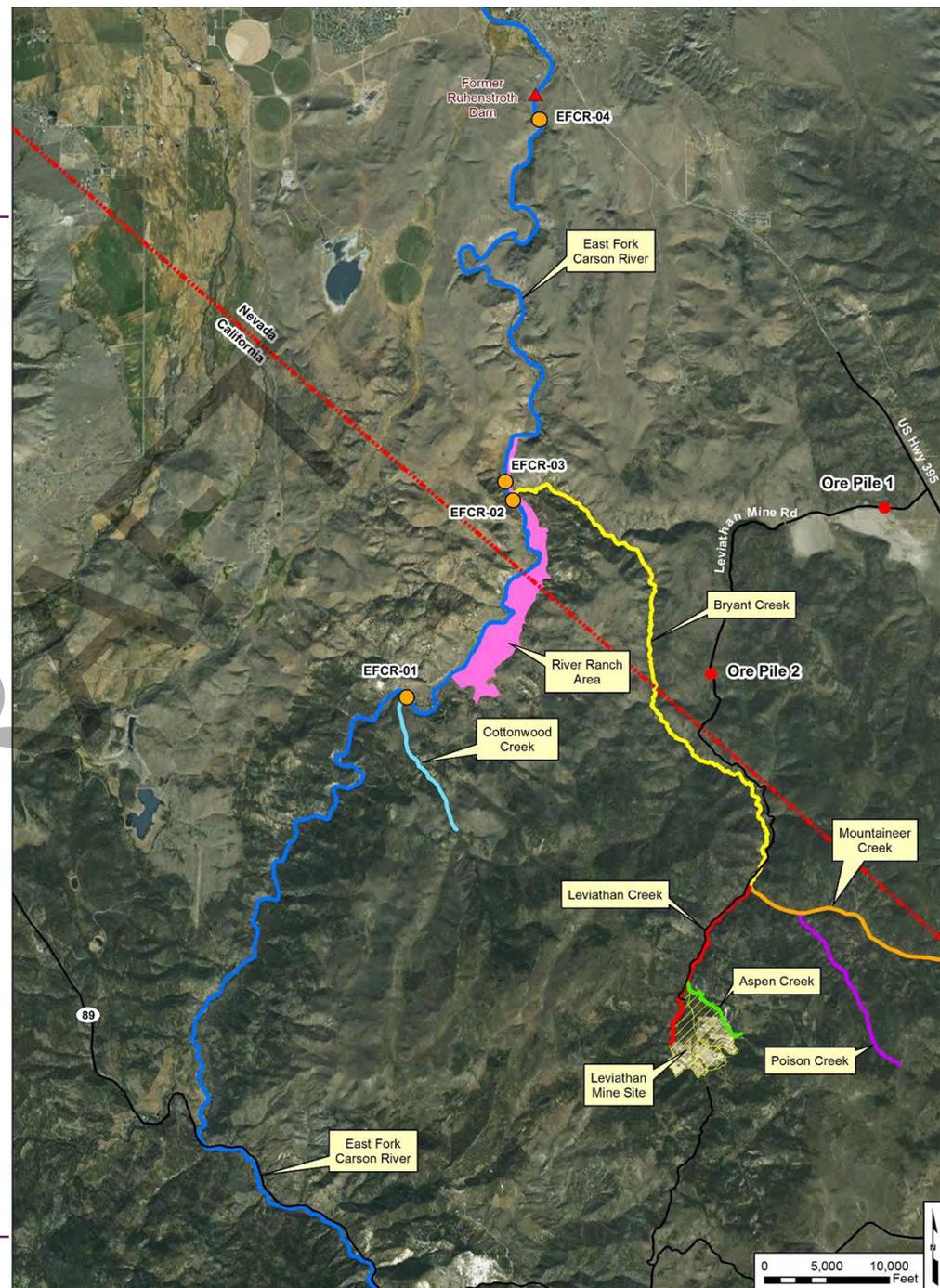
- ▶ Leviathan Creek Study Area
- ▶ Pit Study Area
- ▶ Aspen Creek Study Area

## Off-Property:

- ▶ Downstream Study Area
- ▶ Supplemental Study Areas
  - ▶ River Ranch
  - ▶ Suspected Ore Piles
  - ▶ East Fork Carson River
  - ▶ Leviathan Mine Road

## Reference:

- ▶ Reference Area
  - ▶ On-Property and Off-Property locations
  - ▶ Cottonwood, Mountaineer, Poison Creeks
  - ▶ River Ranch



# 2015 RI/FS On-Going Monitoring Activities

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**Groundwater Monitoring**

**Surface Water Monitoring**

**AD Discharge Monitoring**

**Meteorological Station and  
Evaporation Pan Monitoring &  
Maintenance**

**Storm Water, Base Flow, and  
Snowmelt Runoff Monitoring &  
Maintenance**

**Upper Tributary Weirs, Piezometers  
and Drive-Point Piezometers**

**CUD and Aspen Seep Flow Station  
Data Collection & Maintenance**



# 2015 RI/FS Investigation Activities

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## Monitoring Well Installation

## Beaver Dam/Pond Complex Investigation (Amendment No. 10)

- ▶ Construction/Access Improvements
- ▶ Sediment and Floodplain Sampling

## Aspen Creek Storm Water Station Installation

## Floodplain Mapping

## Floodplain Soil Investigation

## Stream Sediment Investigation

## Plant and Habitat-Related Soil Investigation

## River Ranch Soil Investigation



# 2015 Monitoring Well Installation

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## Drilling and Sampling:

- ▶ Sonic drilling methods
- ▶ Continuously cored and lithologically logged soil/rock
- ▶ Monitored for presence of water-bearing zones
- ▶ Grab groundwater samples collected from discrete water-bearing zones

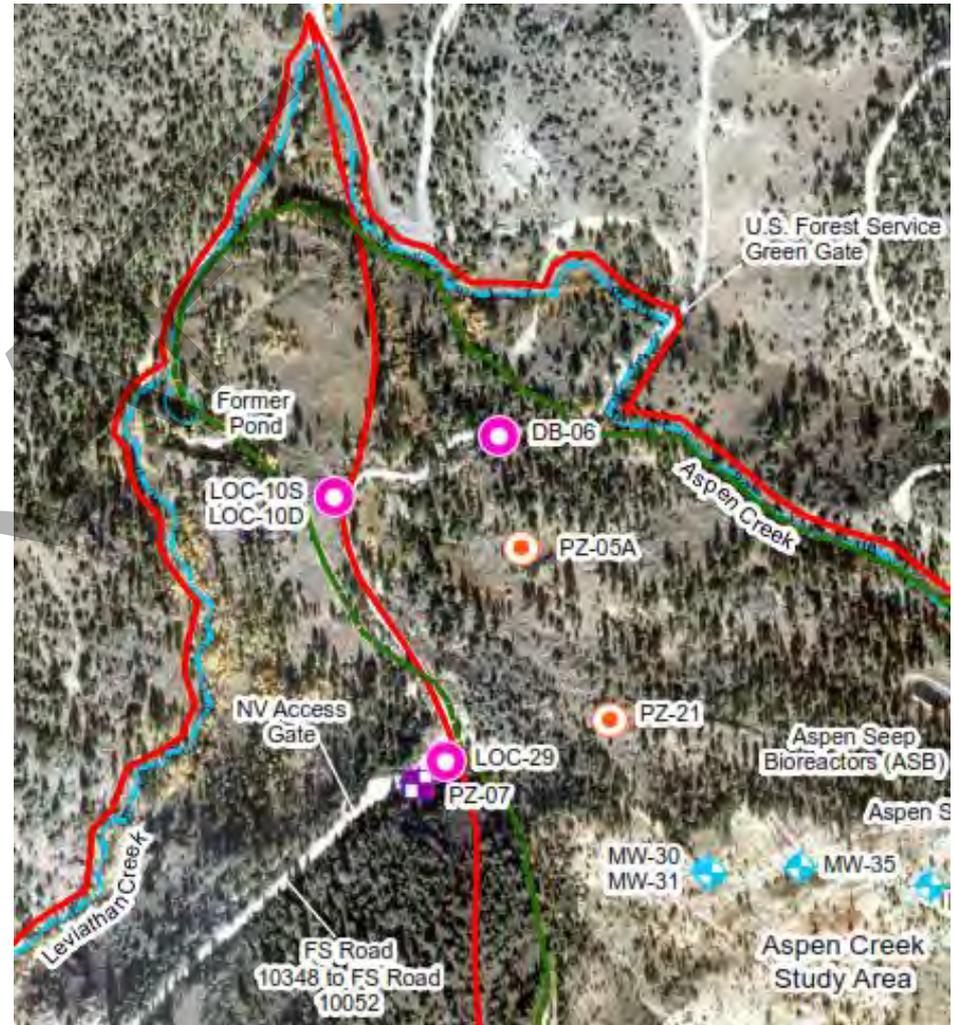


# 2015 On-Property Monitoring Well Installation (continued)

## Locations:

### ► Four monitoring wells installed:

- MW-41 (LOC-29)
  - Borehole = 141 ft bgs
  - Well = 110 ft bgs
  - Screen = 20 feet
- MW-42 (LOC-10D)
  - Borehole = 182 ft bgs
  - Well = 170 ft bgs
  - Screen = 15 feet
- MW-43 (LOC-10S)
  - Borehole = 76 ft bgs
  - Well = 74 ft bgs
  - Screen = 15 feet
- MW-44 (DB-06)
  - Borehole = 150 ft bgs
  - Well = 141 ft bgs
  - Screen = 10 feet



# 2015 Reference Study Area Drilling Activities

## Locations:

- ▶ Two boreholes started but not completed because of weather:
  - ▶ LOC-35 – 95 ft of 230 ft planned
  - ▶ LOC-36 – 121 ft of 140 ft planned

## Status:

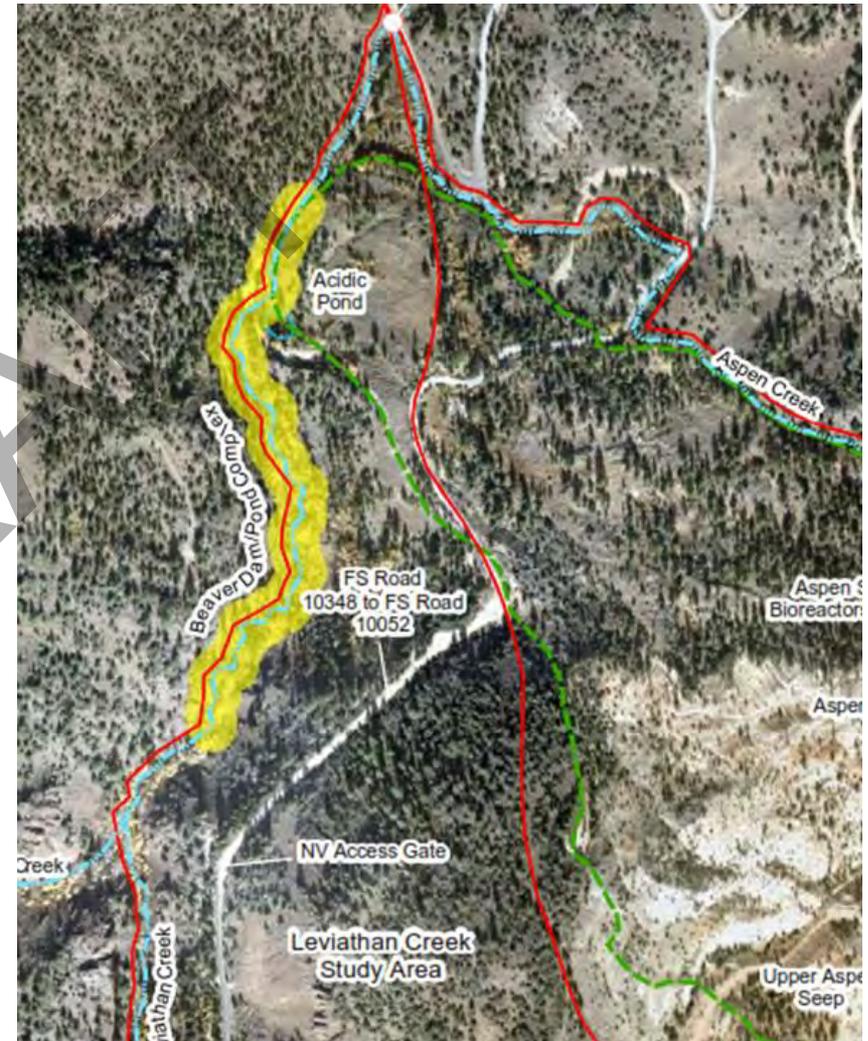
- ▶ Boreholes temporarily backfilled with bentonite
- ▶ To be drilled out and completed in 2016



# 2015 Beaver Dam/Pond Complex Investigation

## Objectives:

- ▶ Evaluate deposited material as source of low pH water in Leviathan Creek
- ▶ Estimate volume of post-mining depositional material
- ▶ Characterize precipitate in beaver ponds
- ▶ Characterize mud in select beaver dams
- ▶ Characterize upper 2 to 3 cm of stream sediment (risk assessment)
- ▶ Characterize upper 2 feet of floodplain (risk assessment)
- ▶ Characterize floodplain soil deeper than 2 feet (source of low pH and metals)



# 2015 Beaver Dam/Pond Complex Investigation (continued)

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## Construction/Preparation:

- ▶ Temporary access road for equipment and personnel access
- ▶ Water Management
  - ▶ Temporary diversion structure
  - ▶ Piping and dewatering pumps
- ▶ Geophysical Survey

## Water quality characterization:

- ▶ Baseline surface water samples for laboratory analysis collected downstream of BD/PC at SW-16 and SW-50
- ▶ Baseline pH established at 9 locations
- ▶ Monitored pH throughout the BD/PC while water was pumped from or diverted around beaver ponds

# 2015 Beaver Dam/Pond Complex Investigation (continued)

## Locations:

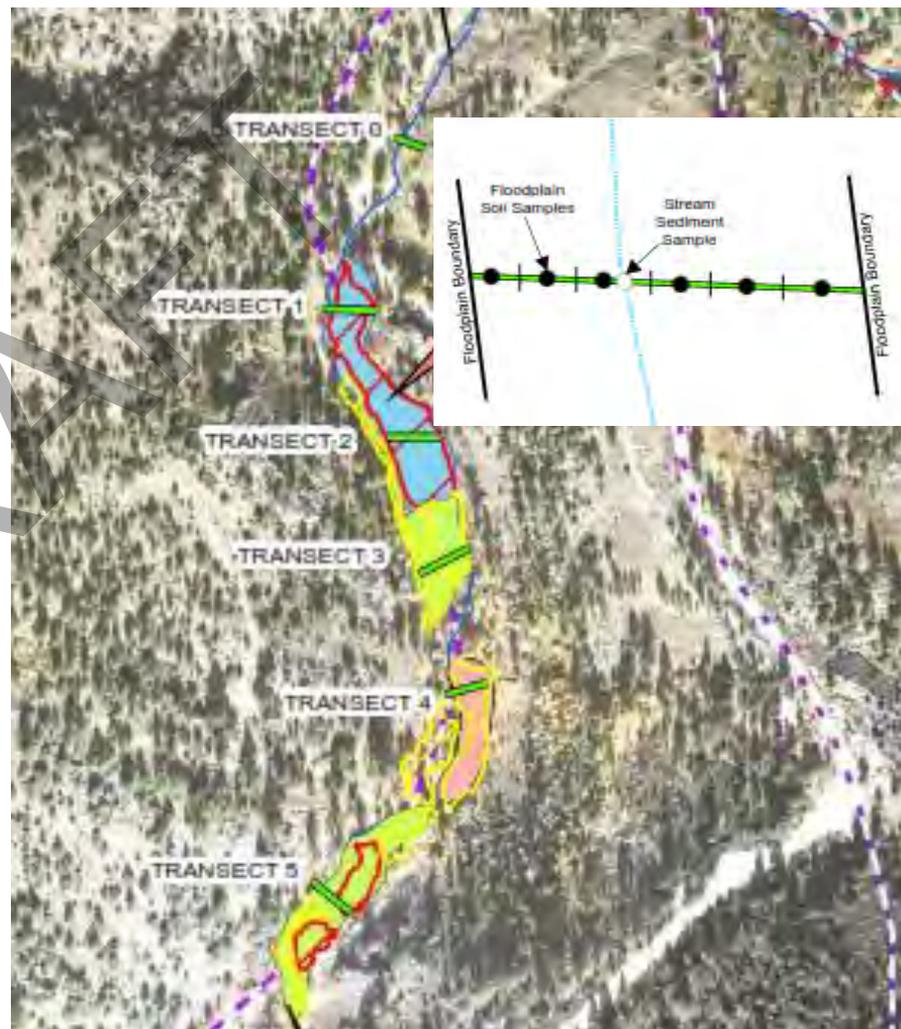
- ▶ Six transects identified
- ▶ Six floodplain soil sampling locations along each transect
- ▶ One chemical precipitate and stream sediment sampling location along each transect

## Sampling and Analysis:

- ▶ Sampling along Transect 1 – 4 completed (except deeper samples along Transect 4)
  - ▶ 88 primary floodplain samples collected depths ranging from 0 to 14.5 feet bgs
  - ▶ Four primary sediment samples collected from 0 to 2 cm bgs
  - ▶ Four precipitate samples

## Sampling Status:

- ▶ To be completed in 2016



# 2015 Beaver Dam/Pond Complex Investigation

## Dam Mud Characterization Sampling

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### Phase 1:

- ▶ Mud in three dams
- ▶ Precipitate in five ponds

### Phase 2:

- ▶ More extensive sampling of mud in three dams

### Phase 1 and 2 Analysis

- ▶ Waste classification
- ▶ Non-hazardous

### Sampling Status:

- ▶ Complete



# 2015 Aspen Creek Storm Water Station Installation



## Locations:

- ▶ ST-07 – Aspen Creek upstream of the mine
- ▶ ST-08 – Aspen Creek adjacent to Aspen Seep

## Installed:

- ▶ Sampler enclosure
- ▶ V-notched weir
- ▶ Automatic sampler, water quality probes, and velocity/area sensor

## Sampling Status:

- ▶ On-going monitoring



# 2015 Floodplain Mapping and Soil Sampling

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## Mapping Locations:

- ▶ Downstream Study Area
- ▶ Reference Study Area
  - ▶ Mountaineer Creek (Upper and Lower)
  - ▶ Cottonwood Creek

## Detailed Mapping:

- ▶ 34 test pits
- ▶ Log soils using USDA Soil Classification System 0 to 2 ft bgs
- ▶ Results used to identify target floodplain sampling locations in the DSA to be sampled in 2016\*

- ▶ \* proposed sampling plan submitted January 8, 2016

## Sampling Locations:

- ▶ On-Property
  - ▶ 24 locations (Aspen and Leviathan Creeks)
- ▶ Reference Study Area
  - ▶ 18 locations on Mountaineer Creek (Upper and Lower)

## Sampling and Analysis:

- ▶ Soil collected from 0 to 0.5 ft bgs and 1.5 to 2.0 ft bgs
- ▶ Analyzed for RI/FS metals, soil pH, TOC, and grain size
- ▶ 53 primary samples collected On-Property
- ▶ 36 primary samples collected on Mountaineer Creek

## Sampling Status:

- ▶ On-property area complete
- ▶ Cottonwood Creek to be completed in 2016
- ▶ DSA to be completed in 2016

# 2015 Stream Sediment Investigation - Sampling

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## Locations:

### On-Property

- ▶ 36 locations
- ▶ Reference Study Area
  - ▶ 23 locations along Mountaineer Creek
  - ▶ 27 locations along Cottonwood Creek

## Sampling and Analysis:

- ▶ Document current channel type
- ▶ Sediment samples collected from upper 2 – 3 cm
- ▶ Analyzed for RI/FS metals, TOC, and grain size

## Sampling Status:

- ▶ Complete



# 2015 Plant and Habitat-Related Soil Investigation

## Locations:

- ▶ On-Property
  - ▶ 20 locations
- ▶ Downstream Study Area
  - ▶ 20 locations
- ▶ Reference Study Area
  - ▶ 24 locations

## Plant Sampling and Analysis:

- ▶ Target plant tissue (stems, seed, leaves, fruit, etc.) analyzed for RI/FS metals
- ▶ 64 plant tissue samples collected

## Habitat-Related Soil Sampling and Analysis:

- ▶ Collocated soil samples collected from 0 -0.5 ft bgs and 1.5 – 2.0 ft bgs analyzed for RI/FS metals, TOC, soil pH, and grain size
- ▶ 97 habitat-related soil samples collected  
(note refusal encountered at some locations and deeper soil sample could not be obtained)

## Sampling Status:

- ▶ Completion expected in 2016 for locations not pending NHPA process



# 2015 River Ranch Soil Investigation

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## Locations:

- ▶ Spatially distributed samples
  - ▶ 28 locations
- ▶ Transects
  - ▶ 1 transect – 3 sample locations

## Sampling and Analysis:

- ▶ Depth
  - ▶ 0-0.5, 0.5-1.5, 1.0-1.5, 1.5-2.0 ft bgs
- ▶ Submitted to laboratory for analysis
  - ▶ 0-0.5 & 1.5-2.0 ft bgs all locations
  - ▶ 0.5-1.0 & 1.0-1.5 ft bgs select locations
- ▶ Analysis
  - ▶ RI/FS metals, soil pH, TOC, soil conductivity, cations

## Sampling Status:

- ▶ Completion expected in 2016 for locations not pending NHPA process



# Approximate RI Sample Counts (includes QA/QC Samples)

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## Collected in 2015

- ▶ Groundwater = 105
- ▶ Surface Water and Source = 66
- ▶ Stream Sediment = 116
- ▶ Floodplain Soil (laboratory) = 226
- ▶ Floodplain Soil (XRF) = 49
- ▶ Plants = 77
- ▶ Plant-related Soil = 125
- ▶ Storm Water, Baseflow, Snowmelt = 59
- ▶ River Ranch Soil = 99
- ▶ TOTAL = 951

## Collected 2010 - 2015

- ▶ Groundwater = 582
- ▶ Mine Waste (laboratory) = 506
- ▶ Mine Waste (XRF) = 650
- ▶ Surface Water & Source = 1,062
- ▶ Stream Sediment = 275
- ▶ Floodplain Soil (laboratory) = 255
- ▶ Floodplain Soil (XRF) = 49
- ▶ Plants = 77
- ▶ Plant-related Soil = 125
- ▶ Fish = 32
- ▶ Storm Water, Baseflow, Snowmelt = 209
- ▶ River Ranch Soil = 99
- ▶ Ore Pile Soil = 14
- ▶ TOTAL = 3,935

# FRI Data Collection Status

Study Area		Data Collection Activity															
		Mapping/Field Verification	Drilling/Well Installation	Groundwater Monitoring	Mine Waste Soil Sampling	Floodplain Soil Sampling	Soil Sampling	Stream Sediment Sampling	Meteorological Monitoring	Surface Water Monitoring	Source Monitoring	Acidic Pond Characterization	Upper Tributary Characterization	Storm Water and Snowmelt Monitoring	Plant/Soil Sampling	Sediment Quality Triad	Fish Surveys and Sampling
<b>On-Property Study Area</b>		X	Q3 2016	Q2 2018*	X	Q3 2016	Q2 2016	Q3 2016	X	X	X	Q2 2016	Q2 2016	Q3 2017*	Q4 2017**	X	Q3 2016
<b>Off-Property Study Area</b>	Downstream Study Area	X				Q3 2016		X							Q4 2017**	X	Q3 2016
	River Ranch	X					Q2 2017**										
	East Fork Carson River	Q2 2016					Q3 2017**			X						X	
	Ore Piles	X					Q2 2017**										
	Leviathan Mine Road	X					Q3 2016										
<b>Reference Study Area</b>		X	Q3 2016	Q2 2018*		Q2 2016	Q2 2017**	X			Q4 2016			Q3 2017*	Q4 2017**	Q3 2016	Q3 2016

1. Estimated completion dates subject to change based actual field implementation time, weather conditions, and contractor availability.

- X** = Task complete (for select activities assumes 2 years monitoring sufficient)
- Green** = Task in progress (for select activities assumes 2 years monitoring needed per work plan)
- Yellow** = Task not started
- Q1** = Quarter in which field work estimated to be completed
- \*** = Based on 2 years monitoring per work plan
- \*\*** = For select locations subject to NHPA process

# Feasibility Study Activities

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Investigation/Study	Field Data Collection	Treatability Study	On-Going Monitoring
Geotechnical Investigation	Q2 2017*		Q3 2018
Revegetation Treatability Study	Q4 2016	Q4 2016	Q3 2018

Estimated completion dates subject to change based on actual field implementation time, weather conditions, and contractor availability.

- = Task complete
- = Task in progress
- = Task not started

- Q1 = Quarter field work estimated to be complete
- \* = For select locations subject to NHPA process

# 2016 Planned RI Field Activities

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## On-Property & DSA On-going Monitoring Programs

- ▶ Groundwater
- ▶ Upper Tributary Groundwater and Surface Water
- ▶ Meteorological Conditions
- ▶ Surface Water and Surface Water AD Discharge
- ▶ Storm Water and Snowmelt Runoff
- ▶ CUD and Aspen Flow Station

## On-Property Area

- ▶ Stream Sediment and Floodplain Soil in Beaver Dam/Pond Complex
- ▶ Acidic Pond Investigation
- ▶ Hydrocarbon Investigation

## Off-Property Area

- ▶ Supplemental Surface Water – Bryant Creek
- ▶ Floodplain Soil

## Reference Area

- ▶ Benthic Invertebrates – Cottonwood Creek
- ▶ Floodplain Soil – Cottonwood Creek
- ▶ Terrestrial and Ore Pile Soil\*
- ▶ Surface Water

## Multiple Areas

- ▶ Drilling and Well Installation, Development, Hydraulic Testing\*
- ▶ Plant/Soil Sampling\*
- ▶ Fish Surveys and Sampling

## Supplemental Study Areas

- ▶ River Ranch\*
- ▶ East Fork Carson River\*
- ▶ Ore Piles\*
- ▶ Leviathan Mine Road

\*2017 completion for areas subject to NHPA process

# 2016 Planned FS Field Activities

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- ▶ Geotechnical Characterization
  - ▶ Field Implementation\*
  - ▶ Initial Monitoring
- ▶ Revegetation Treatability Study
  - ▶ Field Implementation
  - ▶ Initial Monitoring

\* 2016 completion except areas subject to NHPA process

# 2016 Risk Assessment Activities

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## Human Health Risk Assessment

- ▶ Response to comments and revision of work plan
- ▶ Evaluate data sets for use in risk assessment (as appropriate)
- ▶ Process will be a combination of screen risk assessment in technical memorandums followed by baseline risk assessment

## Ecological Risk Assessment

- ▶ Evaluate data sets for use in risk assessment (as appropriate)
- ▶ Process will be a combination of screen risk assessment in technical memorandums followed by baseline risk assessment