Notice of Intention

To Begin a Large Mining Operation

RioTinto

Kennecott Utah Copper LLC

Bonneville Borrow Site

DOGM NO. M/035/0046

Submitted By:

Kennecott Utah Copper

4700 Daybreak Parkway

South Jordan, Utah 84095

To:

Utah Division of Oil, Gas and Mining

1594 West North Temple, Suite 1210

Salt Lake City, Utah 84114-5801

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Kennecott Utah Copper LLC – Bonneville Borrow Area - NOI

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R647-4. Large Mining Operations

R647-4-101. Filing Requirements and Review Procedures

This Notice of Intention (NOI) is submitted to the Utah Division of Oil, Gas and Mining (DOGM) in compliance with part R647-4 of the Utah Minerals Reclamation program by Kennecott Utah Copper.

The proposed quarrying operation is located in unincorporated Salt Lake County, Utah, west of Magna Township, on a 300-acre parcel owned by Kennecott Utah Copper LLC (KUC). Portions of the proposed quarry are located in Section 31 of T1S, R2W and Sections 25 and 36 of T1S, R3W, SLBM.

R647-4-102. Duration of the Notice of Intention

Kennecott understands that, when approved, this NOI, including any subsequently approved amendment or revision, remains in effect for the life of the mine, but that DOGM may review the permit and require updated information and modifications when necessary. Kennecott estimates that the borrow operations will continue until approximately 2028.

R647-4-103. Notice of Intention to begin Large Mining Operations

Kennecott Utah Copper's NOI addresses the requirements of the rules listed in this section as follows:

104. Operator(s), Surface and Mineral Owner(s)
105. Maps, Drawings, and Photographs
106. Operation Plan
108. Hole Plugging Requirements
109. Impact Assessment
110. Reclamation Plan
112. Variance
113. Surety

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R647-4-104. Operator, Surface and Mineral Owners

1. Mine Name: Bonneville Borrow Area
2. Operator: Kennecott Utah Copper LLC
   Kelly D. Sanders
   4700 Daybreak Parkway
   South Jordan, UT 84095
   Phone: 801-204-2000
   Fax: 801-204-2885
   Email: sander@kennecott.com

   Type of Business: Limited Liability Company
   Utah Business Entity No.: 1036481-0160
   Local Business License No.: NA
   Issued by: Salt Lake County

   Registered Utah Agent: Chris Kaiser
   4700 Daybreak Parkway
   South Jordan, UT 84095
   Phone: 801-204-2128
   Fax:
   Email: Chris.Kaiser@riotinto.com

3. Permanent Address: Kennecott Utah Copper LLC
   4700 Daybreak Parkway
   South Jordan, UT 84095
   Phone: 801-204-2000
   Fax:
   Email:

4. Contact Person for Permitting, Surety, Notices:
   Glenn Eurick
   4700 Daybreak Parkway
   South Jordan, UT 84095
   Phone: 801-204-2113
   Fax: 801-204-2888
   Email: Glenn.Eurick@riotinto.com

5. Location of Operation: Portions of Section 31, T1S, R2W, SLBM and Portions of Sections 25 and 36, T1S, R3W, SLBM

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6. Ownership of Land Surface: Kennecott Utah Copper LLC
4700 Daybreak Parkway
South Jordan, UT 84095
Phone: 801-204-2000
Fax:
Email:

7. Owners of Record of Mineral to be Mined:
Kennecott Utah Copper LLC
4700 Daybreak Parkway
South Jordan, UT 84095
Phone: 801-204-2000
Fax:
Email:

8. BLM Lease of Project File Numbers: None

9. Adjacent Land Owners: Kennecott

10. Have the land, mineral, and adjacent owners been notified in writing?
Not applicable

11. Does Permittee/Operator have a legal right to enter and conduct mining operations on the land covered by this notice?
Yes, Kennecott owns the surface and minerals in the proposed borrow area, and the parcel is accessed through the Kennecott entrance on 9180 West off State Route-201 on the west side of Magna, Utah.

R647-4-105. Maps, Drawings, and Photographs

Maps, drawings, and photographs are provided as requested.

105.1. Base Maps: Figures 1 and 2

Figure 1: Base and Mine Location Map shows the mine area and surroundings and is printed at a scale of 1"=1,000'. It shows streams, springs, water bodies, roads, buildings, topography and utilities as required in (b). There are no known underground workings on the site.

Figure 2: Land Ownership Map is printed at a scale of 1"=1,000' and shows the property boundaries, surface ownership of the mine and adjacent lands, and access routes.

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105.2. Surface Facilities Maps: Figures 3 and 4

Figure 3: Existing Surface Facilities and Contours Map is printed at a scale 1"=1,000' and shows existing surface facilities, roads and washes that pass through or near the lands to be affected.

Figure 4a: Mine Plan Map, Interim Excavation Phase 1 Borrow is printed at a scale of 1"=700'

Figure 4b: Mine Plan Map, End Phase 1 Borrow is printed at a scale of 1"=700'

Figure 4c: Mine Plan Map, End Phase 2 Borrow is printed at a scale of 1"=700'

Figure 4d: Crusher and Stockpile Detail is a sample crusher layout and stockpile map.

Figure 4e: Crushing and Screening Plant, Ballast and Sub-ballast Production is a flow diagram.

Figure 4f: Crushing and Screening Plant, Filter Material Production is a flow diagram.

Figure 4g: Crushing and Screening Plant, Roadbase Material Production is a flow diagram.

105.3. Reclamation Treatments: Figures 5

Figure 5: Reclamation Treatments map is printed at a scale 1"=700' and shows details about reclamation treatment areas, including what disturbance, such as highwall, topsoil stockpiles and roads, will be reclaimed. A border outlining the extent of the area to be reclaimed vs. the affected area is shown. Salvaged overburden will be used to slope the highwalls during the reclamation process so that no quarry faces will be left exposed when reclamation is complete.

Figure 5a: Interim Reclamation Plan is printed at a scale 1"=700' and shows details about interim reclamation between Phase 1 and Phase 2.

Figure 5b and 5c: Erosion Control Best Management Practices depicts many of the best management practices (BMP) to be employed as part of a comprehensive erosion control effort within the limits of the mine property.

105.4. Additional Maps:

Figure 6: shows cross-sections of the reclaimed pit.

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Figure 6a: shows cross-sections of the reclaimed pit.

Figure 7: is a Utah Division of Water Rights map printed at a scale of 1"=1,000' showing area water rights.

Figure 7a: is a Water Shed map printed at a scale of 1"=2,000' showing the principle watershed areas.

Figure 8: is a soils map printed at a scale of 1"=1,000' showing existing soil types.

Figure 9: is a Geology map printed at a scale of 1"=1,000' showing the underlying geology of the mine.

105.5. Photographs of the existing vegetation and topography are included in Appendix A.

R647-4-106: Operation Plan

106.1. Mineral to be Mined

The Bonneville Borrow Area will produce pit run and crushed and/or screened aggregate for construction. This will include material obtained from blasting and ripping operations in bedrock-type quartzite deposits.

106.2. Type of Operation to be conducted

The Bonneville Borrow Area will be used for providing earth construction materials for various Kennecott projects, primarily for construction of engineered structures adjacent to the existing tailings impoundment, and for the Tailings Expansion Project (TEP). The borrow area is further identified into three sub-areas: quartzite borrow area, alluvial borrow areas, and railroad embankment borrow area. Kennecott Utah Copper will primarily extract rock for the construction needs of the railroad relocation, stability berms, drainage blanket, road base materials, bridging, riprap, structural fill and other miscellaneous requirements for the TEP. The material will be mined from three zones or areas within the project footprint, i.e., the quartzite borrow area, and the alluvial borrow area, and the railroad embankment borrow area. Mining will take place in two phases, each of which will

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extract material from the quartzite and alluvial borrow areas, while the railroad embankment borrow area will only be active in the second phase.

The total amount of material to be produced from the quartzite borrow area during Phase 1 is 1.57 million cubic yards, and includes about 1.3 million cubic yards for the drainage blanket, about 0.15 million cubic yards for road base, and about 0.08 million cubic yards for railroad ballast and sub-ballast materials.

During Phase 1, about 2.15 million cubic yards of material will be produced from the alluvial borrow area. The majority, 1.66 million cubic yards, will be used as bridging material within the tailings construction area as foundation material primarily for haulage routes. About 0.48 million cubic yards will be required as embankment fill for the railroad relocation and 7200 West road modification. Riprap will be produced from the alluvial borrow area through sorting during excavation.

Only Phase 1 construction materials will be excavated during Phase 1, however the quarry areas are designed to accommodate Phase 2 quantities, allow for interim reclamation of the quarry areas as well as providing access for Phase 2 development. As part of Phase 2 about 3.6 million cubic yards of random fill will come from the existing railroad embankment and the alluvial terrace for construction of engineered structures. Some of the alluvium from the terrace will be processed to produce about 0.2 million cubic yards of rip rap. The location of the mine is shown in **Figure 1**.

Mining Operation

Kennecott will remove the rock from the active mine area by drilling, blasting and/or dozer methods. The equipment used for mining includes, but is not limited to: haul trucks, loaders, scrapers, dozers, drill rig and water trucks. The Bonneville Borrow Area consists of three areas. These include the quartzite borrow, the alluvial borrow, and the existing railroad embankment borrow area. A portable crusher and screen plant will operate next to the quartzite and alluvial borrow areas. The Bonneville Borrow Area will be developed in two phases (**Figure 4a-4e**) with an interim closure between Phase 1 and Phase 2.

The approximate location and layout of these parts of the Bonneville Borrow Area are shown on **Figure 4a**. The quartzite borrow is located within a bedrock ridge at the south end of the site. The alluvial borrow area will extend the existing borrow site, located at the west side of the site, into the materials filling the bottom of the valley further west and north. An existing railroad embankment fill located at the western margin of the alluvial borrow site will also be removed to provide random fill during Phase 2 construction.

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The quartzite material will be removed by drilling, blasting and ripping. Mining will remove approximately 50 vertical feet of previously mined material from the top of the eastern side of the rail cut. At that depth, the dolomite appears to be resistant to ripping and will therefore be left in place to act as a visual barrier from Magna. Mining will continue south of the dolomite contact in the quartzite. The south face on the east side of the rail cut will be mined at a 1:1 (H:V) slope to maximize the quartzite recovery. The remaining talus material on the northern most face east of the rail cut will be removed by backhoe and or dozing the material down the face to the west.

As the east side of the existing rail cut is being mined, the western side of the rail cut will be developed. The north facing slope will be mined at a 2.5:1 (H:V) slope and material will be hauled to the crushing plant. Mining on the western side of the cut will continue in conjunction with the eastern side. Phase 1 mining will end at elevation 5070 feet. Phase 2 mining will lower the floor to the 5020 feet elevation (the original rail cut floor).

The alluvial material will be removed by excavation and loading. Mining will initially proceed directly south at approximate elevation 4800 feet from an existing alluvial borrow. As mining reaches the final limits of the designed excavation the slopes will be cut at 2.5:1 (H:V) slopes. The floor will be sloped to the southwest as a storm water control feature. The alluvium shallows to the south, therefore mining in this area will be limited to approximately 250 feet in width and a maximum depth of 50 feet. Mining will continue to the west and north, in 25 foot increments from the surface, leaving a road along the south edge for access to the railroad embankment, which will be removed during Phase 2. Groundwater is approximately 220 feet below the alluvial borrow area, and quarry operations will virtually have no effect on the groundwater flows in the area. Groundwater is further discussed in Section 106.8 below.

The railroad embankment material will be removed by ripping and loading during Phase 2. The embankment borrow area design consists of removing materials forming the embankment and returning the area to as near to pre-embankment topography as possible. The gently sloping topography upstream and downstream of the embankment would be uninterrupted after excavation and removal of the embankment. A road constructed along the south edge of the alluvial borrow area during Phase 1 excavation will be used to access the toe of the railroad embankment. An all cut road will be constructed from south to north through the embankment materials to allow excavation by benching.

The portable crusher and screen plant is located within the alluvial borrow areas, immediately below the quartzite borrow in order to minimize the total disturbance and the haulage distance to the plant from the quartzite borrow. The location of the plant takes advantage of the existing terrain and is sited to reduce the plant's visibility from the town of Magna. The initial material requirements during construction can be

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developed from the alluvium borrow, allowing early borrow works to develop the site for the crushing/screening plant. The haulage from the borrow area to the tailings construction area will utilize existing paved roads where practical in order to reduce dust emissions. Haul truck traffic crossing the tailings delivery pipes will be limited to a single engineered crossing.

Crushing Operation

Once the rock is removed from the working face (see **Figure 4a**), the material is brought to a crushing and screening plant located in the alluvial borrow area. Boulders will be blasted in place, fines from crushing will be disposed of off the borrow site into the adjacent tailings pipeline. Refer to **Figure 4f** for a conceptual crushing and screening plant layout. The crushing and screening plant is designed for a peak production rate of 700 tph of feed material. The average production feed rate will be roughly 525 tph (or 75% of peak rate). The crusher plant includes a primary/secondary crushing section, a tertiary crushing section, a quaternary crushing section, and a sand processing section. See **Figure 4e**, (for the flow diagram) for ballast and sub-ballast production, **Figure 4f** for filter material, and **Figure 4g** for Roadbed production diagram.

The plant design gives the flexibility to produce gravel and sand products simultaneously while allowing for adjustments in proportions and product specifications with splitter bins and screen deck opening adjustments. Sand products can also be adjusted with the controls of the sand classifier.

The finished product comes out of the crushing plant and is conveyed into the aggregate storage piles, where they are stored until needed for use. When the material is needed for the construction of the engineered structures and/or of the TEP the respective aggregate size will be loaded into 40-T articulated haul trucks and transferred to the construction location. All conveyors are equipped with spray bars that spray water at drop points. Water trucks will wet the haul roads between the stockpile area and the construction areas to minimize dust created from the loaders and the trucks. Dust control stormwater is further discussed in Section 109.4 and the Stormwater Pollution Prevention Plan (SWPPP), **Appendix E**, below.

Blasting Practices

Blasting will be used in the mining process at the Bonneville Borrow Area. Blasting will be conducted by KUC only during daylight hours. It is assumed the 25% of the quartzite material will need to be drilled and blasted. No drilling and blasting is anticipated in the alluvium borrow area or the railroad embankment.

Air type crawler type drills with 4 inch drill bits will be used for drilling. It is assumed the average monthly quartzite to be drilled is 21,000 cubic yards (cy) or 250,000 cy

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annually. Approximately 250 holes per month will be drilled for the required quartzite to be blasted. Typical blasting patterns are assumed to be10 feet by 10 feet square patterns, with a bench height of 20 feet. Each pattern produces approximately 89 cy of quartzite.

Typical blasting rounds are assumed to consist of packaged ANFO explosives and electronic blast-initiation system, however not exclusive, other blasting approaches will be used as needed.

Blasting protocols will follow Kennecott's and Rio Tinto safety standards, and will consist of but not limited to the following; before blasting occurs, a pre-blast warning siren will be used to alert and clear all personnel from the blasting zone. At that time all personnel and equipment will be removed from the quarry area. Access to the quarry will be blocked off by a person with radio communications to restrict access to the area. The siren is then sounded again with a countdown to detonation. Blast is then detonated. No one enters the blasting zone until the blaster has given the all clear. All blasting will be done in accordance with MSHA regulations.

Concurrent Reclamation

No reclamation will take place during Phase 1 or Phase 2, however there will be an interim reclamation done between phases. Increased production will force utilization of all additional mine-out acres for staging, sorting, or processing. Final reclamation will take place after Phase 2. Reclamation is further discussed in Section 110 below.

106.3. Estimated Acreage

Approximately 134 acres will be disturbed over the life of the Borrow Area. This figure includes all access road, storage piles, processing areas, mine areas and affected areas. Kennecott will confine its mining activities to approximately 118 acres during Phase 1.

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Table 1: Acres to be affected during Phase 1 and Phase 2

Area	Approximate Total Affected Acreage	Disturbance Description/Notes	Growth Medium Salvaged (K BCY)
Phase 1			
Existing Mine Disturbance	NA[1]	Pre-existing disturbance	NA[1]
Upper Alluvial Borrow	37	Material on the valley floor, elevation 5020-4880 MSL	362
Lower Alluvial Borrow	37	Material on the valley floor, elevation 4870-4790 MSL	362
Quartzite Borrow	29	Material on south end	14
Ramp from Quartzite Borrow	6	Material on south end	0
North Face East of Rail Cut	0	Material on south end	11
Haul Road	9		15
Phase 1 Subtotal	118		764
Phase 2			
Alluvial Borrow	14	Material on the valley floor, elevation 4870-4790 MSL	139
Quartzite Borrow	1	Material on south end	0
Phase 2 Subtotal	15		139
Total Disturbance – Life of Mine	133		903

[1] existing borrow area will be subject to full surety requirements
K BCY – 1,000 Bank Cubic Yards
MSL - Mean Sea Level

106.4. Nature of material, including waste rock/overburden, and estimated cubic yards

Borrow Material
The current plan is to produce almost 1.6 million cubic yards (MCY) from the quartzite borrow area for Phase 1 and about 0.8 MCY for Phase 2. The alluvial borrow area will produce about 2.2 MCY of materials for Phase 1 and about 2.9 MCY of materials for

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Phase 2. The railroad embankment borrow area is expected to yield about 1.0 MCY of random fill materials for Phase 2 (see **Table 2** for Summary of borrow material).

Table 2: Summary of Borrow Material

Borrow Area	Phase 1		Phase 2		Total Borrow (CY)
	Material Description	Volume (CY)	Material Description	Volume (CY)	
Quartzite Borrow Area	Fine Filter	774,000	Blanket Drain	800,000	
	Drain Rock	274,000			
	Coarse Filter	251,000			
	Railroad Ballast	50,000			
	Railroad Sub-ballast	48,000			
	Road Base	170,000			
Total	-	1,567,000	-	800,000	2,367,000
Alluvial Borrow Area[1]	Bridging Material	1,664,000	Rip Rap Bedding	100,000	
	Railroad and Highway Embankment Fill	478,000	Rip Rap	200,000	
	Rip Rap 6-inch	245	Engineered Structures	2,600,000	
	Rip Rap 12-inch	39	-	-	
	Structural Fill	11,600	-	-	
Total	-	2,154,000	-	2,900,000	5,054,000
Railroad Embankment Borrow Area	-	-	Engineered Structures (random fill)	1,000,000	
Total	-	-	-	1,000,000	1,000,000
Total Borrow	-	3,721,000	-	4,700,000	8,421,000

[1] South engineered structure included in Phase 1 for purposes of material quantity
CY – Cubic Yards

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Historic Mining and Disturbance Area Summary
This property has been previously disturbed multiple times within the last 50 years. Large portions of the property have been bulldozed and filled with heavy sand and rock fill. A railway associated with Kennecott operations had been constructed along the western edge of the permit boundary, disturbing a large swath in a general north and south direction.

106.5. Soils

Most of the soils on the north side of the quartzite borrow area that is located along the west side of the abandoned railroad consist of silty fine grained sands from the slopes. A surficial layer of sandy clayey organic soils, estimated to range from less than 5 to 10 feet thick, will be stripped from the alluvial borrow area and stockpiled for reclamation of the borrow area or tailings impoundment. The soils cover the surface of the terrace and include some recent flood and debris flow deposits. The volume required to be stripped, stockpiled, and used for reclamation is estimated to range from 500,000 to 1,000,000 CY, for both Phase 1 and Phase 2 construction.

Soil map units are shown in **Figure 8**, Soils. Samples of the top 12 inches were collected from five soil pits throughout the mine area. Two soil samples were collected at each location. The first sample was collected from soil located zero to six inches below the ground surface and the second sample was collected from soil located six to 12 inches below the ground surface. These samples were taken to characterize the soils in preparation for future soil salvage. The sample locations are shown on **Figure 3**, Soil Survey Addendum to the Ecological Baseline Report, **Appendix C**. Analytical sampling results are shown in the **Table 3** below.

Results of laboratory testing suggest a range of potential borrow materials exist. In general, the alluvial deposits contain relatively high fines content (up to 68.6%) and clasts that have relatively high carbonate content, which can react with acidic water and cause precipitate, and clogging of drain materials (calcium carbonate, calcite equivalent content up to 55%). The beach and lake spit sands and gravels contain fewer fines (range of 1.8% to 16.9%); however, they also contain sand, gravel, and cobble sized clasts (see photo below) with relatively high carbonate content (range of 34% to 44%). Carbonate content testing was also performed on fines produced from the durability testing, in order to estimate carbonate content within the gravel fraction of the alluvium, which was found to be similar to the results from the fine fraction. Oxidation tests were performed to help characterize potential for the alluvial materials to produce acidic conditions and potentially react with the process water.

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Table 3: Analytical Results of Spring, 2011 Soil Samples, Top Twelve Inches of Soil

Analyte (Units)	Reporting Limit	Analytical Result Area 1 @ 0-6"	Analytical Result Area 1 @ 6-12"	Analytical Result Area 2 @ 0-6"	Analytical Result Area 2 @ 6-12"	Analytical Result Area 3 @ 0-6"	Analytical Result Area 3 @ 6-12"	Analytical Result Area 4 @ 0-6"	Analytical Result Area 4 @ 6-12"	Analytical Result Area 5 @ 0-6"	Analytical Result Area 5 @ 6-12"
Total Potassium (mg/kg)	200	1,660	960	1,300	520	3,250	3,620	3,440	3,330	3,000	3,620
Uniform Soil Classification	not applicable	loam	sandy clay loam	sandy loam	sandy loam	clay loam	loam	loam	loam	loam	clay loam
Cation Exchange Capacity (meq/100g-dry)	0.2	7.1	4.1	2.6	1.2	12	9.7	9.2	9.4	9	10
Conductivity (mmhos/cm)	0.01	0.485	0.479	0.585	0.257	0.14	0.115	0.153	0.128	0.38	0.378
pH @ 25 °C	0.1	7.5	8	8.1	9.1	6.4	6	5.8	6.5	7.8	7.6
Extractable Phosphorus (mg/kg)	5	8	3	5	2	15	37	28	16	21	22
Sodium Absorption Ratio (SAR)	0.15	0.39	0.4	0.23	0.3	0.38	0.54	0.51	0.43	0.17	0.17
Total Nitrogen (as N) (%)	0.005	0.08	0.0507	0.0216	0.0113	0.117	0.0717	0.075	0.0728	0.049	0.0697
Sulfur, Total (%)	0.1	0.02	<0.1	0.14	0.03	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acid Generation Potential	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acid Neutralization Potential	5	19	134	405	446	5	5	7	8	41	33
Acid Base Account	5	19	134	401	446	5	5	7	8	41	33

°C - degrees Celsius
g - gram
kg - kilogram
meq - milliequivalent
mg - milligram
mmhos - millimhos
N - nitrogen
% - percent
< - the amount detected was lower than the reporting limit (practical quantitation limit).

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The soil in all test pits appeared relatively homogenous from the ground surface to 12 inches deep, therefore not revealing soil horizons. Samples area 1, 2 and 5 were taken from area mapped as Stony terrace escarpments. Samples area 3 and 4 were taken from Kearns silt loam, 3 to 6 percent slopes. For comparison purposes the typical profile of the soils is shown below (**Table 4** and **Table 4b,** [National Resource Conservation Service, NRCS, 2011, Web Soil Survey]).

Table 4: Soil Description for Stony Terrace Escarpments

Depth in Inches	Texture	Use
0-12	Silt Loam	Save for topsoil
12-17	Silt Loam	Save for topsoil
17-24	Silt Loam	Save for topsoil
24-30	Silt Clay Loam	Store as overburden
30-42	Silt Clay Loam	Store as overburden
42-60	Gravelly Sandy Loam	Use for product

Table 4b: Soil Description for the Kearns Silt Loam, 3 to 6 Percent Slopes

Depth in Inches	Texture	Use
0-12	Silt Loam	Save for topsoil
12-17	Silt Loam	Save for topsoil
17-24	Silt Loam	Save for topsoil
24-30	Silt Clay Loam	Store as overburden
30-42	Silt Clay Loam	Store as overburden
42-60	Gravelly Sandy Loam	Use for product

The Stony terrace escarpments occur between 4,200 to 5,200 feet elevation. Mean annual precipitation is 14 to 18 inches. The soil is generally 100 percent of stony terrace escarpments, deep and well drained. The soil material ranges from silt, sandy loam to clay loam. The volume is made up of 40 to 70 percent of cobblestone and stones (NRCS, 2011, Web Soil Survey).

The Kearns silt loam, 3 to 6 percent slopes, soils occur between 4,400 to 4,700 feet elevation. Mean annual precipitation is 14- 16 inches. The soils map unit is generally 95 percent Kearns and similar soils and 5 percent minor components and organics. The soil is made up of alluvial fans. Depth class is more than 80 inches. Soils tend to be well drained and be non-saline (about 0.0 to 2.0 mmhos/cm). Soils may have up to

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15 percent calcium carbonate. Potential vegetation includes Upland Loam (Mountain Big Sagebrush), NRCS, 2011, Web Soil Survey.

106.6. Plans for protecting and re-depositing soils

It is estimated that about 118 acres of mining disturbance will occur during Phase 1. At a 5 to 10 foot salvage depth, approximately 763,000BCY of growth media and organic soils will be salvaged from the area. During Phase 2 it is estimated that an additional 15 acres of mining disturbance will occur and approximately 139,000 BCY of growth media will be salvaged from the area. These volumes of growth media may be reduced if a portion of the soil is mixed with the underlying alluvium as part of the mining process.

To protect soils from erosion and soil loss, all stockpiles will be surrounded by erosion control fence. Growth media soils and vegetation (made up of mostly grasses and brush) will be removed just in advance of mining, using bulldozers, front-end loaders and haul trucks. Vegetation at the site will add negligible volume to the stockpiles.

Established growth media stockpiles will be broadcast seeded with a mixture of grasses to maintain slope stability and protect against erosion.

More detail on growth media stripping and protection is included in sub-section 109.3 below.

106.7. Existing vegetative communities to establish re-vegetation success

The project area ranges from 4,800 feet elevation at the west side to 5,100 feet on the east side. The mine area will be excavated in three sub-areas: the alluvial borrow, quartzite borrow and the railroad embankment borrow areas (**Figure 4**).

According to the NRCS range data for the North Western Salt Lake County (NRCS, 2011), which includes the study area (see **Figure 8**, Soils), vegetation production on the acreage to be mined ranges from 13,300 lbs/acre in a favorable year to 665 lbs/acre in an unfavorable year. The designated ecological site name is Upland Loam (Mountain Big Sagebrush).

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Table 5: NRCS Potential Plant Species for Kearns Silt Loam and Stony Terrace Escarpments Soil map Units

Scientific Name	Common Name
Penstemon eatonii	Firecracker penstemon
Castilleja chromosa	Early Indian Paintbrush
Achillea millefolium	White Yarrow
Lolium perenne	Perennial Ryegrass
Stipa hymenoides	Indian Rice Grass
Sporobolus cryptandrus	Sand Dropseed
Elymus lanceolatus ssp psammophilus	Streambank Wheatgrass
Pascopyrum smithii	Western Wheatgrass
Poa secunda	Sandberg Bluegrass
Koeleria macrantha	Junegrass
Elymus trachycaulus ssp trachycaulus var San Luis	Slender Wheatgrass
Stipa viridula	Green Needlegrass
Lupinus caudatus Var. utahensis	Tailcup Lupine
Atriplex canescens	Four-wing Saltbush
Chrysothamnus nauseosus	Rubber Rabbitbrush
Atriplex confertifolia	Shadscale
Artemisia tridentata Var. tridentate	Big Sagebrush
Prunus virginiana	Chokecherry
Quercus x pauciloba Rydb. (pro sp.) [gambelii x turbinella]	Hybrid Oak

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The list covers plant species found in the Oquirrh Mountains area, and parts of Salt Lake County. There are very few trees located on the subject property and they are all Gamble Oak. On November 4 and 5, 2010, a URS Environmental Scientist visited the site and observed the plant species growing at that time of the year (see Ecological Baseline Report in **Appendix B**). Those species observed during the site walk are shown in **Table 5a**.

A vegetation survey was conducted along several transects across the site by the URS Environmental Scientist, URS 2011, Ecological Baseline Report. The report shows the estimate of live canopy cover of weeds, grasses, low shrub and tall shrub by species. The vegetation survey was conducted on ten, 200-foot transects, spread randomly across the project area. The orientation of each transect was determined by using the results of a random number generator (Haahr, 1998) that would select a number between zero and 360. Transects were reviewed to ensure a proportional representation to the different vegetation communities existing on the site. In some cases, the location and/or orientation of transects were adjusted to ensure representative coverage of the four vegetation communities based on the spatial area of each community. Weeds and barren areas are not included in **Table 5a**.

A total of 25, 1-meter square, vegetation plots were recorded along each transect. For each plot, plant species were identified and the percent coverage, including bare ground, was estimated. The Average Percent Bare Ground results are figured by averaging the bare ground observed for each of 25 plots along transects in the respective vegetation community and then averaging those results. Refer to **Appendix B** for the Average Bare Ground calculations. The bare ground is not calculated for the tall shrub vegetation community because the field data gathered for this community only includes the number and species of tall shrubs. The low growing vegetation within the tall shrub transects closely resembles that in the grassland community. The percent bare ground very close to the grassland bare ground, except that there is approximately 40 percent coverage comprised of the overstory of tall shrubs.

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Table 5a: Plant Species observed by URS at the mine site on November 4 and 5, 2010

Common Name	Scientific Name	Form	% Percent Cover
Arrowleaf balsamroot	*Balsamorhiza sagittata*	Grass	1.58
Big sagebrush	*Artemisia tridentate*	Low Shrub	5.95
Big galleta[1]	*Pleuraphis rigida*	Grass	7.81
Cheatgrass[1]	*Bromus tectorum*	Grass	11.69
Crescent milkvetch	*Astragalus aniphioxys*	Grass	0.09
Gambel oak	*Quercus gambelii*	Tall Shrub	10.00
Great Basin wildrye[1]	*Leymus cinereus*	Grass	12.87
Indian ricegrass	*Achnatherum hymenoides*	Grass	0.96
Kentucky bluegrass[1]	*Poa pratensis*	Grass	24.12
New-Mexican Locust	*Robinia neomexicana*	Low Shrub	NA[2]
Rabbitbrush	*Chrysothamnus nauseosus*	Low Shrub	9.68
Russian olive	*Elaeagnus angustifolia*	Tall Shrub	5.00
Shadscale	*Atriplex confertifolia*	Low Shrub	5.95
Shrub live oak	*Quercus turbinella*	Tall Shrub	NA[2]
Silver sagebrush	*Artemisia cana*	Low Shrub	0.56
Western wheatgrass	*Pascopyrum smithii*	Grass	NA[2]

[1]The percent cover is based on an average of the 10 transects surveyed (see full report in **Appendix B**)
[2] Plant species observed on site, but not observed in any of the randomly generated transect locations

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106.8. Depth to groundwater, overburden material, and geologic setting

Groundwater

Two water wells are located within ½ mile radius of the Bonneville Borrow Area. A map using well location data provided from the Utah State Division of Water Rights is attached as **Figure 7**, verifying the location of these existing wells. The closest well to the Bonneville Borrow Area is owned by Magna Water Company. It is located 1,800 feet from the Southeast corner of the permit boundary, and the head of the well is about 220 feet lower than the planned level of excavation of the pit. This water level is at least 300 feet below the lowest planned level of mining in the Bonneville Borrow Pit (4,800).

The other well located within ½ mile radius of the Bonneville Borrow Area is owned by Kennecott Land Company. The well is just northeast the Magna Water Company well 610 feet. The head of this well is approximately 222 feet lower than the planned excavation of the pit. Quarry operations are not anticipated to adversely affect groundwater flows in the area. This in addition to information in Section R467-109.1, indicated that groundwater is not likely to be encountered in the project area during mining, and depth to ground water is expected to be well below the maximum extent of mining.

Overburden Material

A surficial layer of clayey organic soils, estimated to range from less than 5 to 10 feet thick, will be stripped from the alluvial borrow area. Overburden material will be mined, stored and stockpiled as growth media. The soils cover the surface of the terrace and include some recent flood and debris flow deposits. The volume required to be stripped, stockpiled, and used for reclamation is estimated to range from 500,000 to 1,000,000 CY, for both Phase 1 and Phase 2 construction. This overburden will be stripped with dozers and scrappers and placed in stockpiles located around the project area see **Figure 4a**. The overburden stockpiles will be hand broadcast seeded with native grasses to control erosion for the duration of the stockpile. It will be kept there until interim and final reclamation begins and then it will be placed on spent mine area.

Geology of the Area

The Bonneville Borrow Area is located at the foot of the northern Oquirrh Mountains, west of the town of Magna, Utah. The Oquirrh Mountains have a southerly trend along the Salt Lake County and Tooele County border, and are composed primarily of

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Pennsylvanian and Permian sandstone [including quartzitic sandstone] and limestone of the Oquirrh Group, intruded and overlain by Tertiary intrusive and volcanic rocks (Hintze et al., 2000). The subject property is within the Bingham mining district, with most ore associated with the Bingham stock, a mid-Tertiary quartz monzonite intrusive body (Stokes, 1986). The majority of the Bonneville Borrow Area is composed of quaternary alluvial and fan deposits, consisting of poorly to moderately-sorted clay- to boulder-sized sediment (clays, silts, sands, gravels, cobbles, and boulders) deposited principally by debris flows, floods, and streams (Solomon et al., 2007). The southern end of the Bonneville Borrow Area is characterized by thin- to medium-bedded quartzite of the Kessler Canyon Formation of the Oquirrh Group (Solomon et al., 2007). Although the Kessler Canyon Formation can consist of calcareous and dolomitic sandstone and dolomitic limestone interbedded with quartzite, recent geologic mapping conducted at the subject area found little to no evidence of limestone or dolomite interbedded with the quartzite see **Figure 9**.

106.9. Location and size of borrow and waste stockpiles, tailing, and treatment ponds, and discharges

Waste/Overburden Stockpiles

Raw materials consist of quartzite, sand and gravel that will be removed from the quartzite borrow area, the alluvial borrow and the railroad embankment area. Other than the estimated 6 feet of growth media in the alluvial borrow area set aside for reclamation purposes, all rock material removed from the site will be used to create drainage blanket, road base, bridging, embankment, riprap and structural fill. No waste rock is generated.

Material Stockpiles

There are several stockpiles of sorted and sized rock products stored on site. The general, current and future locations of the stockpiles are shown on **Figure 4a**. A list of stockpiles and maximum expected volume of each can be found in **Table 6** below.

Table 6: Stockpiles and Estimated Maximum Volumes for the Bonneville Borrow Area

Stockpile Material	Maximum Volume
Drain Rock	77,000 CY
Coarse Filter	77,000 CY
Fine Filter	77,000 CY

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Tailings

No Tailings will be produced at this mine.

Water Storage

Water for dust suppression, crushing and screening will be hauled or piped to the quarry from a nearby water source provided by the owner. Water will be stored in a tank on site until ready for use. Water will be used for dust control in the crushing, sand and gravel processing and on haul roads. It will be absorbed into the ground leaving no excess water for run-off. However in the unlikely event that run-off from the crusher/screening area occurs, water will be directed to the bottom of the alluvial borrow area, which will act as a storm water retention basin.

Any storm water run-off coming from the affected lands will be collected at the bottom of the alluvial borrow area and within the quarry confines, which at a minimum will be sized for the 10-year, 24-hour event. Stormwater run-off is further discussed in Section 109 and in **Appendix E**, SWPPP.

Discharges

Currently any water used for dust control or processing will be hauled in from off-site sources. No waste water discharges will occur at the site.

R647-4-107. Operation Practices

As required, the relevant Operation Practices stipulated in R647-4-107 will be followed.

R647-4-108. Hole Plugging Requirements

There are no plans for future resource exploration drilling within the permit area. If drilling for any other reason than blast hole drilling is planned in the area, Kennecott will notify DOGM and the following procedures will be employed.

- Drill holes shall be properly plugged as soon as practical and shall not be left unplugged for more than 30 days without approval by DOGM.

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- Dry holes and non-artesian holes that do not produce significant amounts of water may be temporarily plugged with a surface cap to enable Kennecott to re-enter the hole for the duration of set operations.
- Surface plugging of drill holes outside the mine area shall be accomplished by setting a nonmetallic permaplug at a minimum of five (5) feet below the surface, or returning the cuttings to the hole and tamping the returned cuttings to within five (5) feet of ground level. The hole above the permaplug of cuttings will be filled with a cement plug. If cemented casing is to be left in place, a concrete surface plug may not be required if a permanent cap is secured on top of the casing.
- Drill holes that encounter water, oil, gas or other migratory substance and are 2.5 inches or greater in surface diameter will be plugged in the subsurface to prevent the migration of fluid from one stratum to another. If water in encountered, plugging shall be accomplished as outlined below.
- If artesian flow (i.e., water flowing to the surface from the hole) is encountered during or upon cessation of drilling, a cement plug will be placed to prevent water from flowing between geologic formations and at the surface. The cement mix will consist of API Class A or H, with additives as needed, and will weigh at least 13.5 lbs/gal. It will be placed under the supervision of a person qualified in proper drill hole cementing of artesian flow.
- Artesian bore holes will be plugged as described prior to removal of drilling equipment from the well site.
- If the surface owner of the land affected desires to convert an artesian drill hole into a producing and/or monitoring well, the landowner will provide written notification to DOGM accepting responsibility for the ultimate plugging of the drill hole.
- Holes that encounter significant amounts of non-artesian water shall be plugged by: 1) placing a 50-ft cement plug immediately above and below the aquifer(s) or filling from the bottom up (through the drill casing) with a high grade bentonite/water slurry mixture. The slurry shall have a March Funnel viscosity of at least 50 seconds per quart prior to the adding of any cuttings.

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R647-4-109. Impact Statement

109.1. Surface and ground water systems

Surface Water

No perennial streams or intermittent waters have been or are expected to be impacted by the mining operations at the Bonneville Borrow Area. Surface water environmental Permitting Position Statement is included in **APPENDIX E.** Any precipitation and/or run-off that enters the borrow area from sheet flow, which enters the borrow area from the hillside above will be contained within the borrow area(s). Because this proposed Bonneville Borrow Area is small and has no defined channels, a generalized run-off calculation was developed for the active mine for the 25-year, 24 hour storm event using SCS TR-55 method with a type II rainfall distribution. The 25-yr, 24 hour storm depth for the Salt Lake City County is 2.17 inches. Results are summarized in **Table 7** below. Delineated drainage basins are shown in **Appendix E,** SWPPP.

Table 7: Runoff Rate and Volume Estimates for the 25-year, 24-hour Storm Event

Location	Watershed Area (Acres)	Time of Concentration (hrs)	Watershed Curve Number	Peak Discharge (cfs)	Estimated Runoff Volume (Ac-Ft)
A-1	147.18	0.2	91.0	255	253
A-2	28	0.1	91.0	56	56
A-3	48.8	0.1	91.0	98	97

Modeling assuming the 25-year, 24-hour precipitation event (with a depth of 2.17 inches) , as derived from the NOAA Atlas 14, Volume 1, Version 5, Magna, Utah, Point Precipitation Frequency Estimates (National Weather Service, 2011)

Once inside the Borrow area, water disperses across the flat bottom floor. Areas used for stockpiles, crushers and processing facilities are graded higher than surrounding areas to prevent contamination of stormwater within the borrow area. In addition, the working platforms that makes up the borrow area floor (see **Figure 7a)** are bermed to meet MSHA regulations, and act as a containment area where run-off remains until it soaks into the ground or evaporates.

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Two water quality ponds were sized in order to settle eroded sediment transported from stormwater runoff during grading, construction and normal operating activities, shown in the SWPPP, **Appendix E**.

The two water quality ponds were based on a minimum 3,600 cubic feet of storage per acre of contributing area plus an additional 800 square feet per acre of contributing acre adjustment. Geometry of each pond was designed with a longitudinal inlet to outlet length double the width for particulate settling time. Inlet and outlet dampening structures are also in place to maximize maintenance. Pond 1 (the largest, northern pond) was estimated to be able to hold approximately 14.9 acres. Pond 2 (the smaller, southern pond) was estimated to be able to hold approximately 7.2 acres. Both ponds are required to have a minimum available water depth of 3 feet to allow settling and sedimentation accumulation.

Precipitation that is intercepted by the haul roads and access roads is diverted into roadside ditches until it flows into the borrow area. If erosion or sediment is observed on lands, Kennecott commits to using appropriate water and erosion control measures. This includes, but not limited to: properly installed filter fencing, straw bale check dams, dirt berms, log berms, small (<0.1 acre-foot) sediment retention sumps, and rock check dams see **Figures 5b** and **5c**.

All fuel, oil, gas and solvents will be stored in approved tanks, in lined retention areas located on the west side of the project area to prevent pollution to storm water run-off. In addition three settling ponds sized for the 100-year, 24-hour event will be constructed to contain any sediment or pollution laden waters generated at the mine. These protective measures are discussed more thoroughly in the SWPPP, contained in **Appendix E**.

Ground Water

The elevation of the groundwater is estimated to be 4,070 feet. The quarry floor will be about 4,800 in elevation, so there will be about 730 feet in vertical separation between the quarrying activities and the groundwater as shown of **Figure 4a**. No groundwater has been encountered during current borrow exploration activities. Ground water environmental Permitting Position Statement is included in **APPENDIX E.**

The major activities on the mine property that could impact groundwater if residues were to reach the resources are: 1) blasting (which will be relatively minimal); 2) presence of diesel fuel, lubricants, etc. used in the heavy equipment used at the mine,

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3) human wastes, which are processed through chemical toilets, which are serviced regularly. In summary:

- Good housekeeping practices and careful operating procedures are used to minimize fuel and lubricant spills. Fuel and lubricants are stored in above ground tanks that have secondary containment that protect against spills.
- The quantities of blasting materials used create negligible quantities of nitrates that, in the unlikely event that they reached the groundwater would be well below water quality limits.

109.2. Wildlife habitat and endangered species

The project area ranges from 4,800 feet elevation at the west side to 5,100 feet on the east side. The mine area will be excavated in three sub-areas: the alluvial borrow, quartzite borrow and the railroad embankment borrow areas.

Maps in the Utah Conservation Database Center (UCDC), located at http://dwrcdc.nr.utah.gov/ucdc/, (UCDC, 2011), indicate the permit area could contain significant winter/spring habitat for mule deer and elk, but not for moose or pronghorn.

The UCD website lists five Threateneed or Endangered (T&E) species that are present in Salt Lake County and 19 Species of Special Concern (SPC) that could potentially be found in the area of the Bonneville Borrow Site. The T&E species are listed below in **Table 8**. Kennecott has confirmed that none of the T&E species or the SPC species listed are found within the permit area.

Table 8: Threated and Endangered Species of Salt Lake County

Common Name	Scientific Name	Status[1]	Habitat present at Bonneville Borrow Area
Vegetation			
Ute ladies'-tresses orchid	*Spiranthes diluvialis*	T	No – to dry
Wildlife			
Least chub	*Iotichthys phlegethontis*	C	No – to high, no bodies of water
Greater sage-grouse	*Centrocercus urophasianus*	C	No – sagebrush is sparse
June sucker	*Chasmistes liorus*	E	No – to high, no bodies of water
Yellow-billed cuckoo	*Coccyzus americanus*	C	No – to dry

[1] T = Threatened, E = Endangered, and C = Candidate

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URS Corporation was requested to perform a study of the area to see if any T&E or SPC species are found on the permit area. On November 4 and 5, 2010, URS Environmental Planner conducted an inventory of the area and found no T&E species, SPC or habitat conducive to T&E species. In addition, URS did not observe any white-tailed prairie dogs or suitable habitat for sage grouse which are Utah Species of Concern. A copy of the report is attached in **Appendix B**.

109.3. Existing Soil and Plant Resources

After Phase 1 of mining approximately 763,000 BCY of growth media will be stored from the mining operation for reclamation. A total volume of approximately 902,000 BCY of growth media will be available for reclamation once the mine is fully developed as shown in **Figure 4a-4c**.

All growth media/topsoil stockpiles will remain until reclamation is ready to begin. All growth media piles will be placed at angle of repose and a flat to slightly arched top. To protect soils from erosion and soil loss, all stockpiles will be surrounded by erosion control fence with an interior ditch. The ditch will catch and retain any soil that sloughs off the stockpile, and the erosion control fence will prevent contamination and erosion from storm water.

Growth media stockpiles will be constructed in multiple areas within the permit area to reduce handling (see **Figure 4a**) over the span of the mining operations, ultimately covering approximately 16.7 acres.

Substitute growth media (topsoil) material may be developed to augment the growth media resources available. This substitute material would include a mix of natural or crushed fines, small rock, and pit run material; imported manure and/or organic material matter (i.e., agriculture field refuse, wood chips, bran or wheat chaff); fertilizer to enhance fiber breakdown. This material would be stored and spread separate from the actual growth media resources.

The newly stockpiled soil will be seeded in the fall of each year with a quick-growing cover of grass and legumes in order to minimize erosion. The seed mix, listed in **Table 9**, will be broadcast at a rate of 14.5 lbs/acre PLS (pure live seed).

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Table 9: Seed Mix for Growth Media Stockpiles

Seed Species		PLS Pounds Per Acre
Scientific Name	**Common Name**	
Elytrigia intermedia	Intermediate Wheatgrass	2.5
Psuedoroegneria Spicata	Bluebunch Wheatgrass	2.5
Achantherum hymenoides	Indian Rice Grass	2.00
Elymus elymoides	Bottlebrush Squirreltail	1.50
Poa sandbergii	Sandberg Bluegrass	1.50
Medicago sativa	Alfalfa	0.75
Agropyron cristatum	Crested Wheatgrass	0.5
Hedysarum boreale	Northern Sweetvetch	1.25
	Total	**12.50**

PLS = pure live seed

The size of the area stripped in front of the mining and storage areas will be minimized to limit dust generation and the establishment of noxious weeds. At the same time, the stripped area will be large enough to allow equipment to operate on the stripped lands, and contain within the stripped area all fly-rock that could occur from blasting. Please see subsections 106.5 and 106.6 for more information about growth media.

All areas disturbed by Kennecott (the bonded areas) will be reclaimed at the end of mining by regrading (ripping compacted surfaces where necessary), topsoiling, and re-seeding as described in Section 110, with the goal of creating a self-renewing, perennial vegetation cover similar to native conditions.

109.4. Slope Stability, Erosion Control, Air Quality, Public Health, and Safety

Slope Stability

The rock at the Bonneville Borrow Area is made up of a massive quartzite deposit of Pennsylvanian and Permian age, fan, lake spit and beach deposits. During mining, all active high walls in the Quartzite Borrow area will be maintained at 40-foot high walls set back on with 20-foot benches. The south face on the east side of the rail cut will be mined at a 1:1(H:V). The north facing slope will be mined at a 2.5:1(H:V), allowing for placement of growth media. The Alluvial Borrow area overall slope will be mined at a 2.5:1(H:V). Kennecott inspects all high walls two times a month. A more extensive high wall inspection is conducted yearly with the MSHA inspector. A factor of safety of 1.25 or greater will be maintained at all times on slope stability. If problems occur with the

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planned 1:1(H:V) slope, in the Quartzite Borrow area, a further geologic study will be performed to determine a safe slope configuration.

Refer to R647-4-110.2, Reclamation Plan – High walls, for further information on slope stability during reclamation.

Erosion Control

There are no defined water channels within the area planned for disturbance. However, the hillside being mined does shed water into the quarry area during precipitation events. Operations will be performed to control water and erosion in disturbed, bonded areas. The quarry floor (see **Figures 4a-4c**) is surrounded by a MSHA safety berm. Any erosion or sediment produced on mine-affected lands will be contained within the quarry.

The Alluvial quarry floor will be sloped to the southwest as a storm water control measure (toward the quarry face). This negative slope will cause all stormwater entering the quarry to remain there until evaporated or absorbed into the ground. Until the quarry face gets fully develop, refer to **Appendix E,** SWPPP.

Erosion of dirt and dust from roads will be controlled through the application of chemical treatment such as magnesium or calcium chloride, graveling the road, and grading it to have sufficient crown and drainage ditches to the side so that the water does not pond. Sufficient turn-outs from road ditches will be provided to allow water collecting on the road to be released in a non-erosive manner. Erosion protection for soil stockpiles is addressed under soils, above.

Air Quality

Kennecott has applied for an Air Quality permit through the State of Utah, Department of Environmental Quality, Division of Air Quality (DAQ). A copy of the NOI filed with DAQ is attached. A copy of the final AO permit will be provided to the Division.

Public Health and Safety

Kennecott will minimize the hazards for public safety and welfare during operations. These measures include:

- No mining shaft or tunnels exist on site. All buildings, silos, conveyors, and other facilities and equipment are signed to discourage unauthorized or accidental entry in accordance with MSHA regulations.

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- A gate at the single access road on the northwest corner of the quarry will be locked when the site is not operating. The perimeter will be fenced to prevent unauthorized entry into the permit area during both operating and non-operating hours.
- Trash, scrap metal, wood, and extraneous debris will be disposed of in marked containers that are picked up monthly and disposed of at a Salt Lake County Solid Waste Transfer Facility.
- Although none are planned, any exploratory or other drill holes will be plugged and/or capping of as set forth in Rule R647-4-108.
- Appropriate warning signs will be located at public access points, and every 300 feet along the north and east boundary.
- All deleterious or potentially deleterious material, such as fuel tanks and supplies of lubricants and oils, are kept in one bermed storage area to minimize and control adverse environmental effects.
- Used lubricants and hydraulic oils are collected in designated above ground tanks and drums and held for collection by used oil distributors who process it into burner fuels.

- Blasting will follow industry standard for public safety. A pre-blasting survey has been completed, documentation is available at KUC.

R647-4-110. Reclamation Plan

110.1. Current Land Use and Post – Mining Land Use

Current land uses of the property at the Bonneville Borrow Area include mining of sand and gravel and wildlife habitat. Historical use of the property included livestock grazing.

Between Phase 1 and 2 of mining there will be a period where no mining occurs. During this period temporary reclamation measures will be instituted on portions of the disturbed area. Interim reclamation will consist of surface shaping, erosion control, growth media and seeding placement. Seeding would also be required on any remaining stockpiles.

Surface shaping will generally occur as a part of the excavation process, however other non-excavated surfaces will also have growth media application including:

North face – east of the railroad cut

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North face above the existing railroad grade, west of the quartzite borrow area

Excavated surfaces that will be shaped and have growth media applied include:

North face – west of the railroad cut

All alluvial area excavation surfaces (with the exception of the designed road providing access to the existing railroad embankment)

The access road from the alluvial borrow to the quartzite borrow will be left in place to allow access for Phase 2 quarry activities.

After operations at the Bonneville Borrow area are completed, the land will be restored to the anticipated post mining land use developed by KUC during the period of operations. Post mining land use is anticipated to be for wildlife habitat. At this time this LMO reflects a return to current baseline conditions. After Phase 2, borrowing activities will lower the surface of the quartzite and alluvial borrow areas. The quartzite borrow will remove another 50 feet of material within the Phase 1 disturbance limits. As in Phase 1, the north face west of the rail cut will be mined at a 2.5:1 (H:V) slope, while the south face east of the cut will continue at a 1:1 (H:V) slope. Growth media to a depth of 2 feet will be spread on the north face west of the cut and the pit bottom after mining. The south face east of the rail cut will be left in a stable configuration. At a later date, a 2.5:1 (H:V) slope could be placed along the south face.

The road from the quartzite borrow to the crushing plant will be reshaped after mining and growth media applied. The reclaimed road will convey surface water flows from the quartzite borrow into the alluvial borrow area. Water bars and energy dissipation features will be constructed as part of final reclamation.

South from the railroad embankment borrow, along the existing rail grade, a north facing cut slope will be reclaimed by filling at a 2.5:1 (H:V) slope with suitable growth media.

The road constructed to access the existing abandoned railroad embankment will be reshaped after the embankment is removed and growth media will be applied. The reclaimed road will convey surface water flows from the railroad embankment borrow into the alluvial borrow area. Water bars and energy dissipation features will be constructed as part of final reclamation.

In the alluvial borrow area the quarry bottom will be lowered an additional 110 feet continuing to the northwest. As in Phase 1, final slopes will be mined at a 2.5:1 (H:V) slope and growth media applied.

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During operations the alluvial borrow was slightly sloped to the southwest as a surface water control feature. At closure the floor slope will be re-directed towards the northeast edge of the borrow area into the existing drainage via a small drainage ditch. The final location, size and other features of the ditch will be designed during final engineering.

110.2. Reclamation of Road, Highwalls, Slopes, Leach Pads, Dumps, Etc.

Roads

Approximately 5,000 feet of roads, 50 feet in width, with a 3.5 feet high trapazodial berm with 2:1 (H:V) side slopes on fill section, will be required to fully develop the Bonneville Borrow area within the permitted limits. Upon completion of mining activities, the main access road into the quarry and all other roads that services the stockpiles and the crusher are anticipated to be ripped, graded to blend with the planned final contours, covered with topsoil and drill/broadcast seeded as described in reclamation of benches and quarry floor.

Highwalls

As mining progresses in the alluvial borrow area to the west and north in 25 foot increments, sidewalls will be graded to an overall slope of 2.5:1(H:V). In the Quartzite Borrow area mining will progress in a southwest direction, sidewalls will be graded 1:1(H:V) on the south face; with a constant slope to eliminate rockfall, benches will be covered with growth media and seeded, and on the east side of the rail cut, and a 2.5:1(H:V) on the north face to reach their final configuration. If mining were to cease prior to full excavation of the quarry, those high walls disturbed by Kennecott would be reclaimed to the 2.5:1(H:V) configuration noted above.

No significant areas are available for concurrent reclamation. Alternative final reclamation techniques such as rock staining and vegetative view breaks will be evaluated over time and incorporated as appropriate into the final reclamation plan.

Slopes

The quarry floor will be mined down to approximately 4,800 feet in elevation.

All slopes and floors within the disturbed, bonded area will be ripped on the contour to relieve compaction and create a better seed bed (this is discussed further in Sub-section 110.5 below).

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The quarry floor will be graded to a 1 percent slope that will re-direct towards the northeast edge of the borrow area into the existing drainage via a small drainage ditch.

Impoundments, Pits, and Ponds

The quartzite and alluvial borrow areas will not be backfilled except for the replacement of 2 feet growth media on the floor of the quarries. The alluvial borrow area will be reclaimed with 2.5:1(H:V) minimum slope with no high walls exposed and reclaimed with a 1 percent slope re-direct towards the northeast edge of the borrow area into the existing drainage via a small drainage ditch. The quartzite borrow area, the north face west of the rail cut will be reclaimed at a 2.5:1(H:V), while the south face east of the cut will be left at a 1:1(H:V). The south face east of the rail will be left in a stable configuration. No impoundments of ponds will be left that require maintenance or monitoring.

The settling ponds constructed along the north edge will be backfilled upon reclamation using overburden materials salvaged over the life of the quarry. This will be done as part of grading operations in this area. The reclaimed settling ponds will be topsoiled and revegetated in the same manner as the rest of the mine area, as explained under Section 110.5 below.

Drainages

No drainages will be constructed. The native land outside the perimeter of the quarry, crusher and screen plant is on gravelly, vegetated outwash plain and is subject to overflow rather than channelized flow.

The areas will be graded to an approximate 1 percent slope that will re-direct towards the northeast edge of the borrow area into the existing drainage via a small drainage ditch.

Dumps, Shafts, Adits, and Leach Pads

There will be no dumps, adits, shafts, or leach pads created during mining, thus none of these features will need to be reclaimed. The slope between the quarry floor and the crusher and screen plant area will be 2.5:1(H:V) or flatter to minimize erosion and will be seeded as explained in 110.5 below.

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Drill holes

No drill holes outside those required for blasting are anticipated. If any drill holes are required, they will be plugged and sealed as described in R647-4-208 above. There will be no drill holes left open upon reclamation.

110.3. Surface Facilities to be Left

No structures will be left on site. All facilities will be removed and their footprints reclaimed. A list of typical structures to be removed and reclaimed (but not limited to) is included in **Table 10** below.

Table 10: Typical Surface Facilities to be Reclaimed

Typical Structure	Average Dimensions
Jaw Crusher	50' x 25' x 20'
Primary Screen	No primary screen
Grizzly Feeder	Included in Jaw Crusher dim's
Secondary Scalp Screen	20' x 40' x 20'
Secondary Crusher	20' x 50' x 20'
Reclaim Tunnel w/ Feeder	12' x 40' x 12'
Tertiary Scalp Screen	20' x 40' x 20'
Tertiary Crusher	20' x 50' x 20'
Tertiary Screens	20' x 40' x 20'
Quaternary Crushers	20' x 50' x 20'
Quaternary Screens	20' x 40' x 20'
Radial Stacking Conveyors	4 conveyors with 36" inch belt and 150' feet long
Thickener/Clarifier	60' dia. X 26'
Hydrocarbon Storage	**Listed Below:**
Propane Tank	gal
Fuel Tanks	gal on-road tank
	gal off-road tank
	gal gas tank
Oil Drums	Drums in Conex Storage Container

Total acreage for buildings, structures, pads and access roads at the site is 11 acres. All facilities will be demolished after salvaging metals and removing insulation, tile, etc. If any concrete is on-site, concrete will be broken up and buried on site. Other material will be hauled to, and disposed of in a licensed landfill.

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110.4. Treatment, Location, and Deposition of Deleterious Materials

Potentially hazardous insulation, tile, and non-salvageable debris from demolition of structures will be removed to a licensed landfill. All tanks will either be removed to a licensed landfill upon reclamation, sold or relocated. The surety calculations contained in Section 113 assume these items are disposed of at the Salt Lake Valley Landfill, located in Salt Lake City.

All conveyors, crushers, screen, plants and other equipment used for mining and processing of aggregate will be removed upon reclamation or sold. The surety calculations contained in Section 113 assume these items are disposed of at the Western Metals Recycling Center in Salt Lake City.

110.5. Re-vegetation Planting Program and Topsoil Re-distribution

After final shaping and grading of the quarry floor and facilities area, slopes, and roads within the disturbed area, surfaces will be ripped and/or scarified on the contour to relieve compaction.

Soil Material Replacement

Topsoil and topsoil substitute material (described under Sub-section 109.3) will be spread on the quarry floor and plant area using self-loading scrapers to place soil, and a grader to spread the soil. Topsoil to a depth of 2 feet will be spread on the north face west of the cut and the pit bottom floor. Marked lath will be used to guide dozer operators to the correct topsoil depth. Growth media will be spread on the upper slope as far as practical. In addition, growth media will be placed at the toe of the cleaned slope to create a 2.5:1(H:V) surface for reclamation.

Seed Bed Preparation

Prior to spreading any topsoil or topdressing, stockpiles will be tested for organic matter, Nitrogen, Phosphorus, and Potassium. If these levels are low, composted manure will be applied to the solid or topsoil substitute after it is spread.

Topsoil will be laid down with a scraper, and if needed, composted manure at 10 ton/acre will be spread. All surfaces will be scarified along the contour with a road grader to assure mixing of the soil and manure to create consistent-textured soil and a roughened surface that will hold the seed and moisture for best germination.

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Seed Mixture

Table 11 below provides the seed mixture that will be used in reclamation on all bonded, disturbed areas at the Bonneville Borrow Area that are 2.5:1(H:V) or flatter, including highwall benches. Drill and broadcast seeding rates would be the same.

Table 11: Reclamation Seed Mix for Bonneville Borrow Area

Common Name	Scientific Name	PLS Pounds/Acre
Small Burnette	*Sanguisorba minor*	1.5
White Yarrow	*Achillea millefolium*	0.2
Indian Rice Grass	*Stipa hymenoides*	1.0
Western Wheatgrass	*Pascopyrum smithii*	2
Intermediate	*Agropyron intermedium*	3
Great Basin Wildrye	*Elymus cinereus*	3
Four-wing Saltbush	*Atriplex canescens*	2
Rubber Rabbitbrush	*Chrysothamnus nauseosus*	0.25
Big Sagebrush	*Artemisia tridentata Var.*	0.1
Forage kochia	*Bassia prostrate*	0.5
Pacific aster	*Symphyotrichum chilense*	0.1
Palmer's penstemon	*Penstemon palmeri*	0.5
	Total Rate to be Seeded	14.05

Seeding Method

The quarry floor, plant areas, roads on flat or gently sloping surfaces will be seeded using a range-type drill seeder and/or broadcast on the surface.

Fertilization

Prior to spreading any topsoil or topdressing, stockpiles will be tested for organic matter, Nitrogen, Phosphorous, and Potassium. If the levels are low, 10 tons of composted manure per acre will be applied to the soil or topsoil substitute after it is spread. Soil amendment quantities will be approved by DOGM prior to application.

Other Re-vegetation Procedures

None

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R647-4-112. Variance

No variances are anticipated at this time.

R647-4-113. Surety

The reclamation surety calculations are contained in **Appendix F**. A Summary of the estimated costs of reclamation is included below.

Subtotal Demolition and Removal	$120,076.00
Subtotal Backfilling and Grading	$3,662,369.00
Subtotal Revegetation	$148,000.00
Direct Costs	$3,930,445.00
Indirect Costs	
Mob/Demob	$393,045.00
Contingency	$196,522.00
Engineering Redesign	$98,261.00
Main Office Expense	$267,270.00
Project Management Fee	$98,261.00
Subtotal Indirect Costs	$1,053,359.00
Total Cost 2010	$4,983,804.00
Escalation	$306,292.00
Reclamation Cost Escalated (for 118 acres disturbed)	$5,290,096.00

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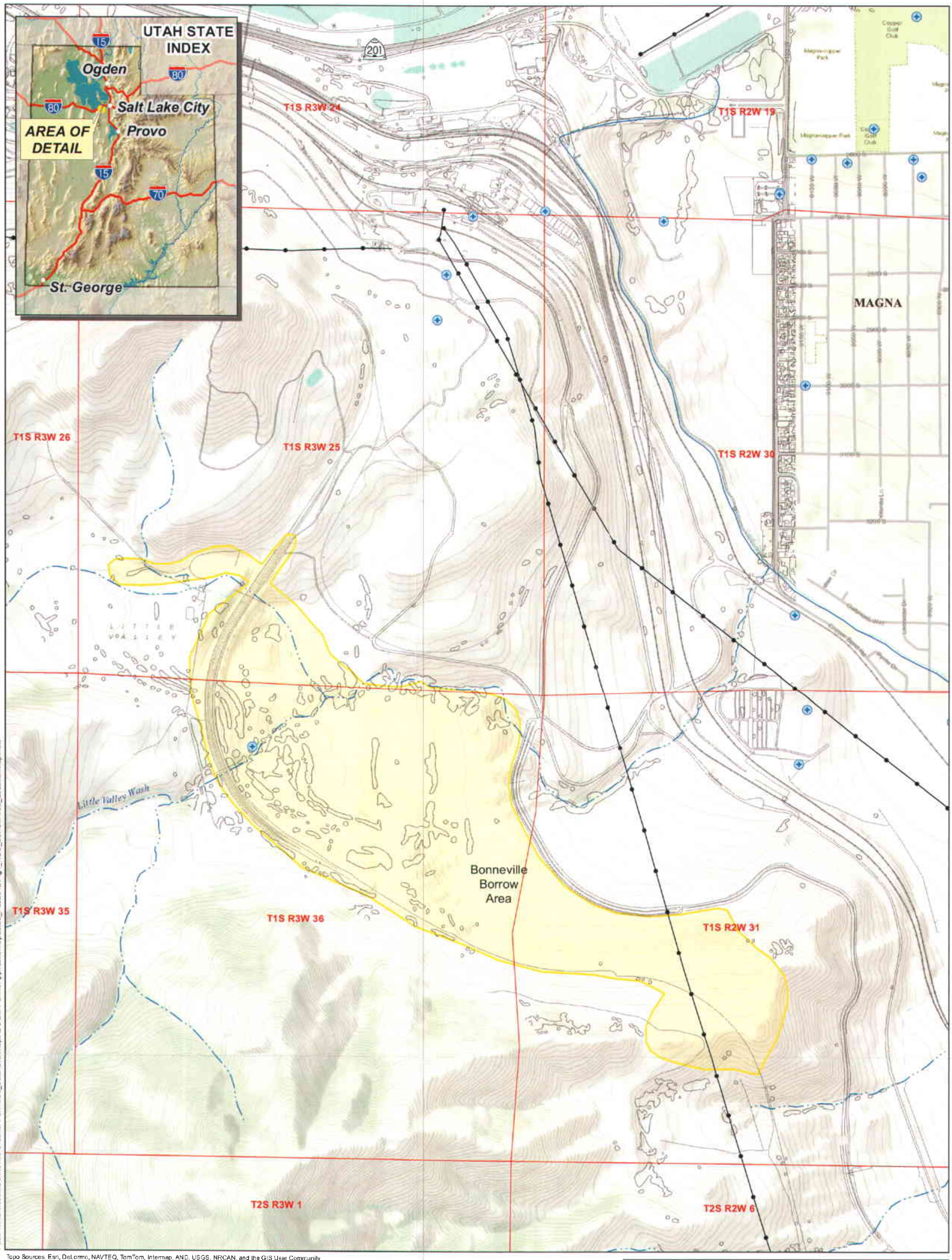

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Topo Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, AND, USGS, NRCAN, and the GIS User Community

- Water Wells
- Existing Electric Lines
- Intermittent Stream
- Rail Road
- Mine Limits

500 0 500 1,000 Feet

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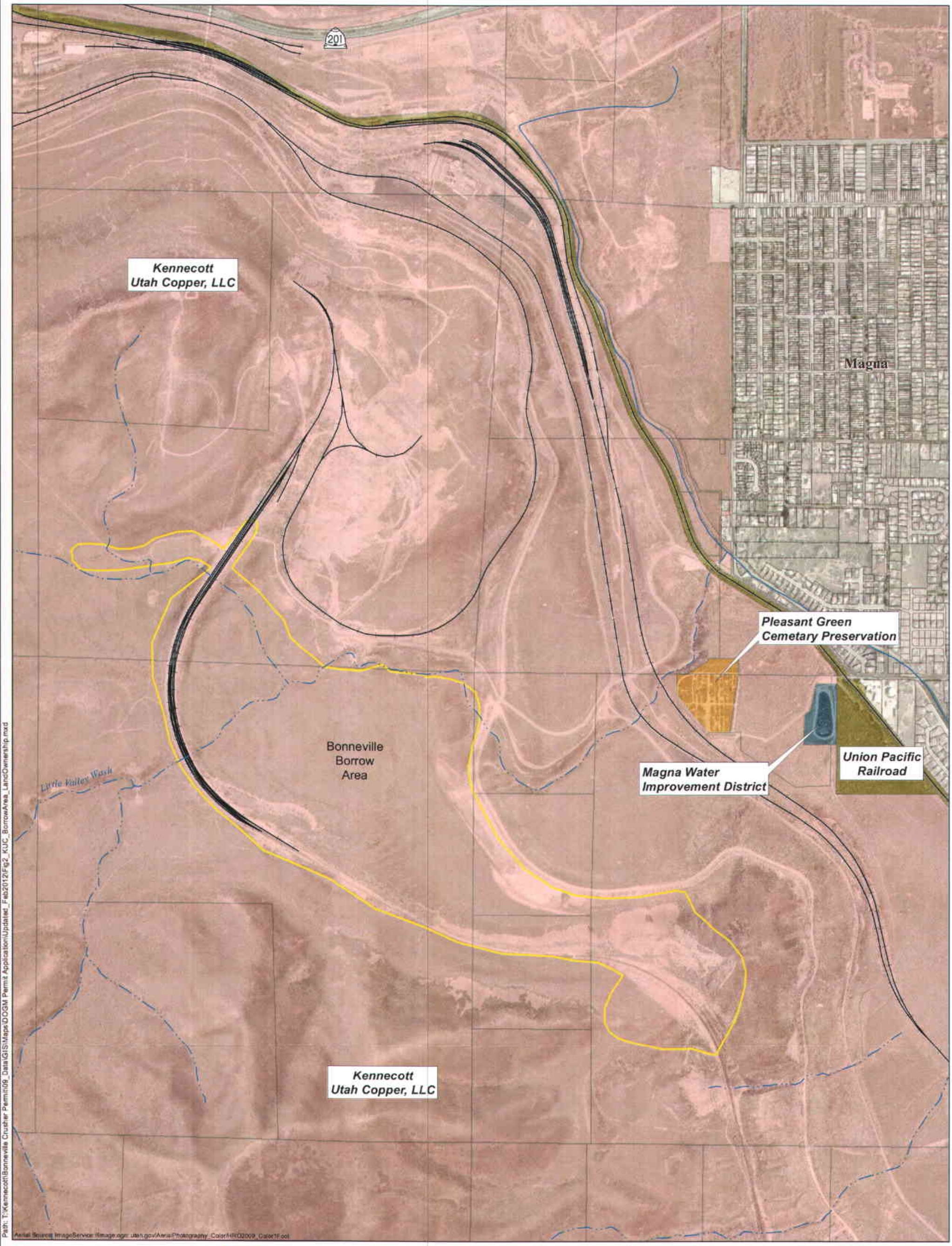
Title: Base Map / Location Map	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 1
RioTinto	Date: March 2012
	URS



Intermittent Stream

Rail Road

Mine Limits

Property Ownership

- Kennecott Utah Coper, LLC
- Union Pacific Railroad
- Pleasant Green Cemetary Preservation
- Magna Water Company
- Residential / Commercial Parcels

Parcel Data Source: Salt Lake County Recorder, August 2010

0 500 1,000 1,500 Feet

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Title: Land Ownership Map	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 2
RioTinto	Date: March 2012
	URS

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Path: T:\Kennecott\Bonneville Crusher Permit\09_Data\GIS\Maps\DOGM Permit Application\Updated_Feb2012\Fig3_KUC_BorrowArea_ExistingFacilities.mxd

Aerial Source: ImageServer: //image.agrc.utah.gov/AerialPhotography_Color/HRO2009_Color1Foot

Topographic Contour (10 foot interval)

Intermittent Stream

Mine Limits

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400 0 400 800

Feet

Title: Existing Surface Facilities and Contour Map	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 3
RioTinto	Date: March 2012
	URS

Path: T:\Kennecott\Bonneville Crusher Permit\09_Data\GIS\Maps\DOGM Permit Application\Updated_Feb2012\Fig4A_KUC_BorrowArea_InterimPhase1.mxd

Aerial Source: ImageServer: Image.agrc.utah.gov/AerialPhotography_ColorIRG2009_ColorIFeet

Do Not Disturb Areas

Existing Power Line

Haul Road

Magna

Alluvial Borrow Area

1% Slope

Water Quality Pond 1

Settling Pond

Drain Rock

Coarse Filter

Fine Filter

Stockpile

Sediment Trap

Proposed Fines Discharge to Tailings Pipe Line

Stockpiles

Proposed Powerline

Crushing and Screening Plant

Power Line to be Abandoned

Contractor Laydown Area (Final Location to be Determined by Contractor)

Water Quality Pond 2

Proposed Power Line

Quartzite Borrow Area

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Intermittent Stream

Phase 1 Haul Road

Cross Section (See Following Page for Detail)

Proposed "V" Ditch

Flow Direction

1% Slope (Pit Floor)

Growth Media Stock Pile (16.7 acres)

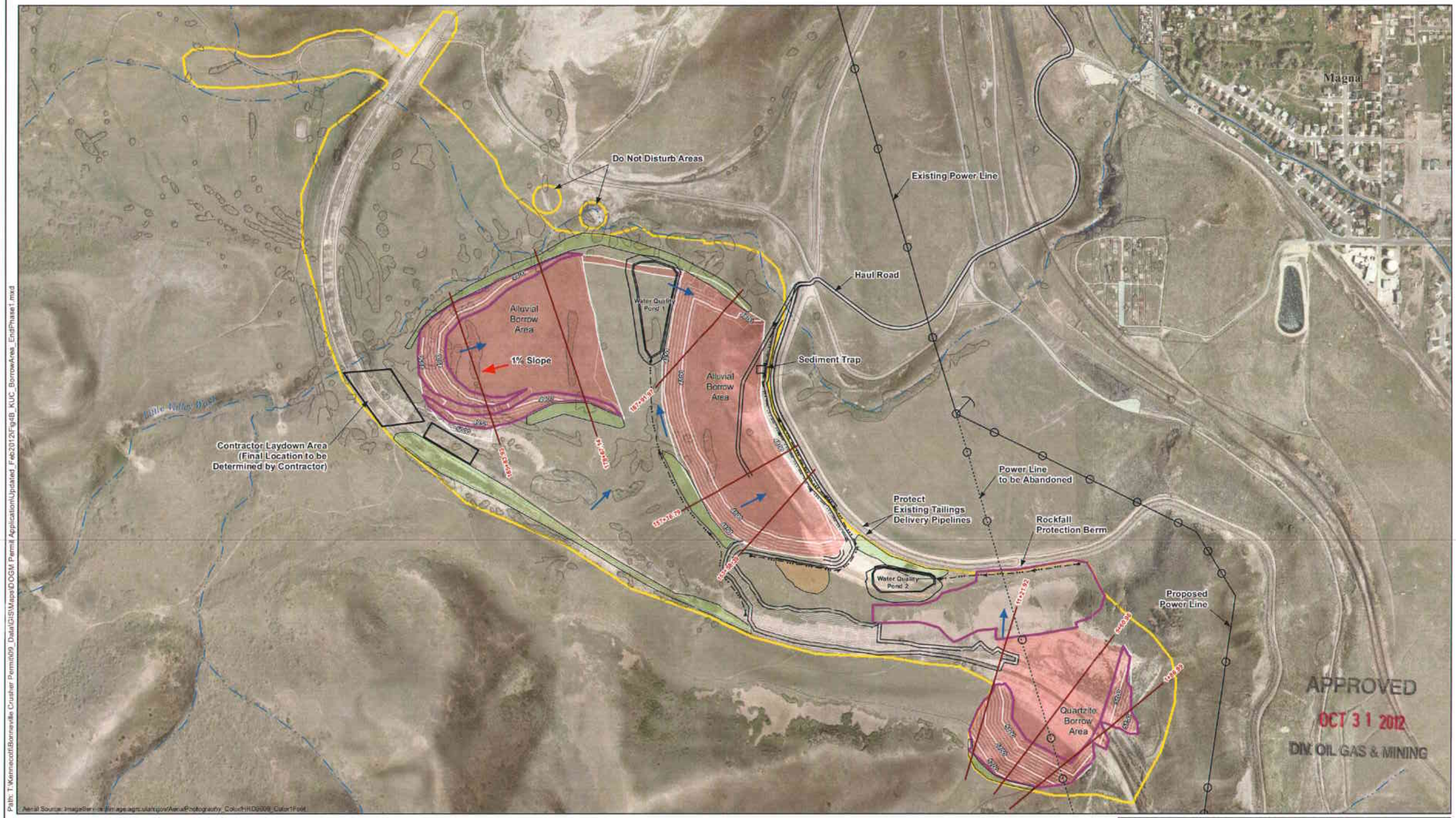
Quartzite Stockpile

Interim Reclamation Area

Mine Limits

400 0 400 800 Feet

Title: Mine Plan Map, Interim Excavation Phase 1 Borrow	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 4A
RioTinto	Date: March 2012
	URS



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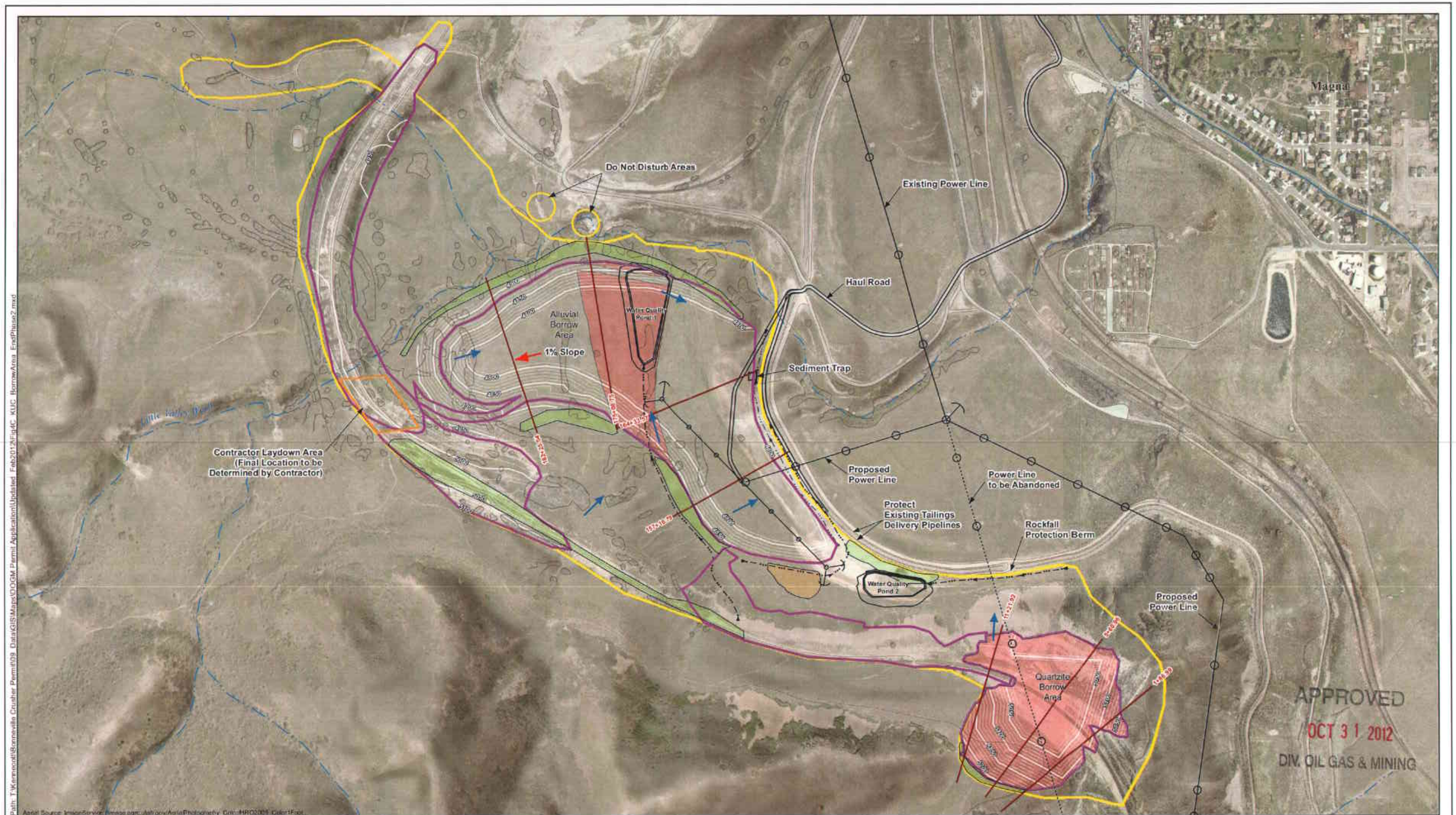
Aerial Source: ImageServer/image.agrc.utah.gov/AerialPhotography_Color/HHD2009_Color1Foot

- Intermittent Stream
- Phase 1 Haul Road
- Cross Section (See Following Page for Detail)
- Proposed "V" Ditch
- Flow Direction
- 1% Slope (Pit Floor)
- Growth Media Stock Pile
- Quartzite Stockpile
- Phase 1 Disturbance Area
- Phase 1 Reclamation Area
- Mine Limits

400 0 400 800 Feet

Title: End Phase 1 Borrow	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 4B
RioTinto	Date: March 2012
	URS

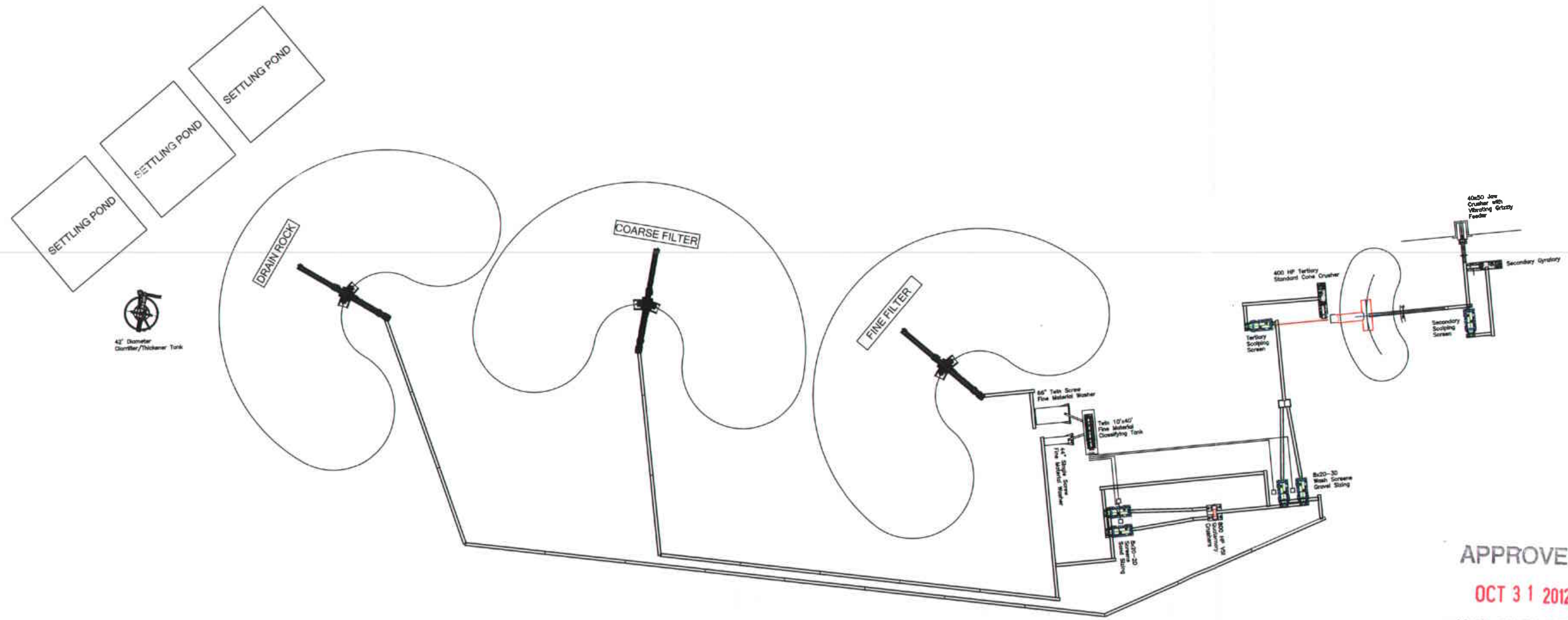


Intermittent Stream
Phase 1 Haul Road
Cross Section (See Following Page for Detail)
Proposed "V" Ditch
Flow Direction
1% Slope (Pit Floor)

Growth Media Stock Pile
Quartzite Stockpile
Phase 2 Disturbance Area
Phase 2 Reclamation Area
Mine Limits

400 0 400 800 Feet

Title: End Phase 2 Excavation	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 4C
RioTinto	Date: March 2012
	URS



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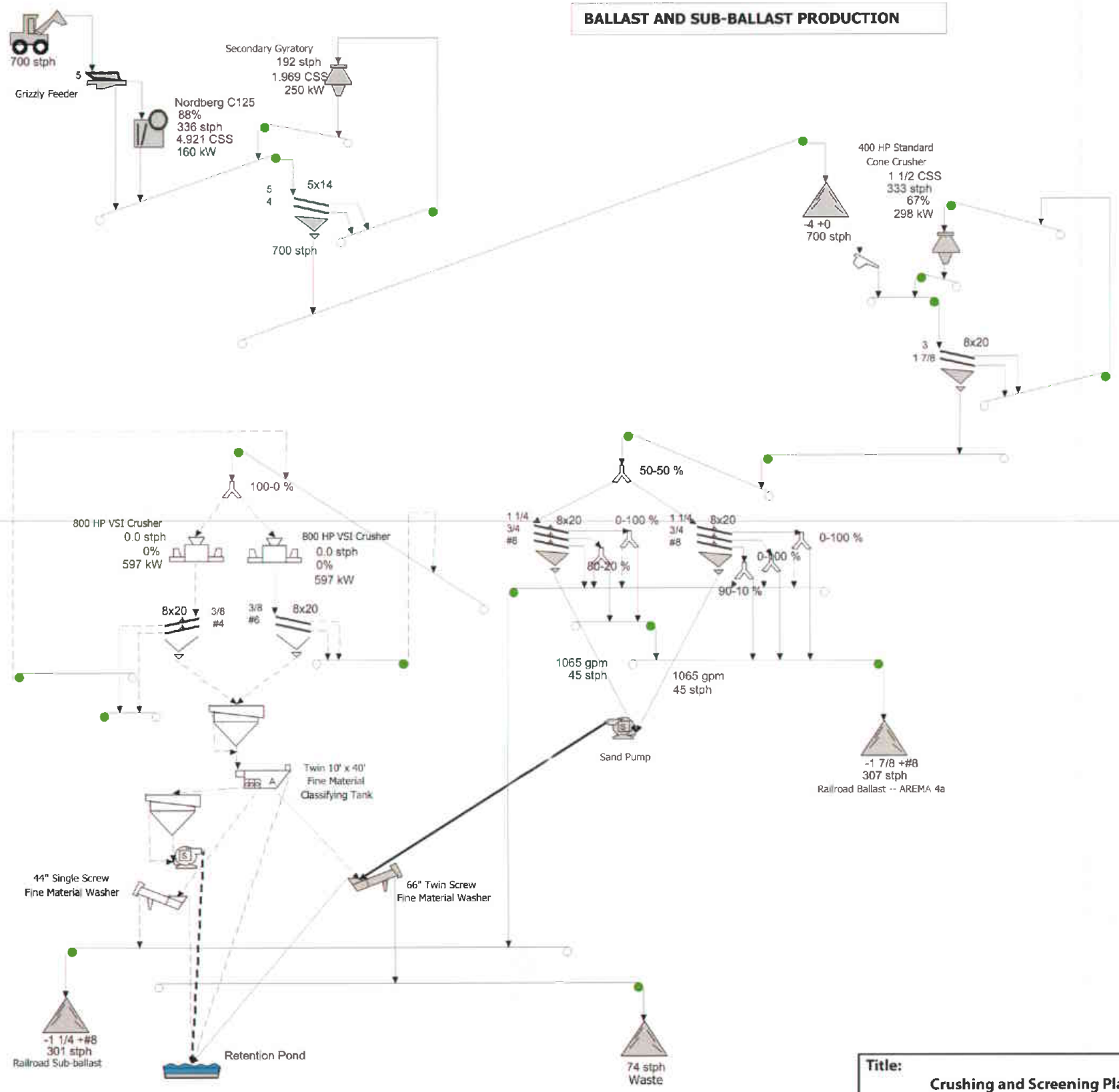
Title:	**Conceptual Crusher and Stockpile Detail**
Bonneville Borrow Area DOGM Permit Applicaton	Proj No: 24585223
	Figure: 4D
RioTinto	Date: March 2012
	URS

BALLAST AND SUB-BALLAST PRODUCTION



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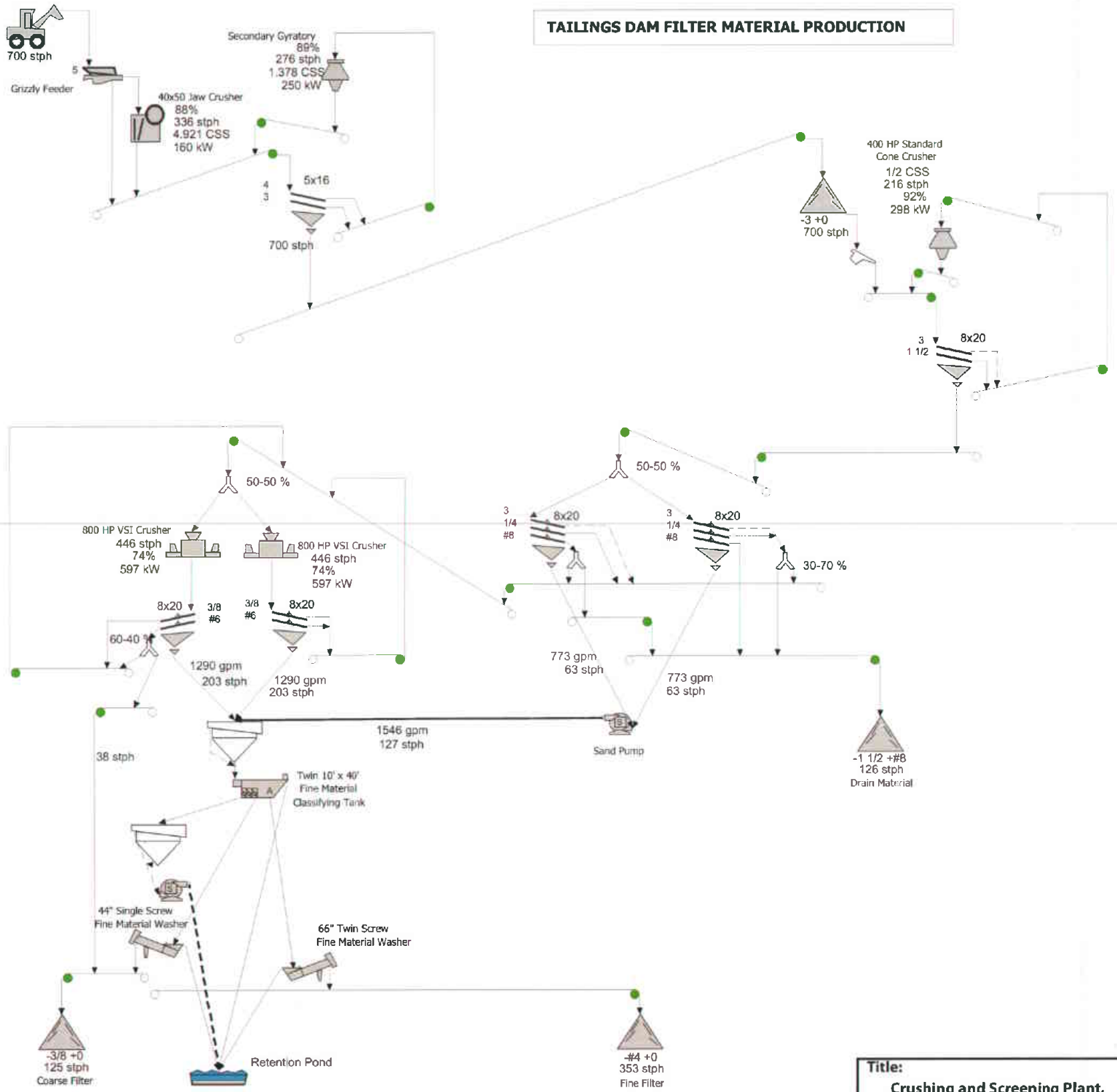
Calculation results may differ due to variations in operating conditions and application of crushing and screening equipment. This information does not constitute an express or implied warranty, but shows results of calculations based on information provided by customers or equipment manufacturers. Use this information for estimating purposes only.

All calculations performed by AggFlow. http://www.AggFlow.com

Title: **Crushing and Screening Plant, Ballast Sub-ballast Production**	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223 Figure: 4E
RioTinto	Date: March 2012 URS

TAILINGS DAM FILTER MATERIAL PRODUCTION



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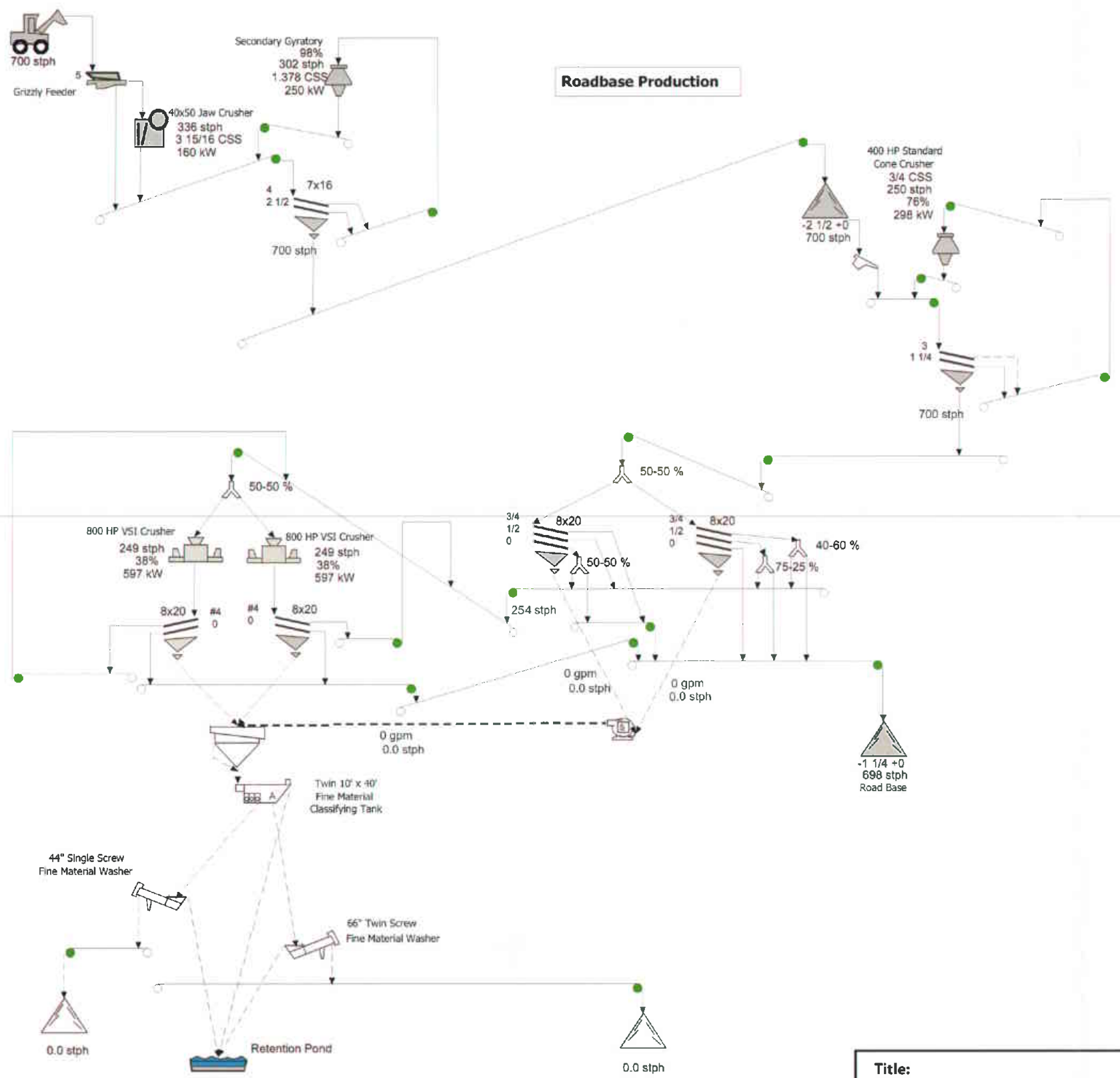
All calculations performed by AggFlow. http://www.AggFlow.com

Title: **Crushing and Screening Plant, Filter Material Production**	
Bonneville Borrow Area	Proj No: 24585223
DOGM Permit Applicaton	Figure: 4F
RioTinto	Date: March 2012
	URS



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All calculations performed by AggFlow. http://www.AggFlow.com

Title:
Crushing and Screening Plant,
Roadbase Material Production

Bonneville Borrow Area	Proj No: 24585223
DOGM Permit Applicaton	Figure: 4G
RioTinto	Date: March 2012
	URS

Path: T:\Kennecott\Bonneville Crusher Permit\09_Data\GIS\Maps\DOGM Permit Application\Updated_Feb2012\Fig5_KUC_BorrowArea_ReclamationTreatment.mxd

Aerial Source: ImageServer: images.agrc.utah.gov/ArcIMS/Photography_Color/IRO0009_Color1Foot

Existing Power Line

Magna

Railroad Reclamation Area

Do Not Disturb Areas

Alluvial borrow graded to 2.5:1 (H:V) and the floor graded to the NE corner of the mine micro topography undulations will be used in the final grading of the floor and side slopes to enhance revegetation and natural appearence

Haul Road

Area to be regraded to blend in with existing topography 2.5:1 (H:V), to enhance natural appearance with alluvial borrow slopes.

Alluvial Borrow Area

74 Acres

9 Acres

Proposed Power Line

Power Line to be Abandoned

Protect Existing Tailings Delivery Pipelines

Railroad Reclamation Area

Topsoil will be redistibuted over entire disturbed mine, ~2ft, reseeding and revegetation over the final placed topsoil.

6 Acres

Haul Road

Proposed Power Line

Quartzite Borrow Area

29 Acres

Quartzite sidewall will be regraded at 1:1 (H:V) on the south face, east side will be graded at 2:1 (H:V)

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Intermittent Stream

Haul Road to Remain After Reclamation

Final Borrow Disturbance Area

Mine Limits

Regraded at 1:1 (H:V)

Regraded at 2.5:1 (H:V)

Haul Road Area Graded to Blend In With Final Contours

N

400 0 400 800 Feet

Title: Reclamation Treatment Map

Bonneville Borrow Area
DOGM Permit Application

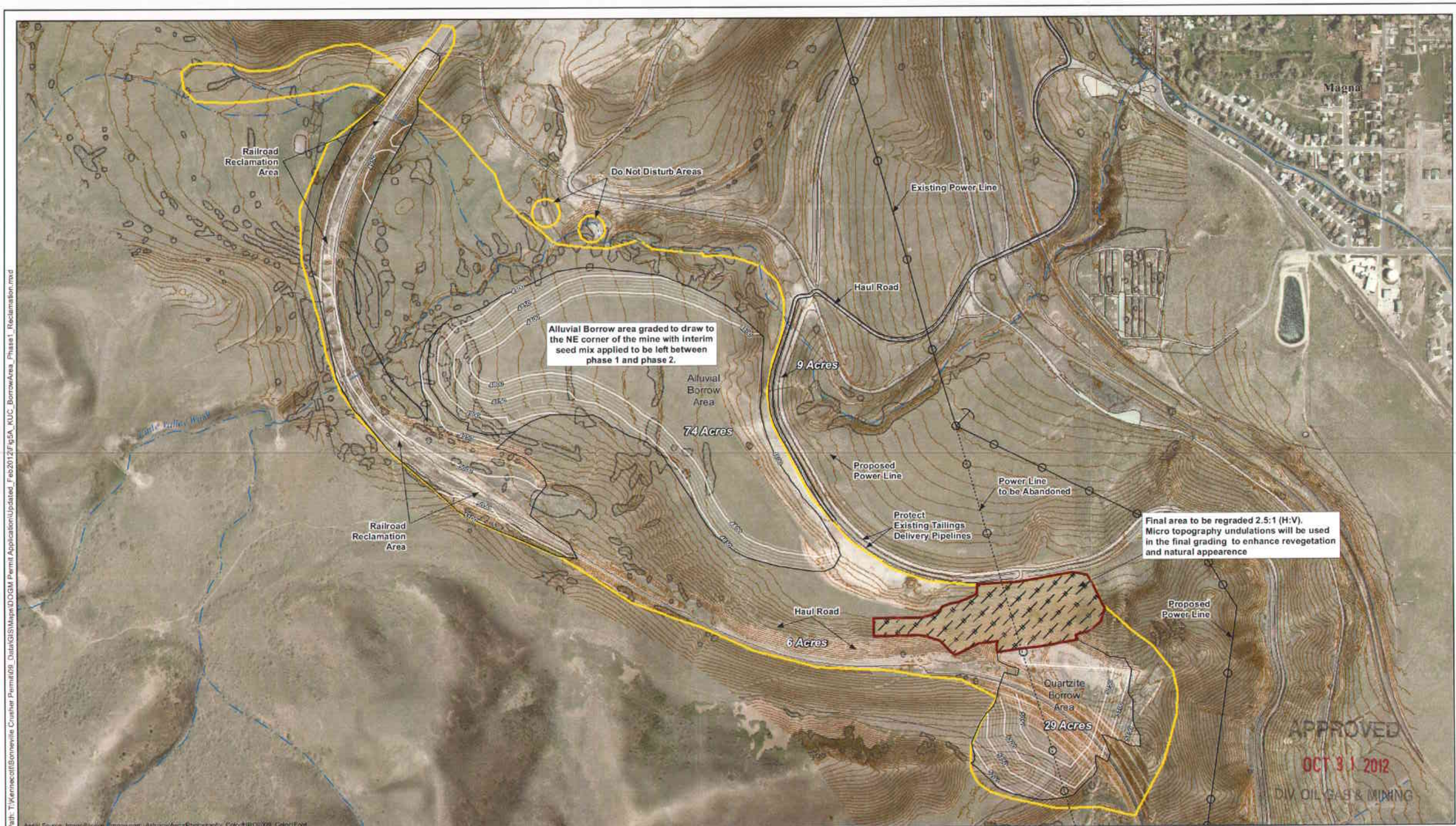
Proj No: 24585223

Figure: 5

Date: March 2012

RioTinto

URS



Intermittent Stream

Haul Road to Remain After Reclamation

Final Borrow Disturbance Area

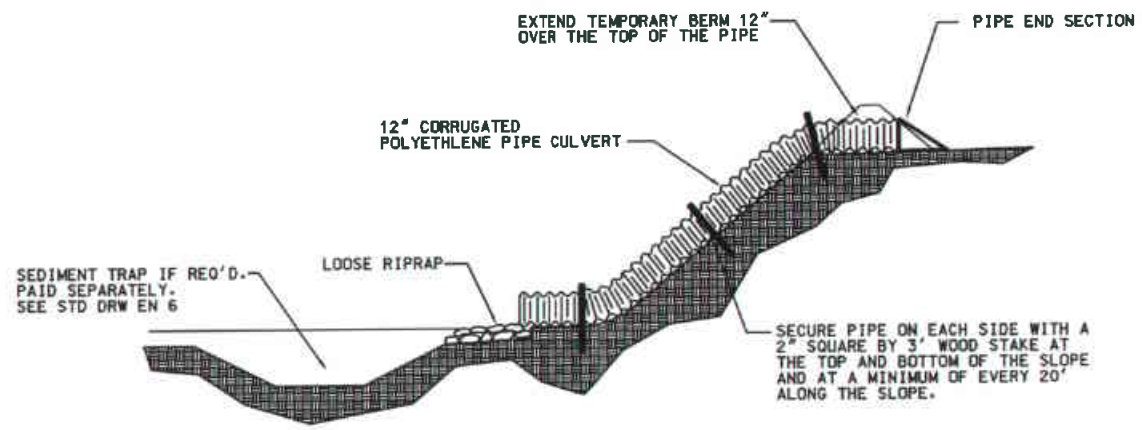
Regraded at 2.5:1 (H:V)

Mine Limits

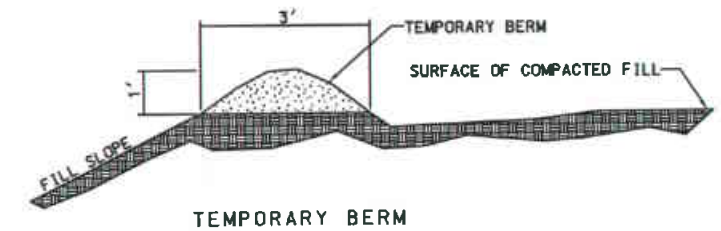
400 0 400 800 Feet

Title: Interim Reclamation Map	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 5A
RioTinto	Date: March 2012
	URS

SLOPE DRAIN AND TEMPORARY BERM



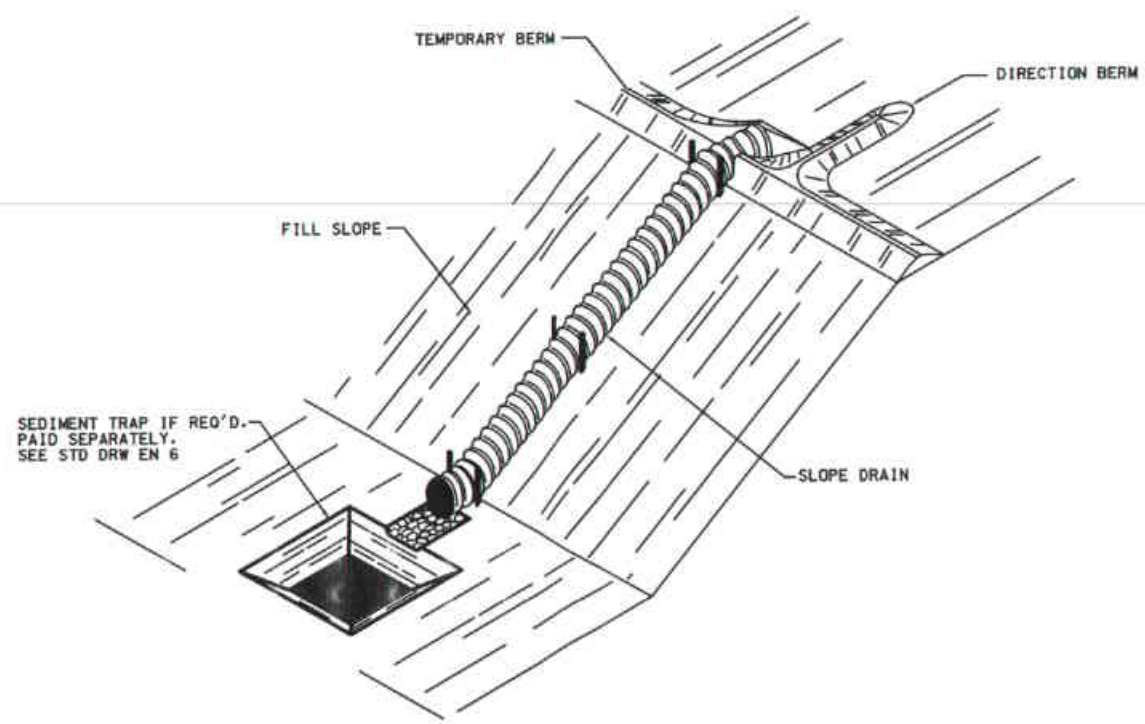
SLOPE DRAIN SECTION



TEMPORARY BERM

NOTES FOR TEMPORARY BERM:

1. COMPACT THE RIDGE OF EXISTING SOIL TO PROVIDE A NON-ERODIBLE BERM THAT DIVERTS STORM RUNOFF FROM RECENTLY CONSTRUCTED SLOPES. REPAIR ANY EROSION OF THE BERM IMMEDIATELY.
2. TEMPORARY BERMS ARE TYPICALLY USED IN CONJUNCTION WITH SLOPE DRAINS.



SLOPE DRAIN ISOMETRIC

NOTES FOR SLOPE DRAIN:

1. COMPACT THE SOIL SURFACE AND BERMS AROUND THE ENTRANCE TO THE PIPE END SECTION TO PREVENT WATER FROM UNDERMINING THE PIPE AND ERODING THE SLOPE. REPAIR ANY EROSION AROUND THE INLET. OUTLET OR SLOPE IMMEDIATELY.
2. SECURE THE PIPE TO THE GROUND EVERY 20' TO PREVENT PIPE MOVEMENT AND SUBSEQUENT FAILURES DURING STORM EVENTS.
3. USE WATER-TIGHT FITTINGS AT ALL SLOPE DRAIN CONNECTIONS.
4. EXTEND THE SLOPE DRAIN AS REQUIRED TO COINCIDE WITH THE HEIGHT OF THE EMBANKMENT.
5. EXTEND THE DRAIN A MINIMUM OF 3' BEYOND THE TOE OF THE SLOPE AND PROVIDE OUTLET PROTECTION.
6. 50 PERCENT OF THE RIPRAP TO BE BETWEEN 6" AND 8" WITH A MAXIMUM SIZE OF 12" AND A MINIMUM SIZE OF 4".
7. IF A SEDIMENT TRAP CANNOT BE CONSTRUCTED AT THE PIPE OUTLET PROVIDE A SEDIMENT TRAPPING DEVICE BEFORE THE PIPE INLET.
8. MAINTAIN SLOPE DRAINS UNTIL SLOPES HAVE BEEN PERMANENTLY STABILIZED. REMOVE SLOPE DRAINS AS DIRECTED BY OWNER.

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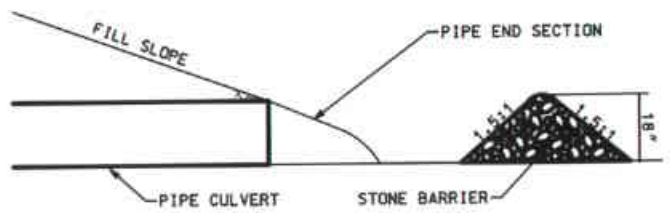
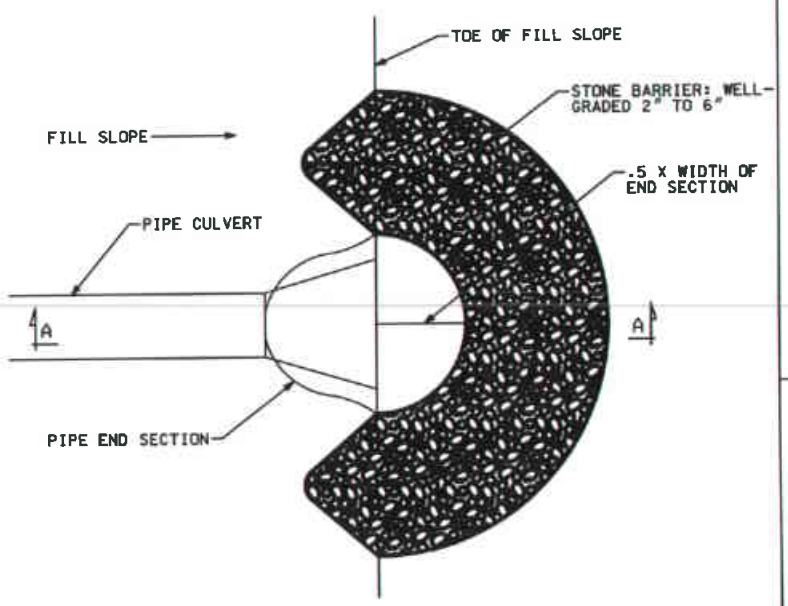
Title: Erosion Control Details (BMPS) Sheet 1 of 2	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 5B
RioTinto	Date: MARCH 2012
	URS

PIPE INLET BARRIER



SECTION A-A



PLAN VIEW

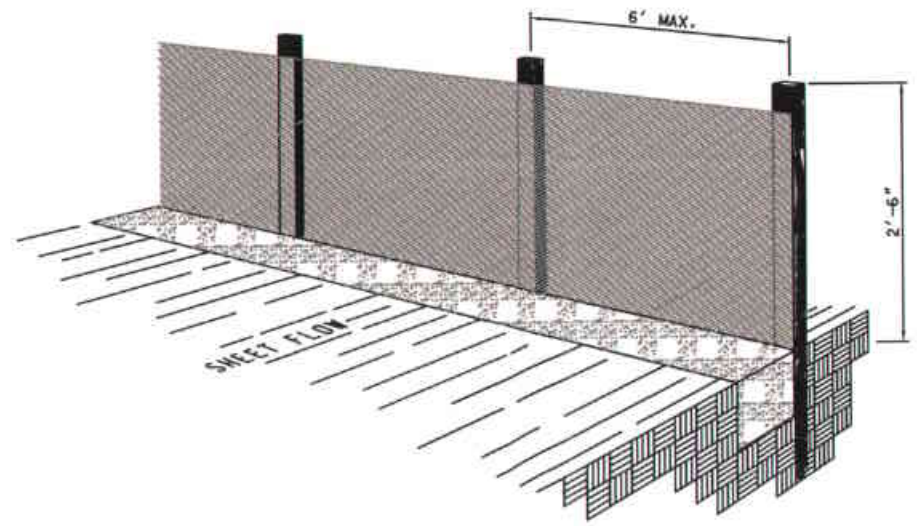
NOTES FOR PIPE INLET BARRIER:

1. PLACE PIPE INLET BARRIERS AT LOCATIONS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
2. MAINTAIN A PROPERLY FUNCTIONING SEDIMENT BARRIER THROUGHOUT CONSTRUCTION.
3. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.
4. WHEN SURROUNDING AREAS HAVE BEEN SEEDED AND MULCHED, REMOVE THE STONE BARRIER BY SPREADING THE STONE ALONG THE CUT DITCH.
5. AN 18" MINIMUM DIAMETER FIBER ROLL MAY BE USED AS A SUBSTITUTE FOR THE STONE BARRIER. STAKE AS SHOWN ON STD DRW EN 1.

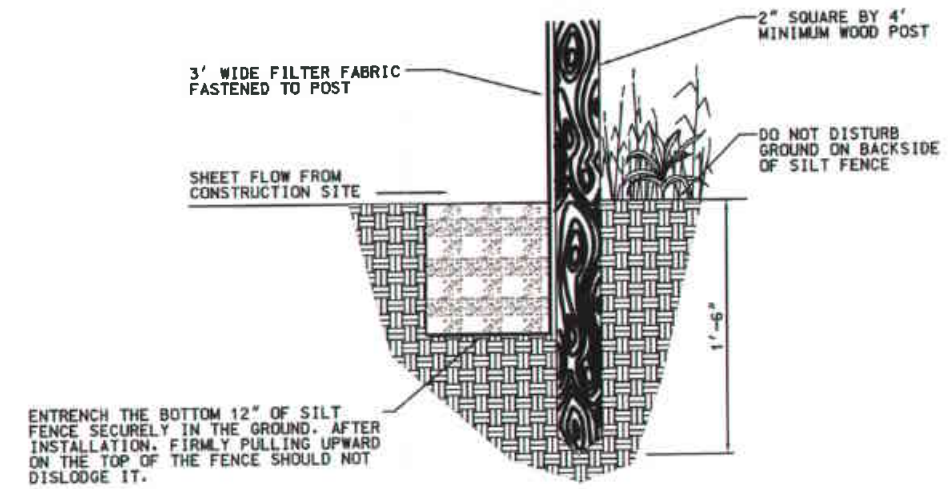
NOTES FOR CHECK DAMS:

1. PLACE A CHECK DAM AT EVERY TWO-FOOT DROP IN ELEVATION ALONG THE CUT DITCH.
2. A 9" TO 12" DIAMETER FIBER ROLL CAN BE USED IN PLACE OF THE 18" ROLL PROVIDED A ROLL IS INSTALLED AT EVERY ONE-FOOT DROP IN ELEVATION ALONG THE CUT DITCH.
3. PLACE CHECK DAMS PERPENDICULAR TO THE FLOW LINE OF THE DITCH.
4. DO NOT PLACE CHECK DAMS ACROSS NATURAL STREAM BEDS.
5. DO NOT USE STONE CHECK DAMS WITHIN CLEAR ZONES.
6. CONSTRUCT CHECK DAMS SO THAT WATER DOES NOT FLOW AROUND THE ENDS OF THE DAM.
7. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA AS DIRECTED BY THE OWNER.
8. AFTER SURROUNDING AREAS HAVE BEEN SEEDED AND MULCHED, SPREAD ROCK FROM CHECK DAMS TO LINE THE CUT DITCH AND BREAK APART FIBER ROLLS AND SPREAD THE STRAW OVER SEEDED AREAS.

SILT FENCE



PERSPECTIVE VIEW



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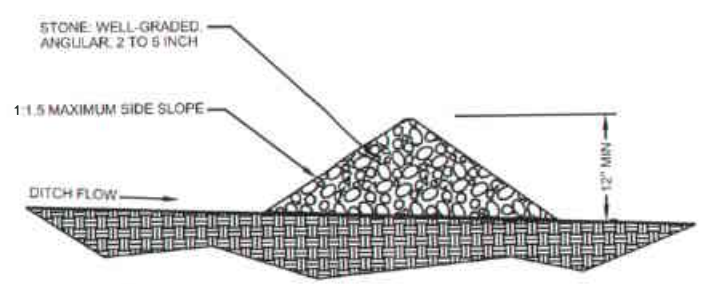
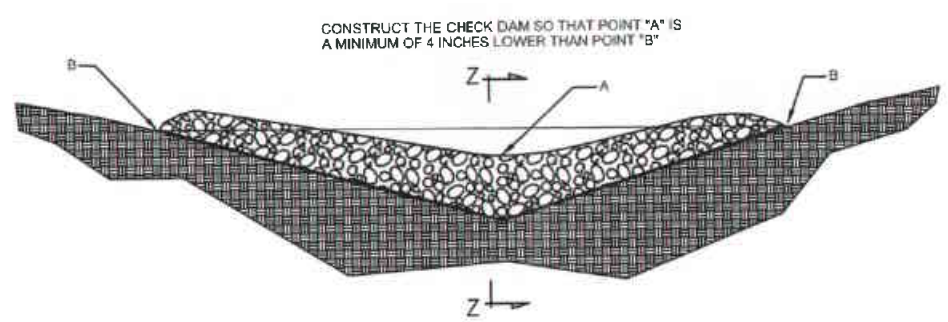


SECTION Z - Z



STONE CHECK DAM

NOTES FOR SILT FENCE:

1. WHERE PERMITTED, POSITION THE SILT FENCE 5' BEYOND THE TOE OF SLOPE.
2. TO AVOID CREATING LOW POINTS ALONG THE SILT FENCE, ALIGN THE FENCE ALONG THE CONTOUR AS MUCH AS POSSIBLE. WHERE EXCESSIVE RUNOFF WILL ACCUMULATE AT A LOW POINT, PROVIDE AN OPENING IN THE FENCE AND INSTALL A SEDIMENT TRAP.
3. WHEN EXCAVATING THE TRENCH, USE MACHINERY THAT WILL MINIMIZE DISTURBANCE.
4. TO PREVENT RUNOFF FROM FLOWING AROUND THE ENDS OF THE SILT FENCE, RUN THE ENDS OF THE FENCE UP SLOPE.
5. DO NOT PLACE SILT FENCE ACROSS POTENTIAL CONCENTRATED FLOWS (e.g., PIPE OUTLETS, DRAINAGE CHANNELS, CUT DITCHES).
6. AVOID USING SPLICES ALONG THE FENCE AS MUCH AS POSSIBLE. IF A SPLICE IS NECESSARY, BEFORE POUNDING IN THE END POSTS, OVERLAP THE END POSTS AND TWIST 180 DEGREES.
7. MAINTAIN A PROPERLY FUNCTIONING SILT FENCE THROUGHOUT THE DURATION OF THE PROJECT OR UNTIL DISTURBED AREAS HAVE BEEN VEGETATED.
8. WHEN A STORM EVENT DEPOSITS SEDIMENT BEHIND THE FENCE, REMOVE THE SEDIMENT AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.
9. IN AREAS THAT HAVE BEEN SEEDED AND MULCHED, REMOVE SILT FENCE UNLESS THEY ARE PROTECTING A WETLAND OR WATER BODY.
10. SILT FENCE INSTALLATION AS DIRECTED BY OWNER.
11. SILT FENCE WILL BE MAINTAINED ON AN ONGOING BASIS.

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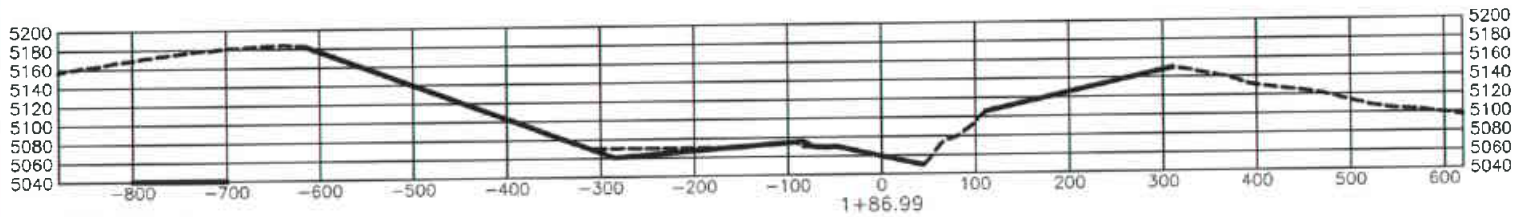
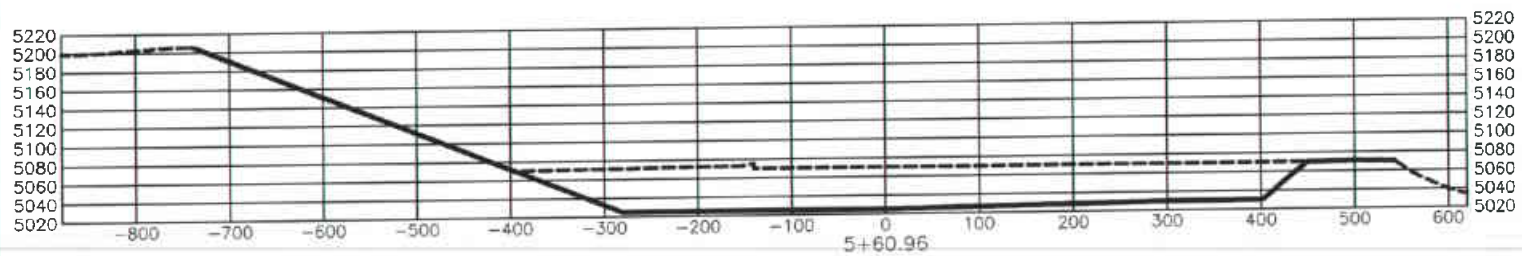
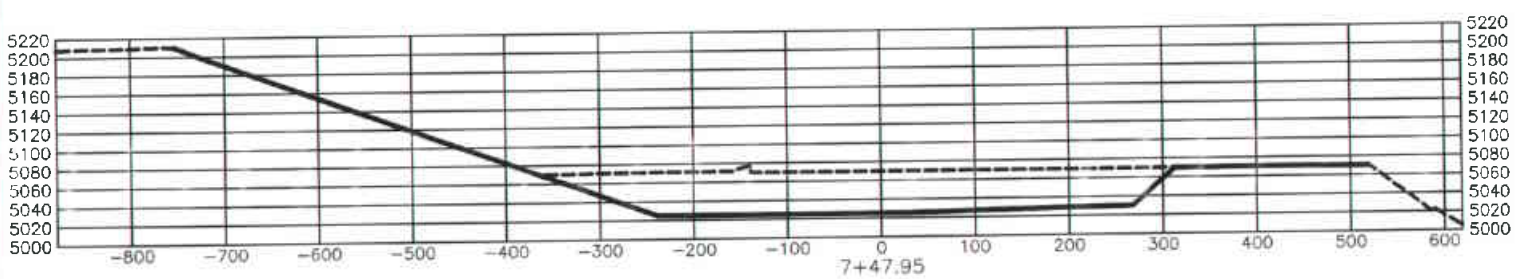
Title: Erosion Control Details (BMPS) Sheet 2 of 2	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 5C
RioTinto	Date: MARCH 2012
	URS



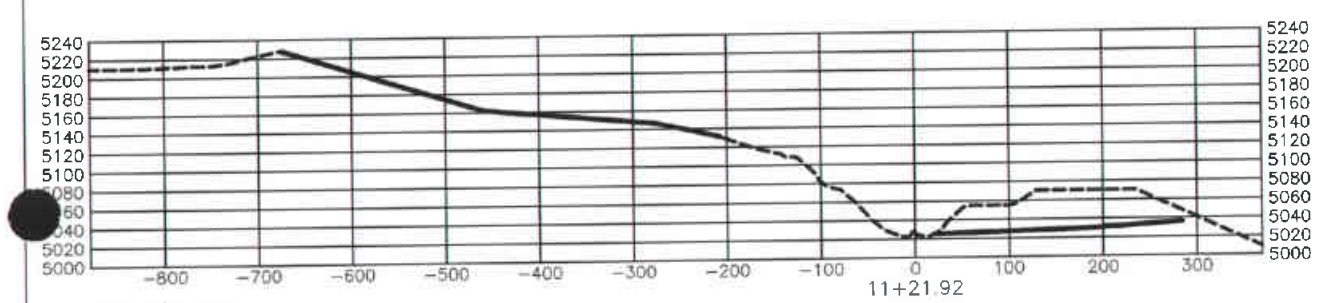
SEE FIG 4A



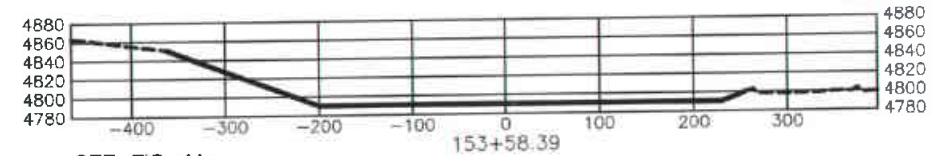
SEE FIG 4B



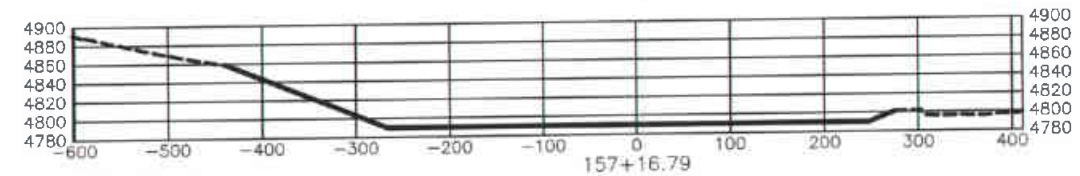
SEE FIG 4C



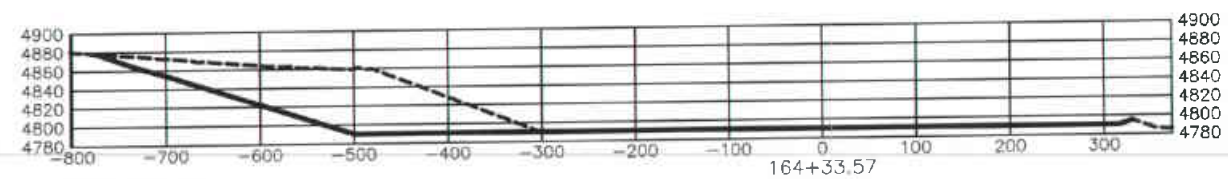
SEE FIG 4D



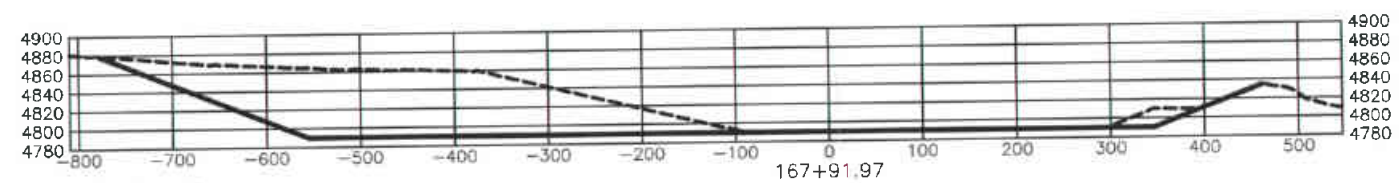
SEE FIG 4A



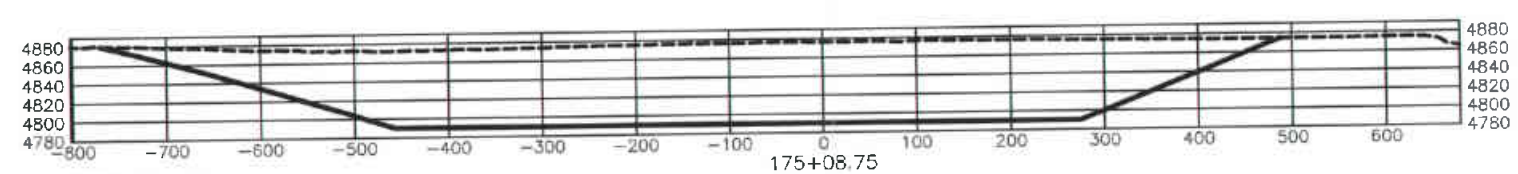
SEE FIG 4A



SEE FIG 4C



SEE FIG 4B



SEE FIG 4C

LEGEND

EXISTING GRADE

FINAL GRADE

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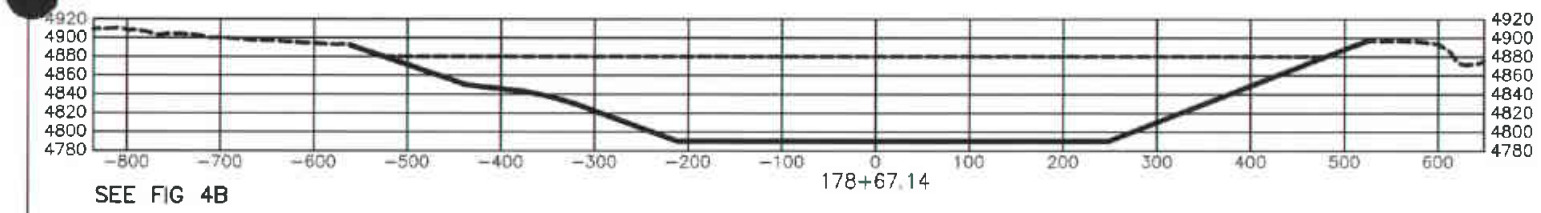
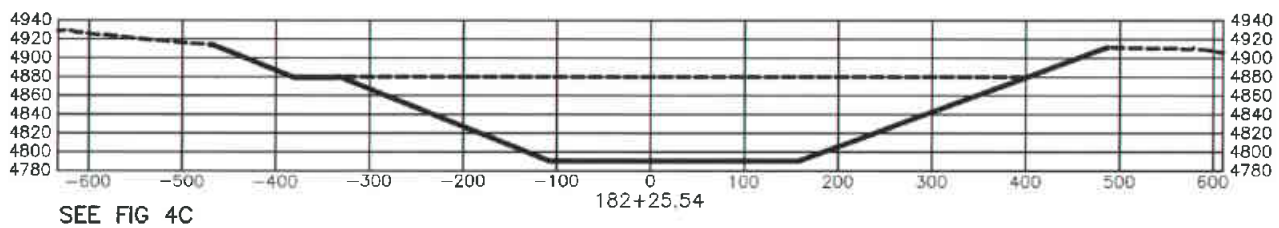
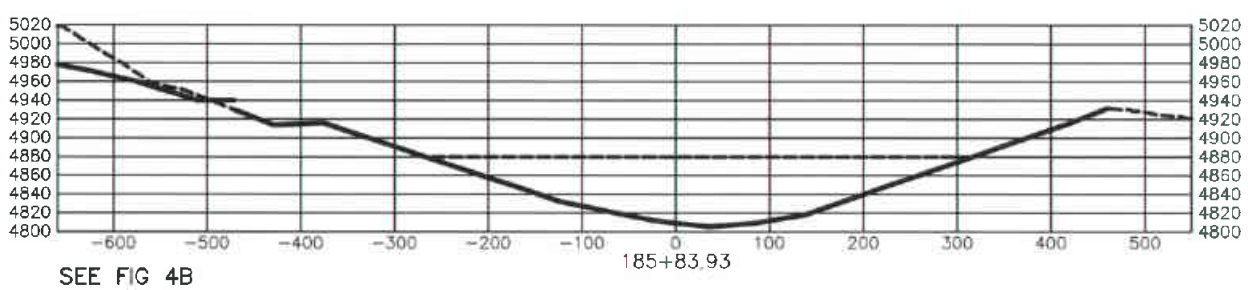
OCT 3 1 2012
DIV. OIL GAS & MINING

Title: Final Pit Cross-Sections and Benching	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 6
RioTinto	Date: MARCH 2012
	URS







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OCT 3 1 2012

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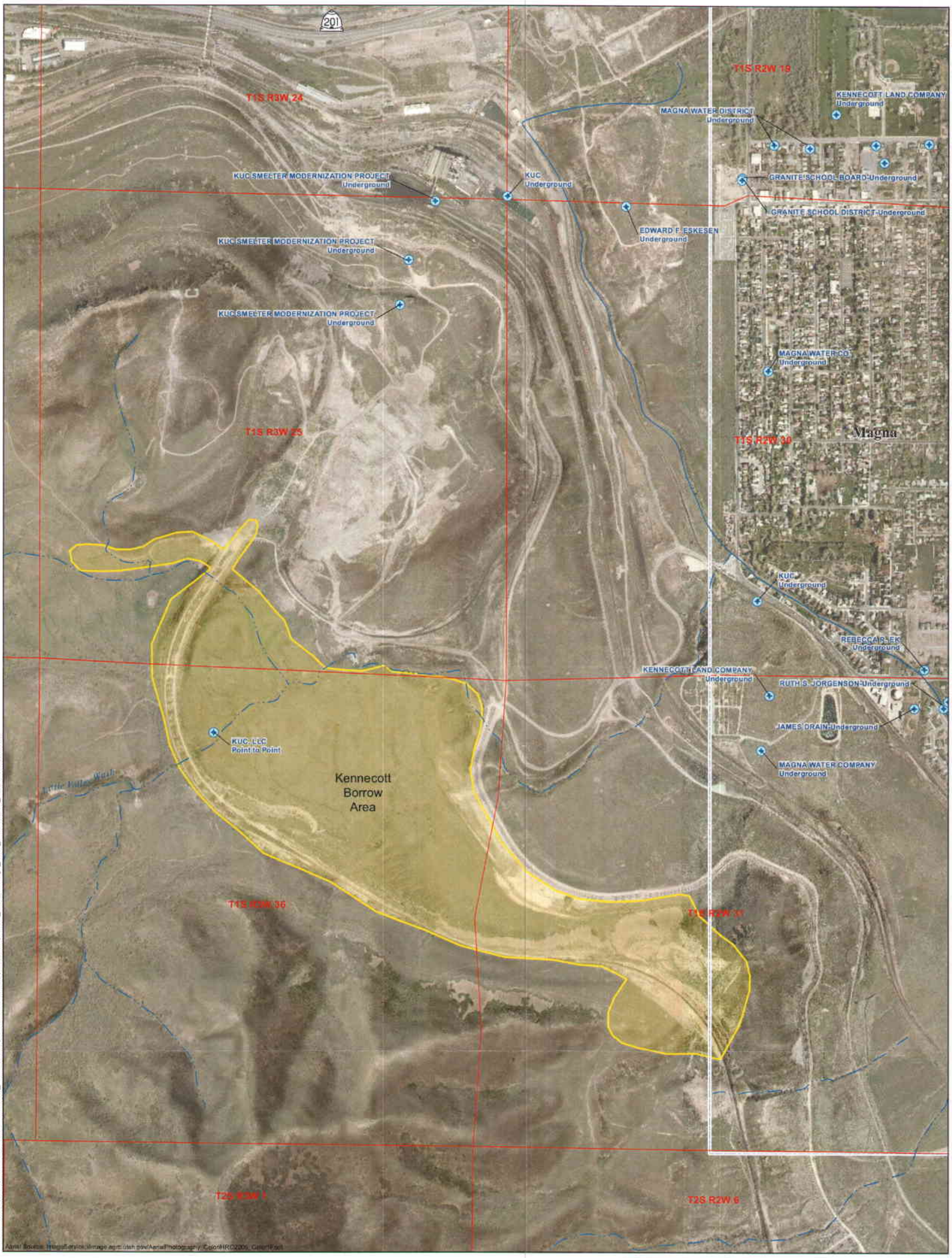
LEGEND

- - - - - EXISTING GRADE

——— FINAL GRADE

Title: Final Pit Cross-Sections and Benching	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 6A
RioTinto	Date: MARCH 2012
	URS



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Well Site
State of Utah, Department of Natural Resources, Division of Water Rights, 2011

Intermittent Stream

Magna Water Company Improvement Dist.
State of Utah, Department of Natural Resources, Division of Water Rights, 2010

PLSS Township, Range

Mine Limits

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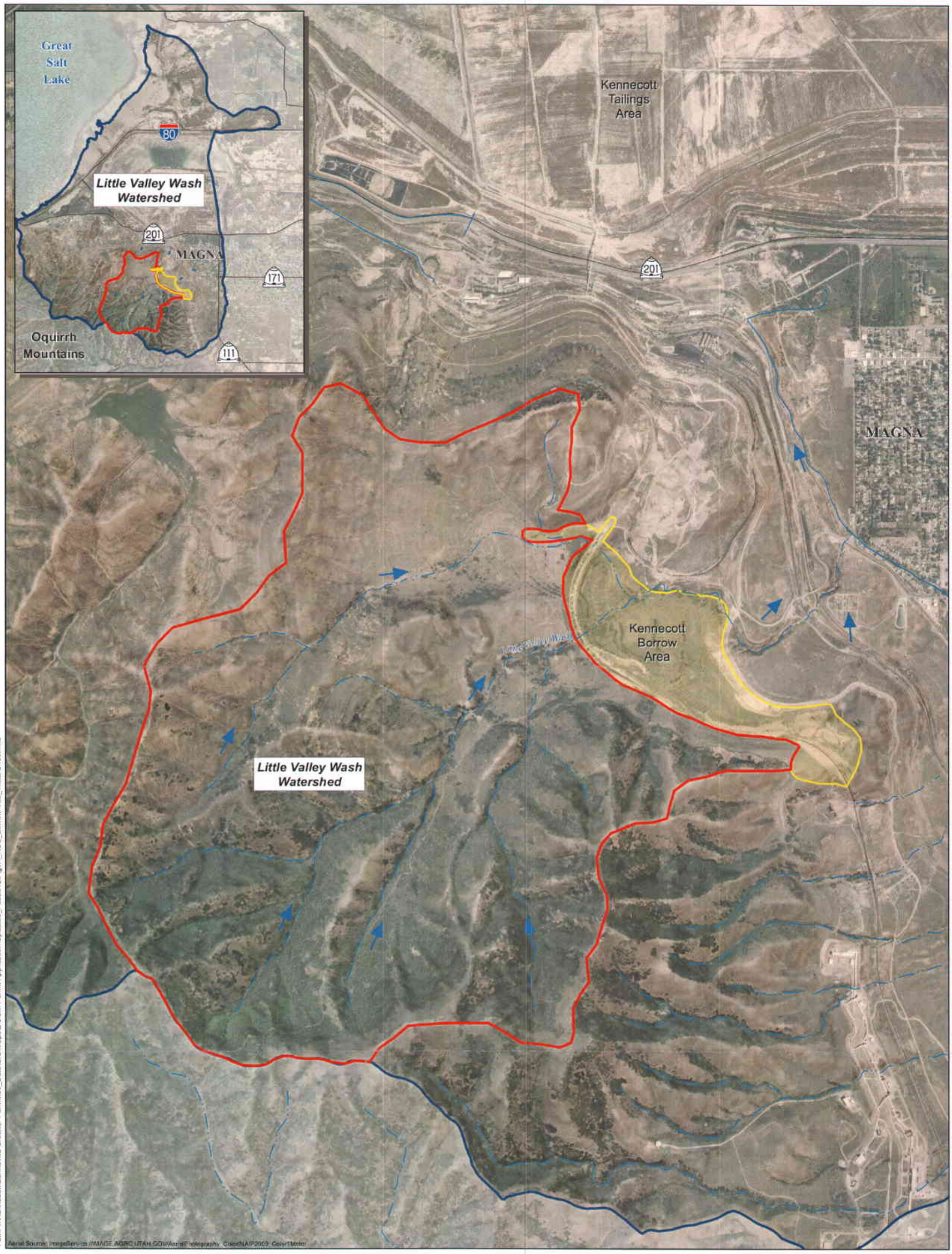
0 500 1,000 1,500 Feet

Title: Utah State Division of Water Rights Well Location Map	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 7
RioTinto	Date: March 2012
	URS



Intermittent Stream

Surface Water Flow Direction

Sub-watershed Boundary

Watershed Boundary
Watershed Data Source: USGS National Hydrography Dataset (NHD)

Mine Limits

0 1,000 2,000 3,000 Feet

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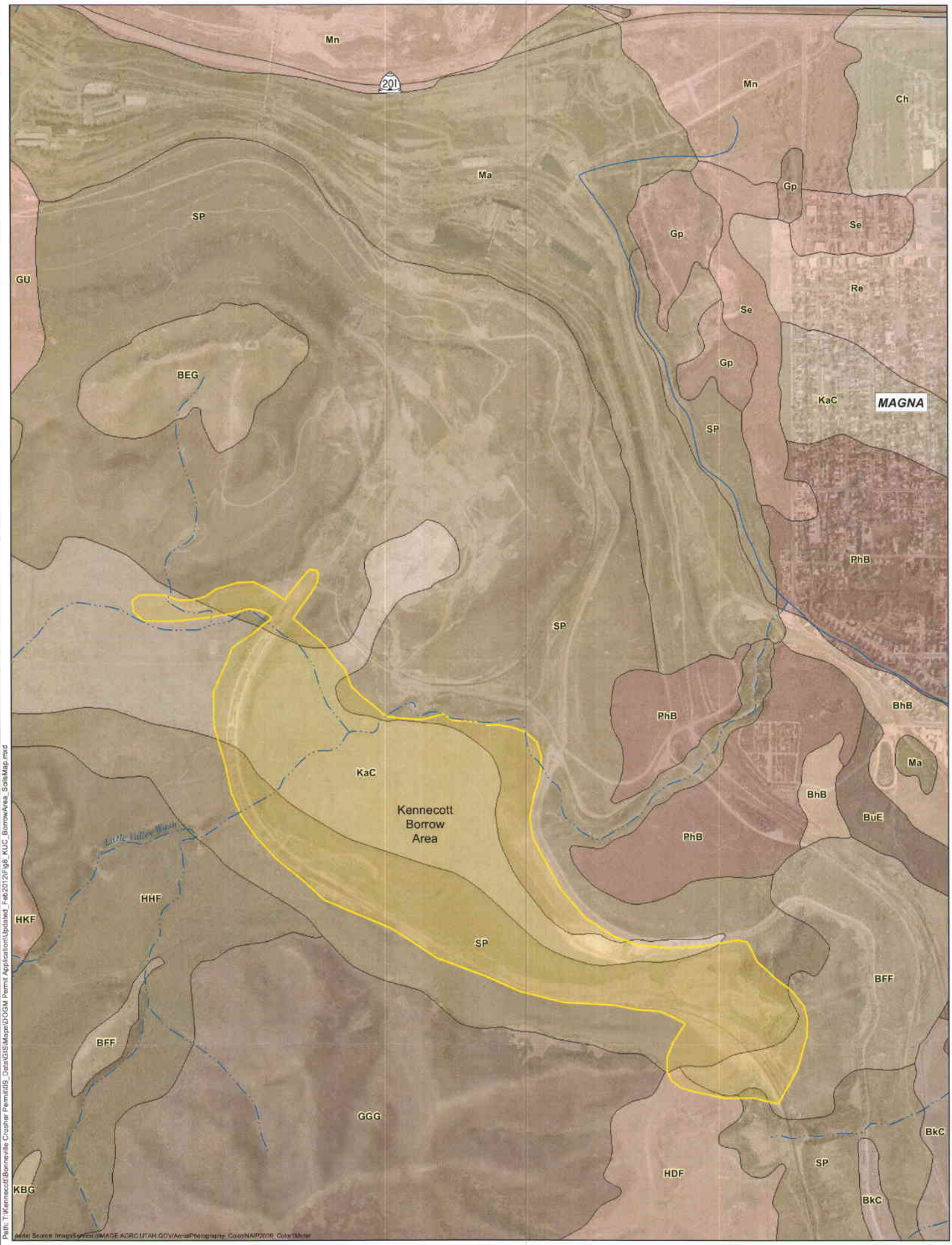
Title: Water Shed Map	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 7A
RioTinto	Date: March 2012
	URS

Path: T:\Kennecott\Bonneville Crusher Permit\09_Data\GIS\Maps\DOGM Permit Application\Updated_Feb2012\Fig7A_KUC_BorrowArea_WaterShed.mxd



Intermittent Stream

Mine Limits

Soil Units

Kac	Kearns silt loam, 3 to 6 percent slopes
SP	Stony terrace escarpments
BFF	Butterfield extremely stony loam, 5 to 50 percent slopes
HDF	Harkers-Dry Creek association, moderately steep

Soil Data Source: NRCS, http://soildatamart.nrcs.usda.gov/ssurgometadata.aspx

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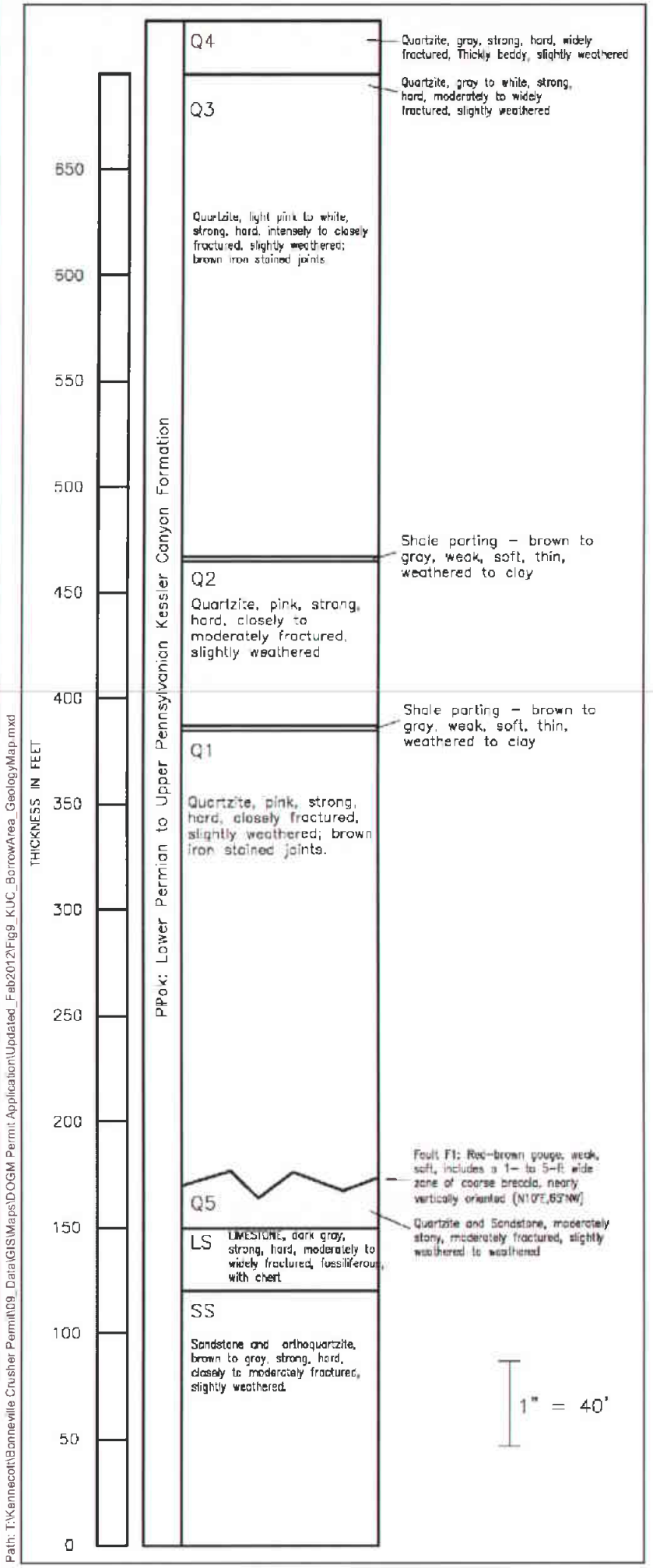
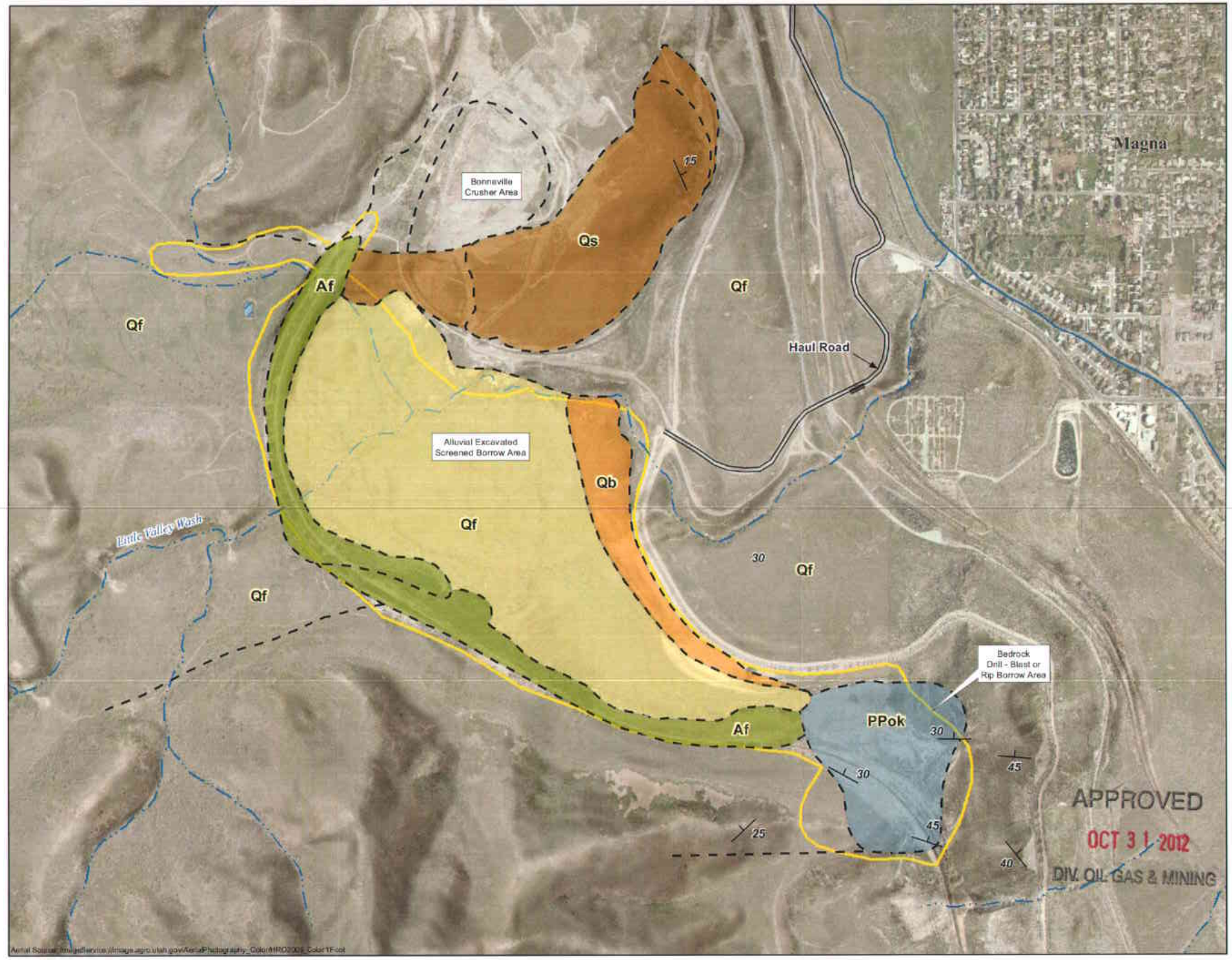
0 500 1,000 1,500 Feet

Title: Soil Map Unit Designation	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 8
RioTinto	Date: March 2012
	URS





40 Strike and Dip (Kessler Canyon Formation)

Geologic Units

- Af — Railroad Fill
- Qs — Lake Spit Deposits
- Qb — Lake Beach Deposits
- Qf — Fan Deposits
- PPok — Quartzite Bedrock

500 0 500 1,000 Feet

Title: Bonneville Borrow Area Surface Geologic Map	
Bonneville Borrow Area DOGM Permit Application	Proj No: 24585223
	Figure: 9
RioTinto	Date: March 2012
	URS

Path: T:\Kennecott\Bonneville Crusher Permit\09_Data\GIS\Maps\DOGM Permit Application\Updated_Feb2012\Fig9_KUC_BorrowArea_GeologyMap.mxd

Appendix A

Photos of Area

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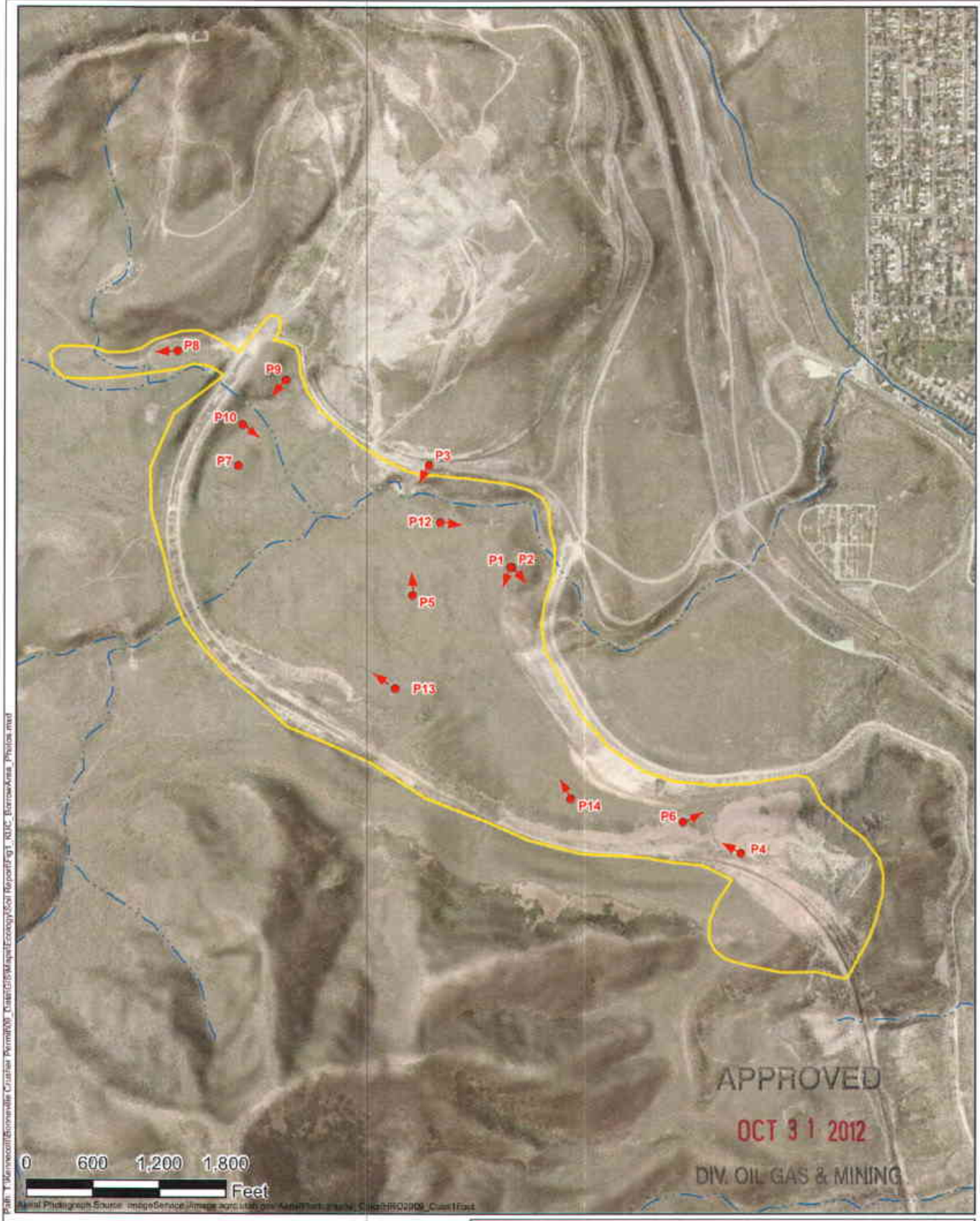


Photo Point Location
(Arrow indicates direction of photo)

Intermittent Stream

Notice of Intent Permit Boundary

Title: Photo Orientation Map	
Project: Bonneville Borrow Area	URS Proj No: 24585223
	Figure: 1
Client : Kennecott Utah Copper LLC	Date: February 2012
	URS

Photograph Log

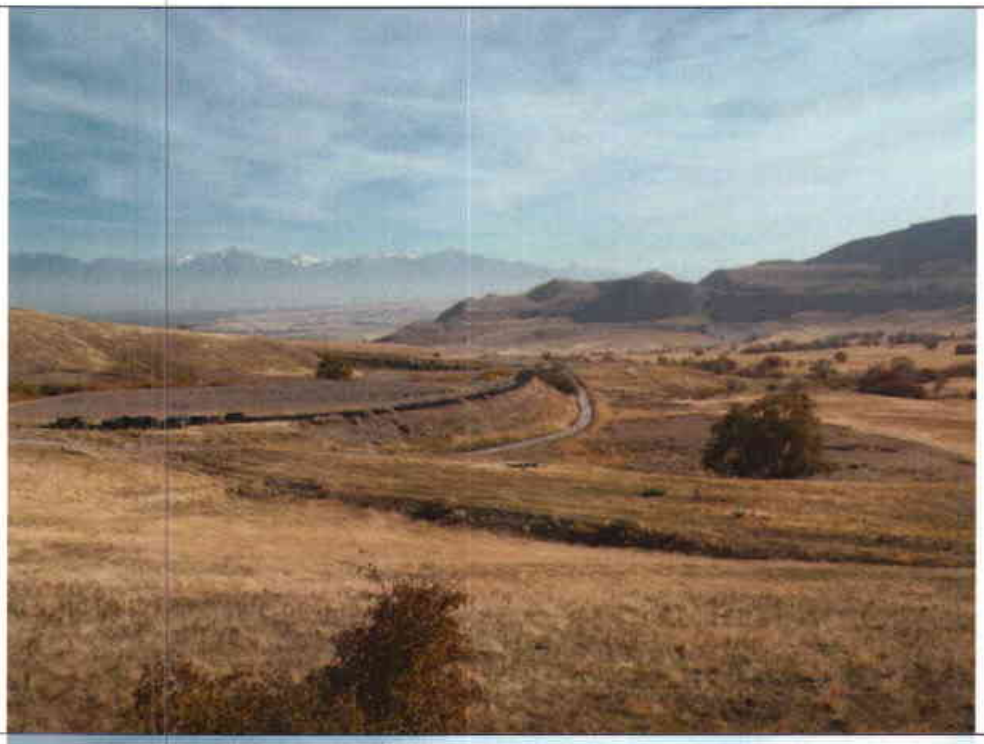
URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 1 of 8**
Client: Kennecott Utah Copper			**Date:** 11/4/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 1

Description:
Looking east at the Site from the access road inside the east site boundary.



Photograph: 2

Description:
Looking southeast at the Site from the access road inside the east Site boundary.

Recorded By: Laura Springsteen

Date 12/9/2010

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Photograph Log

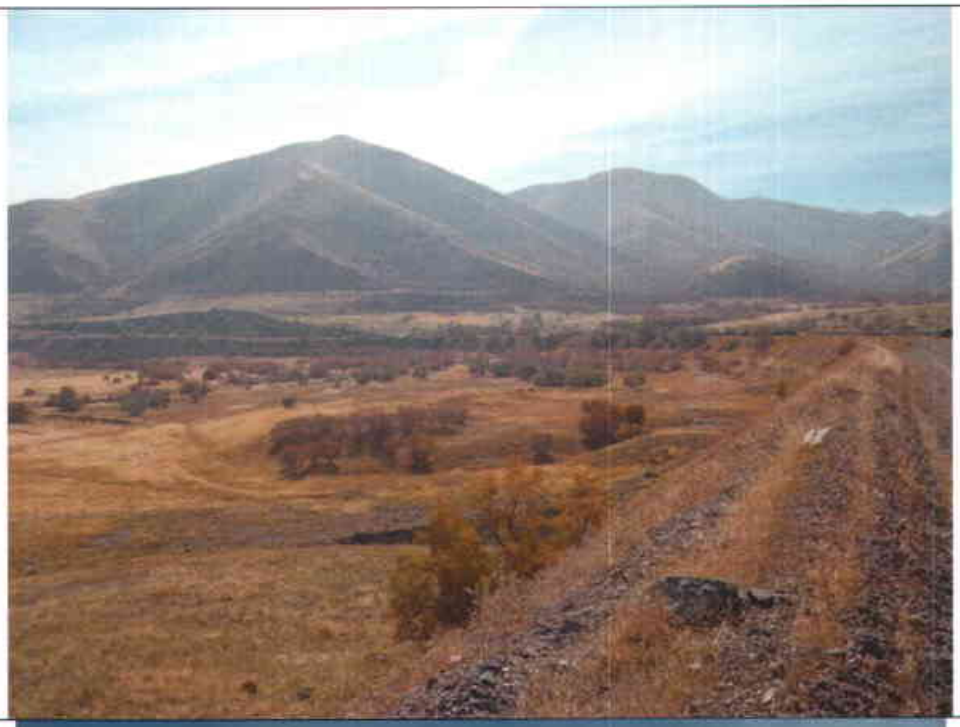
URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 2 of 8
Client: Kennecott Utah Copper			**Date:** 11/4/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 3

Description: Looking east at the Site from the access road inside the east Site boundary.



Photograph: 4

Description: Looking northwest at the Site from the southern access road.

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Recorded By: Laura Springsteen | Date 12/9/2010

Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 3 of 8**
Client: Kennecott Utah Copper			**Date:** 11/4/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 5

Description:
Looking north at grassland in the northern part of the Site.

Photograph: 6

Description:
Looking east at the low shrub vegetation community in the southeastern part of the Site.

Recorded By: Laura Springsteen

Date 12/9/2010

OCT 31 2012
DIV. OIL GAS & MINING

Photograph Log

URS

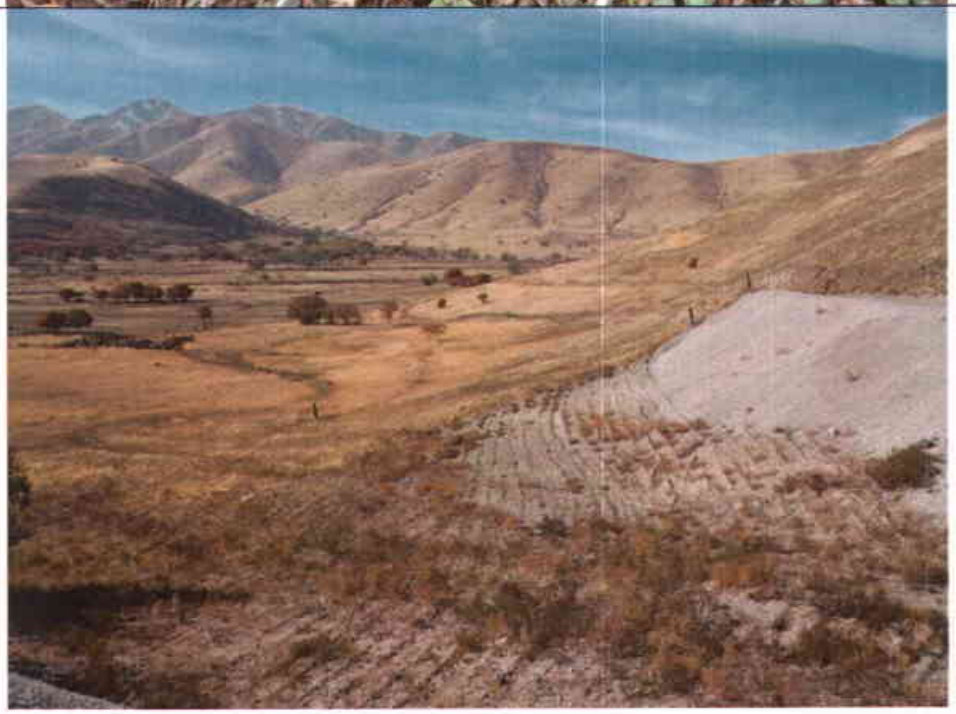
General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 4 of 8**
Client: Kennecott Utah Copper			**Date:** 11/16/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 7

Description:
Looking at an example of new growth that does not exhibit species identifying features. Pen cap is included in photograph for scale.

Photograph: 8



Description:
Looking west at area 1 of Site. Transect 1 is located in the grassland in the center of the photograph.

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Recorded By: Laura Springsteen | Date 12/16/2010

Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 5 of 8**
Client: Kennecott Utah Copper			**Date:** 11/16/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 9

Description:
Looking southeast at Transect 2.

Photograph: 10

Description:
Looking southeast at Transect 3.

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Recorded By: Laura Springsteen | Date 12/16/2010

OCT 3 1 2012

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 6 of 8**
Client: Kennecott Utah Copper			**Date:** 11/16/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 11

Description:
Looking east at Transect 4.

Photograph: 12

Description:
Looking east at Transect 5.

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Recorded By: Laura Springsteen

Date 12/17/2010

Photograph Log

URS

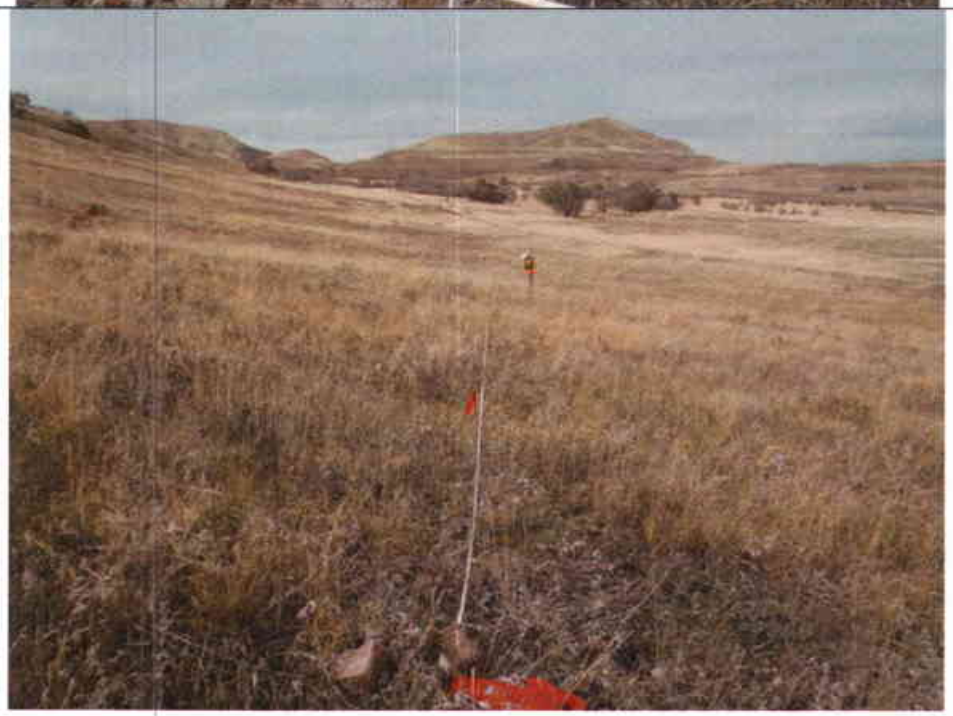
General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 7 of 8**
Client: Kennecott Utah Copper			**Date:** 11/17/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 13

Description:
Looking northwest at Transect 6.

Photograph: 14



Description:
Looking north at Transect 7.

APPROVED

Recorded By: Laura Springsteen

Date 12/17/2010

OCT 3 1 2012

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 8 of 8**
Client: Kennecott Utah Copper			**Date:** 11/17/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 15

Description:
Looking east at Transect 8.

Photograph: 16

Description:
Looking southeast with Transects 9 and 10 in the distance.

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Recorded By: Laura Springsteen | Date 12/16/2010

Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 1 of 5**
Client: Kennecott Utah Copper			**Date:** 4/6/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 1

Description:
Soil sample collection pit for Area 1, 0-6 inches deep.

Photograph: 2

Description:
Soil sample collection pit for Area 1, 6-12 inches deep.

Recorded By: Laura Springsteen | Date 4/6/2011

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 2 of 5
Client: Kennecott Utah Copper			**Date:** 4/5/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 3

Description:
Soil sample collection pit for Area 2, 0-6 inches deep.

Photograph: 4

Description:
Soil sample collection pit for Area 2, 6-12 inches deep.

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Recorded By: Laura Springsteen | Date 4/5/2011

Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 3 of 5
Client: Kennecott Utah Copper			**Date:** 4/5/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 5

Description:
Soil sample collection pit for Area 3, 0-6 inches deep.

Photograph: 6

Description:
Soil sample collection pit for Area 3, 6-12 inches deep.

Recorded By: Laura Springsteen | Date 4/5/2011

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Photograph Log

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General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 4 of 5
Client: Kennecott Utah Copper			**Date:** 4/6/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 7

Description:
Soil sample collection pit for Area 4, 0-6 inches deep.

Photograph: 8

Description:
Soil sample collection pit for Area 4, 6-12 inches deep.

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Recorded By: Laura Springsteen | Date 4/6/2011

Photograph Log

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General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 5 of 5
Client: Kennecott Utah Copper			**Date:** 4/6/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 9

Description:
Soil sample collection pit for Area 5, 0-6 inches deep.

Photograph: 10

Description:
Soil sample collection pit for Area 5, 6-12 inches deep.

Recorded By: Laura Springsteen | Date 4/6/2011

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Appendix B

Vegetation Study

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Ecological Baseline Report
Bonneville Borrow Area
Magna, Utah

Prepared For:

Kennecott Utah Copper, LLC
4700 Daybreak Building KUC Mine
South Jordan, Utah 84095

Prepared By:

URS

URS Corporation
756 East Winchester Street, Suite 400
Salt Lake City, Utah 84107

August 2011

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1.0 INTRODUCTION

URS has prepared this baseline report (report) for the proposed Bonneville Borrow Area (Site), in Magna, Salt Lake County, Utah (Appendix A - Figures 1 and 2). This report summarizes the results of the ecological surveys including: vegetation transects; threatened and endangered species and their habitats; and wildlife. The baseline surveys for soils, wetlands, and waters of the U.S. will be addressed in addendums to this report.

1.1 Purpose

This report provides information to the Utah Division of Oil, Gas and Mining (DOGM) and will be part of a Notice of Intention (NOI) to Commence Large Mining Operations. Ecological surveys for the Site are designed to provide an initial baseline assessment of habitat and wildlife conditions within the proposed area of the borrow pit. DOGM requires that an ecological baseline survey be completed. The information from the baseline survey will be used to determine the reclamation standard for the site upon the completion of the mining operation.

2.0 SITE DESCRIPTION

2.1 Regional

The Site is situated within the east foothills of the Oquirrh Mountains in Salt Lake County, Utah. This region is considered a semi-arid landscape and receives approximately 16 inches of precipitation annually (U.S. Census Bureau, 2000).

The ecoregion designations of the Site are Sagebrush Basins and Slopes and Woodland- and Shrub-Covered Low Mountains. The Sagebrush Basins and Slopes ecoregion is semiarid. The potential natural vegetation is Great Basin sagebrush. It is dominated by Wyoming big sagebrush with perennial bunchgrasses. The Woodland- and Shrub-Covered Low Mountains ecoregion is covered by woodland or, at higher elevations, by mountain brush (Woods et al., 2001).

The landscape consists of shrub steppe vegetation communities, man-made terraced landscape, dry washes, rock outcroppings, and rolling hills with mountains to the south and west and the Salt Lake Valley to the east (Appendix B - Photographs 1 through 4). The northeast portion of the Site is fenced off and used for livestock grazing.

2.2 Local Area

The Site is located in an area known as Little Valley on Kennecott Utah Copper, LLC (Kennecott) property. The Site is approximately 300 acres set aside for a proposed borrow area (Figure 1). It is accessed through the Kennecott entrance on 9180 West off of State Route-201 on the west side of Magna, Utah (Figure 1). The Site can be found on the United States Geological Survey 7.5 minute Farnsworth Peak, UT (1974) and Magna, UT (1979) quadrangle maps within Township 1 South, Range 2 West, Section 31 and Township 1 South, Range 3 West, Sections 25 and 36. The approximate Site center point is Latitude 40.693° and Longitude 112.25°. Site elevation ranges between approximately 5,240 and 4,800 feet above mean sea level.

The Site is located on the eastern facing slope of the Oquirrh Mountains, which are relatively broad and predominantly comprised of the very thick Pennsylvanian-Permian (39 to 36 million years ago) Oquirrh Formation.

The Site consists of rolling terrain, steep slopes, rock outcroppings and man-made terraces. The moisture in this region comes in the form of precipitation and run-off from the mountains. Surface and groundwater flow in a general eastern trend toward the Salt Lake Valley where they infiltrate into a shallow aquifer. In the 1920s several flash flood events from storm bursts caused major damage in

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Magna. In the 1940s there was an historic reservoir constructed above the Site in Little Valley. The reservoir dam failed and flooded Magna. Flood control measures, including the construction of terraces, were installed on the Site (USU, 2000). Most of the area has been revegetated and is dominated by grasses (Neville, 2010). Flood control measures, including the construction of terraces, were installed on the Site (USU, 2000) in 1950's to help alleviate the potential for future flooding events to impact Magna. Most of the area has been revegetated and is dominated by grasses (Neville, 2010). There has not been any flooding since the flood control work was completed. The reservoir was not reconstructed (USU, 2000).

Currently, the mining operation consists of a borrow pit on the eastern part of the Site (Figure 2). There are two main access roads to the Site, one borders the southern Site boundary and the other borders the northern Site boundary. There is an old railroad bed (track has been removed) outside the southern boundary that is currently being removed. Photographs of the Site are provided in Appendix B.

3.0 OBJECTIVES

The objective of this baseline report is to accurately depict and document the existing site conditions prior to the proposed borrow area. This baseline report covers the following three sections: Vegetation, Threatened and Endangered Species, and Wildlife. Wetlands and Waters of the U.S. and Soils data will be reported in addendums. The existing site conditions have been recorded so that, upon the completion of the mine operations, the Site can be reclaimed as close to its original condition as possible.

4.0 METHODS

In order to complete a vegetation, threatened and endangered specis and wildlife baseline survey, the following tasks were conducted: vegetation community mapping; vegetation transects for community diversity and percent cover; a survey for threatened and endangered species and their habitats; and identification of wildlife species observed on-site. These tasks were implemented in the field on November 4, 5, 16, and 17, 2010. A MobileMapper 6™ global positioning system (GPS) unit by AshTech was used during the survey. The study area being considered for the borrow area is approximately 300 acres.

4.1 Vegetation Community Mapping

The Site was walked on November 4 and 5, 2010. Plant species were identified and four vegetation communities were defined; weeds, grassland, low shrub, and tall shrub. The boundaries of these communities were hand drawn onto aerial photograph field maps. Vegetation community boundary data were then digitized using ESRI® ArcMap.

4.2 Vegetation Community Diversity

Ten, 200-foot, transects were determined randomly across the study area. The starting location of transects were randomly selected using ESRI ArcMap Hawths Tools. The orientation of each transect was determined by the results of a number range from one to 360 selected by a random number generator (Haahr, 1998). Transects were verified to ensure a proportional representation to the different vegetation communities existing onsite. In some cases, the location and/or orientation of transects were adjusted to ensure representative coverage of the four vegetation communities based on the spatial area of each community. Barren areas were not included. In order to document the Site, photographs were taken at each of the transects (Appendix B - Photograph Log).

A total of 25 1-meter square vegetation plots were monitored within each transect. For each plot, plant species were identified and the percent coverage, including bare ground, was estimated.

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After field surveys were completed, data were analyzed to determine the diversity index, and the average cover for each species was calculated. The Simpson Diversity Index (D) (OWWT, 2010) was used to calculate the diversity index. Simpson Diversity Index (D) measures the probability that two individuals randomly selected from a sample will belong to the same species. The results are documented in Section 5.1 of this report. Calculations are included in Appendix C.

For each of the grassland and low shrub transects, a diversity index was calculated for all species observed using the Simpson Diversity Index (D)*. For each plant species identified, a total percent cover and an average percent cover was determined. For the tall shrub transects (transects 9 and 10) a Simpson's Diversity Index (D) was calculated for the tall shrub species only.

The Simpson's Diversity Index (D) is used to estimate the number of different species that should be used when developing the reclamation seed mix. The total percent cover was determined for each individual species per transect by adding the percent cover for each species found within each sample plot for that transect. The average percent cover was determined by taking the total percent cover for each species and dividing by the number of sample plots for each transect. There were a total of 10 transects and 250 sample plots. Refer to Tables 2 and 3, for the sample results from each transect.

$$\text{*Simpson's Diversity Index } D = \frac{\sum n(n-1)}{N(N-1)}$$

n = the total number of organisms of a particular species. When calculating D for vegetation communities percent cover is used to derive n.
N = the total number of organism of all species

The Simpson's Diversity Index (D) ranges from zero to one. In general, if the value of D is close to zero, this indicates greater diversity, and if the value of D is close to one, this indicates low diversity.

4.3 Threatened and Endangered Species

Background information pertaining to federally listed threatened and endangered species and state species of special concern was obtained through online resources at the U.S. Fish and Wildlife Service (USFWS) and the Utah Division of Wildlife Resources (DWR) (DWR, 2010a, 2010b) internet pages. An information request was submitted to DWR (Appendix D). In addition, a search of the UDWR database was done to see if critical habitat coincided with our project location and signs and/or habitat of specific species were looked at during the field effort.

4.4 Wildlife

Wildlife species, and their sign, observed during the Site visit were documented.

4.5 Soils

Soil data has been gathered and is reviewed in an addendum to this report.

4.6 Wetlands and Waters of the U.S.

The National Wetlands Inventory (USFWS, 2003) for the Site was reviewed. A wetland and waters of the U.S. delineation has been conducted and is documented in an addendum to this report.

5.0 RESULTS

On November 4, 5, 16, and 17, 2010, URS staff conducted field surveys in accordance with the methods described in Sections 4.1 through 4.6. On November 4 and 5, 2010, the weather was sunny with very light breezes and high temperatures of mid-60 degrees Fahrenheit. On November 16, 2010, it was partly

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cloudy and cold with a very strong south wind and a short hail storm in the afternoon. On November 17, 2010, the sky was clear and it was cold (50 degrees Fahrenheit) with a very light breeze.

5.1 Vegetation Community Diversity

As discussed previously, the Site is primarily grassland that was revegetated as part of previous flood control work. The following four vegetation communities were identified: weed, grassland, low shrub, and tall shrub. The weed area is dominated by cheatgrass (*Bromus tectorum*), common ragweed (*Ambrosia artemisiifolia*), and field pennycress (*Thlaspi arvense*). The grassland areas are dominated by cheatgrass (*Bromus tectorum*), common ragweed (*Ambrosia artemisiifolia*), Great Basin wildrye (*Leymus cinereus*), and Kentucky bluegrass (*Poa pratensis*). Low shrub areas are dominated by rabbitbrush (*Chrysothamnus nauseosus*), big sagebrush (*Artemisia tridentata*), and shadscale (*Atriplex confertifolia*). Tall shrub areas are dominated by Russian olive (*Elaeagnus angustifolia*) and Gambel oak (*Quercus gambelii*) with a grass understory. There are some non-native species such as cheat grass (*Bromus tectorum*), common ragweed (*Ambrosia artemisiifolia*), curly dock (*Rumex crispus*), field pennycress (*Thlaspi arvense*), salt cedar (*Tamarix* sp.), Canada thistle (*Cirsium arvense*), and whitetop (*Cardaria draba)*. Canada thistle (*Cirsium arvense*) and whitetop (*Cardaria draba*) are listed in Utah noxious weeds (Belliston et al., 2006). A list of vegetation observed as provided below in Table 1.

Table 1. Vegetation Identified at Bonneville Borrow Area, November 2010

Common Name	Scientific Name	Common Name	Scientific Name
Arrowleaf balsamroot	*Balsamorhiza sagittata*	New-Mexican Locust	*Robinia neomexicana*
Big sagebrush	*Artemisia tridentata*	Rabbitbrush	*Chrysothamnus nauseosus*
Big galleta	*Pleuraphis rigida*	Russian olive	*Elaeagnus angustifolia*
Cheatgrass	*Bromus tectorum*	Salt cedar	*Tamarix* sp.
Common ragweed	*Ambrosia artemisiifolia*	Shadscale	*Atriplex confertifolia*
Crescent milkvetch	*Astragalus aniphioxys*	Shrub live oak	*Quercus turbinella*
Curly dock	*Rumex crispus*	Silver sagebrush	*Artemisia cana*
Field pennycress	*Thlaspi arvense*	Snakeweed	*Xanthocephalum sarothrae*
Foxtail barley	*Hordeum jubatum*	Canada thistle	*Cirsium arvense*
Gambel oak	*Quercus gambelii*	Western wheatgrass	*Pascopyrum smithii*
Great Basin wildrye	*Leymus cinereus*	Whitetop	*Cardaria draba*
Indian ricegrass	*Achnatherum hymenoides*	Yarrow	*Achillea millifolium*
Kentucky bluegrass	*Poa pratensis*	Yellow clover	*Melilotus officinalis*

* Salt Grass was observed during the wetland delineation field survey April 2011, however was not observed during the November 2010 vegetation field survey.

5.2 Vegetation Transects

Five transects were located in the grassland community, two transects were located in the tall shrub community, two transects were located in the low shrub community, and one transect was located in a weed community. Table 2 lists the Simpson Diversity Index (D) and the average percent of bare ground for each vegetation community.

Table 2. Vegetation Diversity Indices, Bonneville Borrow Area, November 2010

Vegetation Community	Simpson Diversity Index (D)	Average Percent Bare Ground
Weed	0.24	13.8
Grassland	0.14	10.3
Low Shrub	0.12	35.6
Tall Shrub	0.51	NC

NC = not calculated. See text below for bare ground analysis of this vegetation community.

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The Site exhibits a highly diverse vegetation population. The value of D is less than 0.24 for the weed, grassland, and low shrub vegetation communities. The tall shrub diversity index shows lower diversity because only the tall shrub canopy is used to calculate the diversity. The largest species will normally be relatively homogenous. Tall shrub areas have an understory very similar to the grassland areas. Although tall shrub areas show a lower diversity index, if you were to look at the understory, the diversity index would be similar to the grassland index. Refer to Appendix C for the Simpson's Diversity Index calculations.

The Average Percent Bare Ground results are figured by averaging the bare ground observed for each of 25 plots along transects in the respective vegetation community and then averaging those results. Refer to Appendix C for the Average Bare Ground calculations. The bare ground is not calculated for the tall shrub vegetation community because the field data gathered for this community only includes the number and species of tall shrubs. The low growing vegetation within the tall shrub transects closely resembles that in the grassland community. The percent bare ground very close to the grassland bare ground, except that there is approximately 40 percent coverage comprised of the overstory of tall shrubs.

Although the Site has been disturbed in the past, the previous regrading and revegetation efforts have successfully maintained a high level of vegetation diversity. Photographs taken of each transect are provided in Appendix B (photographs 8 through 16) and portray the types of vegetation and Site conditions.

5.3 Threatened and Endangered Species

The USFWS has listed five federally protected species with the potential to occur or be affected by projects within Salt Lake County, Utah. These species are listed in Table 3. No individuals or potential habitats of any of the listed species were identified during fieldwork. In addition, the USFWS and DWR were contacted for additional information concerning threatened or endangered species within the Bonneville Borrow Area (Appendix D). This section describes the habitat and the potential impact determinations for each species.

Table 3. Threatened and Endangered Species of Salt Lake County

Common Name	Scientific Name	Status[1]
Vegetation		
Ute ladies'-tresses orchid	*Spiranthes diluvialis*	T
Wildlife		
Least chub	*Iotichthys phlegethontis*	C
Greater sage-grouse	*Centrocercus urophasianus*	C
June sucker	*Chasmistes liorus*	E
Yellow-billed cuckoo	*Coccyzus americanus*	C

[1] T = Threatened, E = Endangered, and C = Candidate

Ute Ladies'-tresses

The Ute ladies'-tresses has a federal status of threatened. It occurs along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams (DWR, 2010b). There is no potential habitat for the Ute ladies'-tresses on the Site.

Greater Sage-grouse

The greater sage-grouse is a federal candidate species. They inhabit sagebrush plains, foothills, and mountain valleys. Sagebrush is the predominant plant of quality habitat (DWR, 2010b). The species relies on sagebrush with a good understory of grasses and forbs and associated wet meadows for habitat. Sagebrush on the Site is sparse and there are no wet meadows on or adjacent to the Site; therefore, the

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Site is not optimum habitat for the greater sage-grouse. No individuals of this species were identified within or adjacent to the project area.

Least Chub
The least chub is a candidate federal status species. They inhabit ponds, streams, and springs within the Bonneville Basin (DWR, 2010b). There are no water bodies on the Site that would support the least chub.

June Sucker
The June sucker has a federal status of endangered. They inhabit Utah Lake and the Provo River (DWR, 2010b). There are no water bodies on the Site that would support the June sucker.

Yellow-billed Cuckoo
The yellow-billed cuckoo is a federal candidate species. It can be found in dense lowland riparian habitat at 2,500 to 6,000 feet above mean sea level; usually within 300 feet of water. The yellow-billed cuckoo is a neotropical migrant that nests in localized riparian valleys throughout Utah (DWR, 2010b). The Site does not have habitat to support the yellow-billed cuckoo because there is no riparian habitat. No individuals of this species were identified within or adjacent to the project area.

5.4 Other Wildlife
Eight species of wildlife were identified during the field surveys (Table 4). Most identifications were visual observations of individuals, but identifications were also made by observing scat and vocalizations. The species identified were typical of arid areas that have limited resources due to low precipitation.

The Site supports abundant mule deer and elk populations. Mule deer were observed on the Site and the bugling calls of elk were heard during the Site visit. As the surveys were conducted during the late fall, outside of nesting season, the diversity of bird species observed was limited. There were six abandoned bird nests observed on the Site. They were large nests, made mostly of twigs, in small to medium trees. They were most likely used by American crow or cow birds.

Table 4. Wildlife Species Identified at the Bonneville Borrow Area, November 2010

Common Name	Scientific Name	Type of Observation
Black-billed magpie	*Pica hudsonia*	Visual
Elk	*Cervus canadensis*	Sound, Scat
Mountain chickadee	*Poecile gambeli*	Visual and Sound
Mule deer	*Odocoileus hemionus*	Visual
Red squirrel	*Tamiasciurus hudsonicus*	Visual
Red-tailed hawk	*Buteo jamaicensis*	Visual
Robin	*Turdus migratorius*	Visual
Western scrub-jay	*Aphelocoma californica*	Visual

5.5 Wetlands and Waters of the U.S.
A Wetlands and Waters of the U.S. delineation has been conducted at this time and is documented in Appendix E of this report.

5.6 Soils
This information will be provided in an addendum to this report.

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6.0 RECLAMATION AND RECOMMENDATIONS

Utah Division of Oil, Gas, and Mining, Practical Guide to Reclamation (UDOGM, 2000) should be used as a reference during the reclamation process. In general, post-mining land should be returned as close as possible to its natural landscape for wildlife and soil stabilization. Restoration of the topography in Little Valley should be accomplished with care to prevent future flooding in the city of Magna.

Soils should be prepared in accordance with the *Practical Guide to Reclamation* (DOGM, 2000). Soils should be roughened in order to lower the soil loss potential, increase moisture retention, cool surface temperatures, and increase seed germination. For best propagation, seed should be applied in the late fall. Broadcast seeding will limit the amount of soil disturbance. It is recommended that no fertilizer amendments be applied to the revegetated areas because fertilizer can promote the growth of invasive species. Care should be taken to eradicate all noxious weeds and their seeds prior to seeding.

Vegetation should be replaced to mimic the vegetation present on site prior to mining. Revegetation seed mixes can also be designed to reflect the surrounding vegetation present when the reclamation occurs. The seed mix should reflect the species composition observed within the project area prior to mining and the surrounding landscape as well as those species not observed, but typically associated with the landscape, soil type, elevation, and precipitation of the project area. The use of native plant species is preferred. It is understood that if a specific species is not available during the time of seeding, it may be necessary to substitute a similar species. The seed mix used should include at least seven plant species in order to mimic current vegetation diversity.

7.0 SUMMARY

This baseline report describes the ecological conditions of the following three resources: vegetation, threatened and endangered species, and wildlife. Wetlands and Waters of the U.S. and soils resources will be analyzed in addendums to this report. Ecological surveys for the Site were designed in order to provide an initial baseline assessment of habitat and wildlife conditions within the proposed project area for the borrow pit.

Most of the area was revegetated in the past and is dominated by grasses (Neville, 2010). The vegetation communities identified on the Site include: weed, grassland, low shrub, and tall shrub. The vegetation diversity on the Site is high (refer to Appendix C for the Simpson Diversity Index calculations). The average percent bare ground varies between the vegetation communities from approximately 36 to 10 percent. There were no threatened or endangered species observed during the Site visits, and no habitat for these species was identified. Eight wildlife species (observed wildlife species are listed in Table 4, Page 6) were observed during the Site visits.

Site reclamation should be conducted in accordance with the *Utah Division of Oil, Gas, and Mining, Practical Guide to Reclamation* (UDOGM, 2000). This baseline report can be used to assist with determining vegetation appropriate for reclamation and revegetation activities. Topography on the Site should be reclaimed to mimic existing conditions at the Site to the extent possible.

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APPENDIX A

Site Figures

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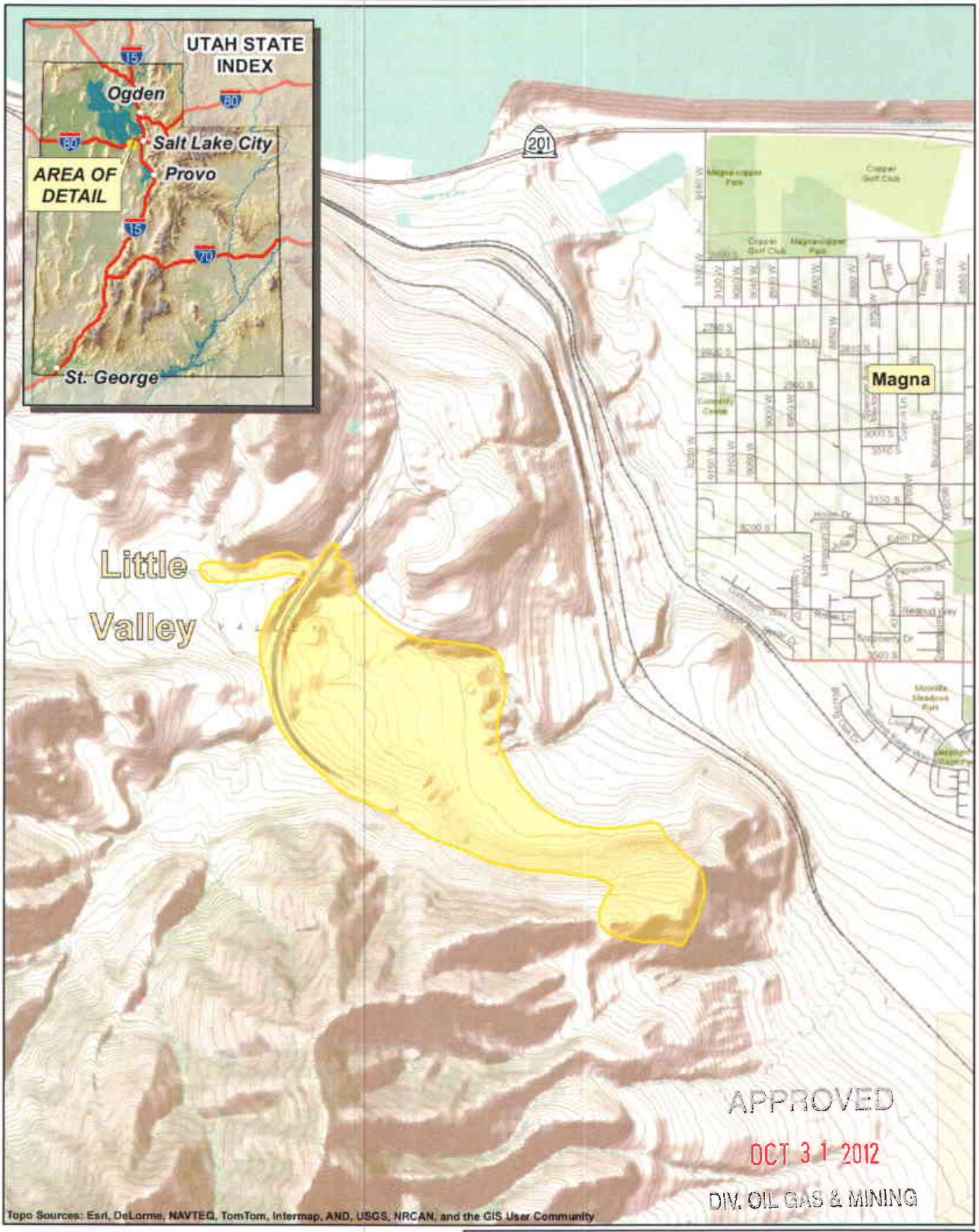

Notice of Intent Permit Boundary

0 1,000 2,000 3,000 Feet

Title: Location Map	
Project: Bonneville Borrow Area	URS Proj No: 24585223
	Figure: 1
Client: Kennecott Utah Copper LLC	Date: July 2011
	URS

Transect (200 feet)
Railroad
Alluvium Borrow Area
Quartzite Borrow Area
Railroad Embankment Borrow Area
Notice of Intent Permit Boundary

Vegetation Types
Barren
Tall Shrub
Reclaimed Grassland
Low Shrub
Weeds

0 350 700 1,050 Feet

Title: Vegetation Transect Field Map	
Project: Bonneville Borrow Area	URS Proj No: 24585223
	Figure: 2
Client : Kennecott Utah Copper LLC	Date: July 2011
	URS

APPENDIX B

Photograph Log

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Photograph Log

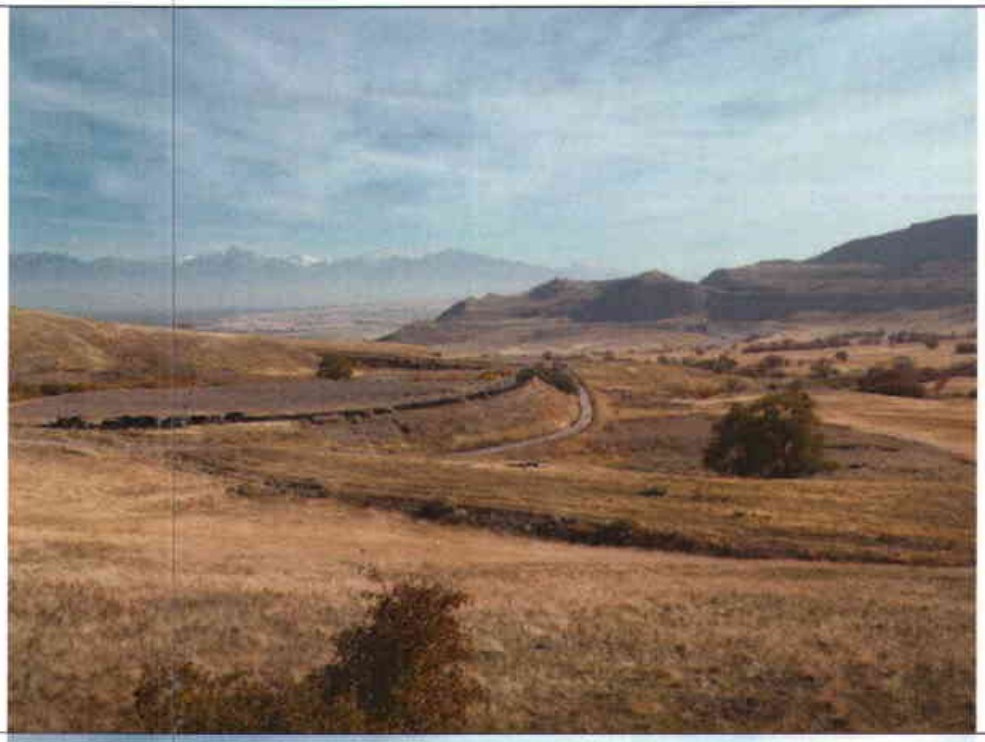
URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 1 of 8**
Client: Kennecott Utah Copper			**Date:** 11/4/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 1

Description:
Looking east at the Site from the access road inside the southeast site boundary.



Photograph: 2

Description:
Looking south at the Site from the access road inside the east Site boundary.

Recorded By: Laura Springsteen

Date 12/9/2010

Photograph Log

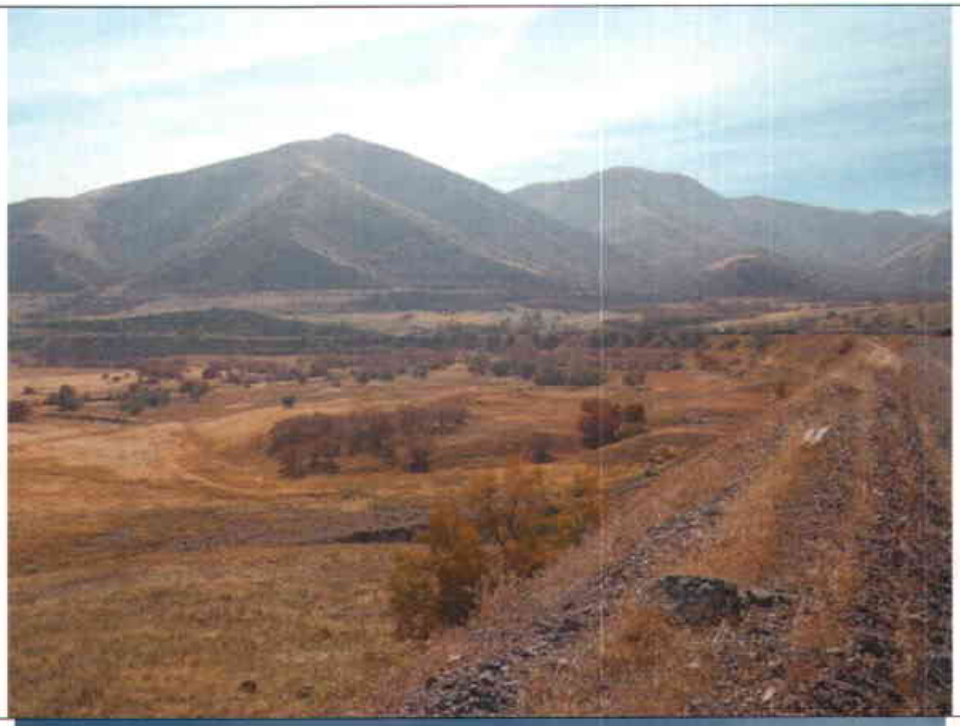
URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 2 of 8
Client: Kennecott Utah Copper			**Date:** 11/4/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 3

Description:
Looking southwest at the Site from the access road inside the east Site boundary.



Photograph: 4

Description: Looking northwest at the Site from the southern access road.

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Recorded By: Laura Springsteen | Date 12/9/2010

Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 3 of 8**
Client: Kennecott Utah Copper			**Date:** 11/4/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

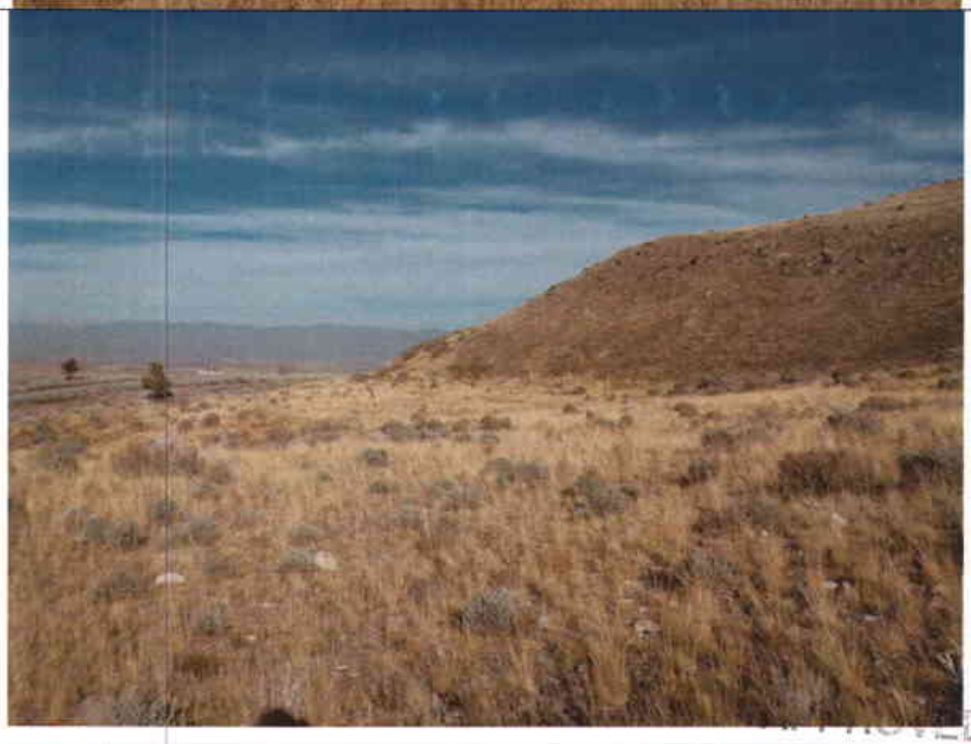
Photographs

Photograph: 5

Description:
Looking north at grassland in the northern part of the Site.

Photograph: 6

Description:
Looking east at the low shrub vegetation community in the southeastern part of the Site.



Recorded By: Laura Springsteen

Date 12/9/2010

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 4 of 8**
Client: Kennecott Utah Copper			**Date:** 11/16/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 7

Description:
Looking at an example of new growth that does not exhibit species identifying features. Pen cap is included in photograph for scale.

Photograph: 8

Description:
Looking west at area 1 of Site. Transect 1 is located in the grassland in the center of the photograph.

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Recorded By: Laura Springsteen | Date 12/16/2010

Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 5 of 8**
Client: Kennecott Utah Copper			**Date:** 11/16/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 9

Description:
Looking southwest at Transect 2.

Photograph: 10

Description:
Looking southeast at Transect 3.

Recorded By: Laura Springsteen

Date 12/16/2010

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 6 of 8**
Client: Kennecott Utah Copper			**Date:** 11/16/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 11

Description:
Looking southeast at Transect 4.

Photograph: 12

Description:
Looking east at Transect 5.

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Recorded By: Laura Springsteen | Date 12/17/2010

Photograph Log

URS

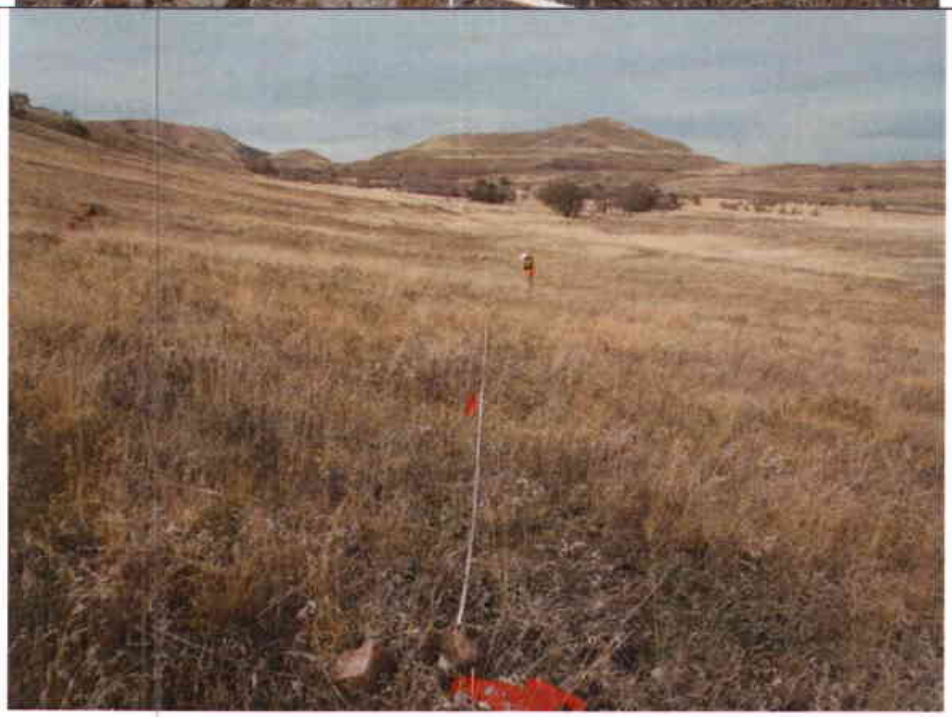
General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 7 of 8**
Client: Kennecott Utah Copper			**Date:** 11/17/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 13

Description:
Looking northwest at Transect 6.

Photograph: 14



Description:
Looking north at Transect 7.

Recorded By: Laura Springsteen

Date 12/17/2010

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 8 of 8**
Client: Kennecott Utah Copper			**Date:** 11/17/10
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen			

Photographs

Photograph: 15

Description: Looking east at Transect 8.

Photograph: 16

Description: Looking southeast with Transects 9 and 10 in the distance.

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Recorded By: Laura Springsteen | Date 12/16/2010

APPENDIX C

Simpson Diversity Index and Bare Ground Calculations

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Grassland, Transects 1, 4, 5, 6, and 7

Plant Species	Total Cover[1]	Average Percent Cover (n)[2]	n(n-1)
Achillea mollifolium	65	0.57	-0.25
Achnatherum hymenoides	110	0.96	-0.04
Ambrosia artemisiifolia	890	7.79	52.94
Artemisia cana	80	0.70	-0.21
Astragalus aniphioxys	10	0.09	-0.08
Balsamorhiza sagittata	180	1.58	0.91
Bromus tectorum	2,725	23.86	545.52
Cardaria draba	85	0.74	-0.19
Cirsium sp.	5	0.04	-0.04
Hordeum Jubatum	225	1.97	1.91
Leymus cinereus	2,340	20.49	399.36
Moss	405	3.55	9.03
Pleuraphis rigida	20	0.18	-0.14
Poa pratensis	1,530	13.40	166.10
Poa sp.	715	6.26	32.94
Thlaspi arvense	235	2.06	2.18
Unknown[2]	1,545	13.53	169.50
Xanthocephalum sarothrae	255	2.23	2.75
Total Cover	**11,420**	100	1,382
Total Percent Cover (N)	**100**		
Σn(n-1)	**1,382**		
N(N-1)	**9,900**		
D	**0.140**		

Weed Transect, Transect 2

Plant Species	Total Cover	Average Percent Cover (n)[1]	n(n-1)
Ambrosia artemisiifolia	139	6.29	33.24
Bromus tectorum	110	4.98	19.78
Cardaria draba	42	1.90	1.71
Leymus cinereus	327	14.79	203.95
Moss	48	2.17	2.54
Poa pratensis	770	34.83	1,178.02
Pleuraphis rigida	40	1.81	1.46
Thlaspi arvense	50	2.26	2.85
Unknown	685	30.98	928.87
Total Cover	**2,211**	**100**	**2,372**
Total Percent Cover (N)	**100**		
Σn(n-1)	**2,372**		
N(N-1)	**9,900**		
D	**0.240**		

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Low Shrub, Transects 3 and 8

Plant Species	Total Cover	Average Percent Cover (n)[1]	n(n-1)
Ambrosia artemisiifolia	395	10.93	108.47
Artemisia cana	15	0.41	-0.24
Artemisia tridentata	215	5.95	29.42
Atriplex confertifolia	215	5.95	29.42
Bromus tectorum	225	6.22	32.51
Cardaria draba	95	2.63	4.28
Chrysothamnus nauseosus	350	9.68	84.06
Hordeum jubatum	5	0.14	-0.12
Leymus cinereus	120	3.32	7.70
Melilotus officinalis	5	0.14	-0.12
Moss	460	12.72	149.19
Poa sp.	5	0.14	-0.12
Pleuraphis rigida	775	21.44	438.17
Thlaspi arvense	110	3.04	6.22
Unknown	605	16.74	263.35
Xanthocephalum sarothrae	20	0.55	-0.25
Total Cover	**3,615**	**100**	**1,152**
Total Percent Cover (N)	**100**		
Σn(n-1)	**1,152**		
N(N-1)	**9,900**		
D	**0.116**		

Tall Shrub, Transects 9 and 10

Plant Species	Number of Organisms (n)	n(n-1)
Quercus gambelii	22	462
Elaeagnus angustifolia	14	182
Total Number of Organisms (N)	**36**	**644**
Σn(n-1)	**644**	
N(N-1)	**1,260**	
D	**0.511111111**	

[1]Total Cover is the sum of the percent cover for each plot within the vegetation community type. Barren ground is not included.
[2]Average Percent Cover (n) - average percent cover is used for n for most vegetation communities because of the difficulty in counting numbers of individual plants.
[3]Unknown species includes plants that cannot be identified because they are either to young or are dried and missing seedheads.

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Grassland Transects 1, 4, 5, 6, and 7

Transect 1	
Plot	Percent Bare Ground
1	5
2	5
3	5
4	20
5	5
6	0
7	5
8	10
9	5
10	25
11	5
12	5
13	15
14	25
15	10
16	8
17	2
18	15
19	10
20	10
21	10
22	18
23	20
24	10
25	5
Total	253
Average Percent (Total/25 plots)	**10.12**

Transect 4	
Plot	Percent Bare Ground
1	5
2	10
3	10
4	0
5	0
6	0
7	10
8	15
9	5
10	5
11	5
12	5
13	10
14	10
15	20
16	10
17	10
18	8
19	10
20	25
21	15
22	5
23	5
24	2
25	5
Total	205
Average Percent (Total/25 plots)	**8.2**

Transect 5	
Plot	Percent Bare Ground
1	23
2	37
3	30
4	35
5	45
6	5
7	10
8	15
9	15
10	20
11	5
12	5
13	0
14	0
15	5
16	5
17	5
18	5
19	10
20	10
21	5
22	5
23	5
24	5
25	15
Total	320
Average Percent (Total/25 plots)	**12.8**

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Transect 6	
Plot	Percent Bare Ground
1	5
2	0
3	5
4	5
5	5
6	10
7	0
8	5
9	5
10	0
11	5
12	5
13	5
14	5
15	5
16	5
17	5
18	10
19	50
20	45
21	25
22	45
23	40
24	20
25	30
Total	340
Average Percent (Total/25 plots)	**13.6**

Transect 7	
Plot	Percent Bare Ground
1	0
2	5
3	5
4	0
5	10
6	5
7	10
8	5
9	10
10	15
11	10
12	5
13	10
14	10
15	0
16	0
17	0
18	5
19	10
20	10
21	10
22	0
23	10
24	15
25	15
Total	175
Average Percent (Total/25 plots)	**7**

Average Percent Bare Ground for Grassland	
Transect	Average Percent
1	10.1
4	8.2
5	12.8
6	13.6
7	7.0
Average	**10.3**

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Low Shrub Average Percent Bare Ground

Transect 3	
Plot	Percent Bare Ground
1	60
2	0
3	40
4	50
5	20
6	60
7	75
8	35
9	25
10	50
11	10
12	40
13	30
14	10
15	85
16	20
17	75
18	90
19	80
20	60
21	95
22	90
23	80
24	0
25	70
Total	1250
Average Percent	**50.0**

Low Shrub Average Percent Bare Ground

Transect 8	
Plot	Percent Bare Ground
1	50
2	35
3	45
4	35
5	38
6	50
7	14
8	35
9	25
10	30
11	14
12	42
13	50
14	10
15	5
16	0
17	5
18	0
19	0
20	5
21	5
22	0
23	5
24	15
25	15
Total	528
Average Percent	**21.1**

Weed Average Percent Bare Ground

Transect 2	
Plot	Percent Bare Ground
1	15
2	25
3	40
4	20
5	30
6	10
7	10
8	15
9	20
10	10
11	10
12	0
13	0
14	20
15	15
16	10
17	5
18	5
19	10
20	5
21	5
22	5
23	5
24	10
25	45
Total	345
Average Percent	**13.8**

Ground for Low Shrub	
Transect	Average Percent
3	50.0
8	21.1
Average	**35.6**

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APPENDIX D

Threatened and Endangered Species and Wildlife Correspondence

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URS

December 9, 2010

Sarah Lindsey
Utah Division of Wildlife Resources
1594 W. North Temple, Suite 2110
Salt Lake City, Utah 84116

Re: **Request for Information**
Bonneville Crusher Area Borrow Site, Kennecott Utah Copper LLC, Salt Lake County, Utah

Dear Ms. Lindsey:

URS Corporation, on behalf of Kennecott Utah Copper LLC, is conducting a baseline survey in order to prepare a Notice of Intent (NOI) for a Large Mine Operation (LMO) Mine and Reclamation Plan (MFRP) for the Bonneville Crusher Area Borrow Site located in Township 1 South, Range 2 West, Section 31 and Township 1 South, Range 3 West, Sections 36 and 25 on the USGS Farnsworth Peak and Magna 7.5 minute quadrangle maps. The Site is located in Salt Lake County, approximately one mile southeast of Magna, Utah. The Site is approximately 300 acres. The approximate center point of the Site is longitude -112.25, latitude 40.693. A topographic site location map and an aerial photographic site map are enclosed for your review.

In order to assist with our review of the site, URS Corporation is requesting additional information regarding rare animal and plant species located within the project site.

I look forward to your response so that we may continue to move forward with this project. If you have any questions please do not hesitate to contact me at (801) 904-4110.

Thank you,

URS Corporation

Laura Springsteen

Laura Springsteen
Environmental Planner

Enclosure

cc: Amber Fortner, URS

URS Corporation
756 East Winchester Street
Suite 400
Salt Lake City, Utah 84107
Tel: 801.904.4000
Fax: 801.904.4100
www.urscorp.com

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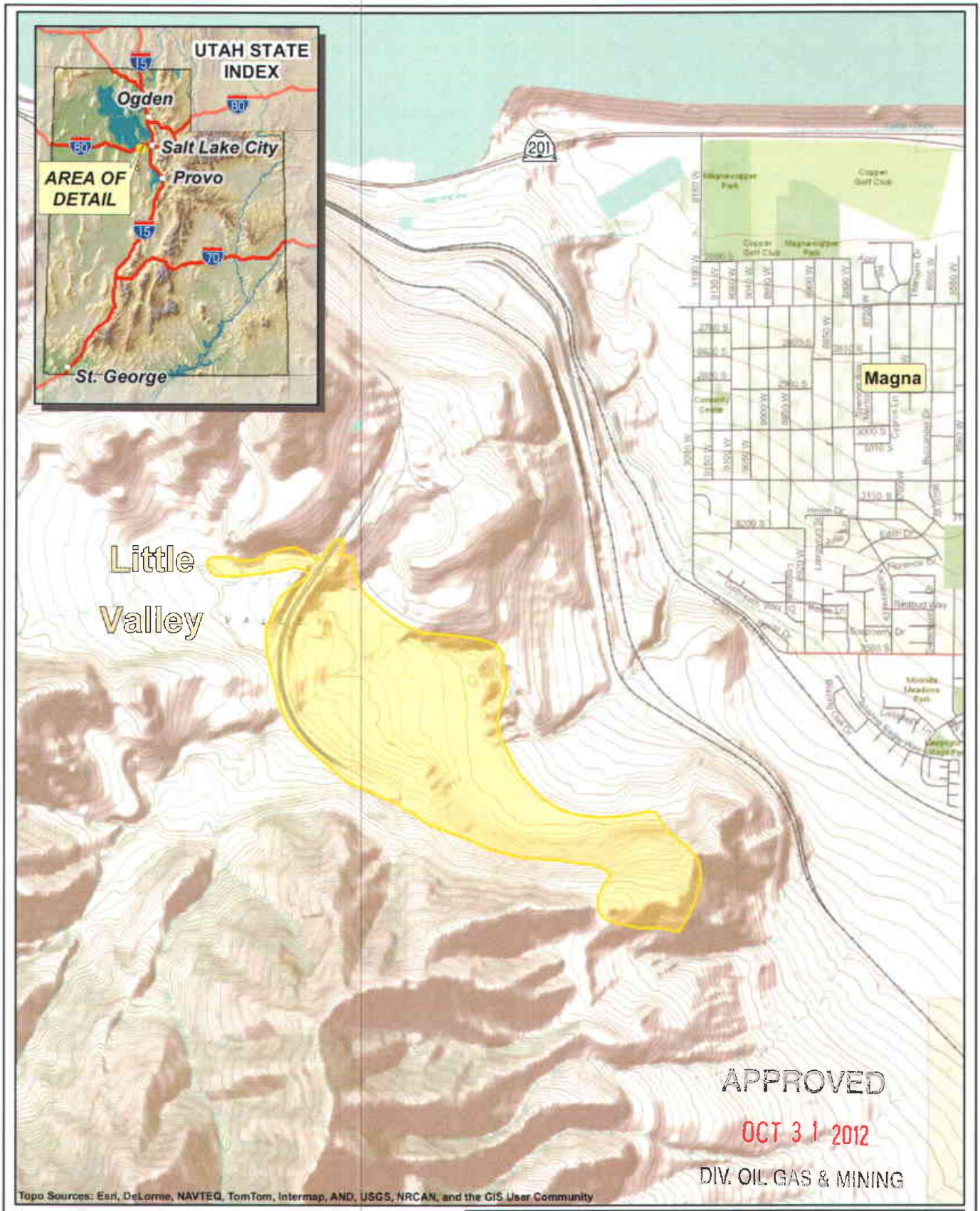

Notice of Intent Permit Boundary

0 1,000 2,000 3,000 Feet

Title: Location Map	
Project: Bonneville Borrow Area	URS Proj No: 24585223
	Figure: 1
Client: Kennecott Utah Copper LLC	Date: July 2011
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Path: T:\Kennecott\Bonneville Crusher Permit\09_Data\GIS\Maps\Ecology\ReportFigures_July2011\Fig2_BonnevilleCrusher_BorrowArea_SiteMap.mxd

- Alluvium Borrow Area
- Quartzite Borrow Area
- Railroad Embankment Borrow Area
- Notice of Intent Permit Boundary

Title: Site Map	
Project: Bonneville Borrow Area	URS Proj No: 24585223
	Figure: 2
Client : Kennecott Utah Copper LLC	Date: July 2011
	URS

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Wildlife Resources

JAMES F. KARPOWITZ
Division Director

December 13, 2010

Laura Springsteen
URS Corporation
756 East Winchester, Suite 400
Salt Lake City, Utah

Subject: Species of Concern Near the Bonneville Crusher Area Borrow Site

Dear Laura Springsteen:

I am writing in response to your letter dated December 9, 2010 regarding information on species of special concern proximal to the Kennecott Bonneville Crusher Area Borrow Site located in Section 31 of Township 1 South, Range 2 West, and Sections 25 and 36 of Township 1 South, Range 3 West, SLB&M, near Magna in Salt Lake County, Utah.

The Utah Division of Wildlife Resources (UDWR) does not have records of occurrence for any threatened, endangered, or sensitive species within the project area noted above. However, in the vicinity there are recent records of occurrence for ferruginous hawk and long-billed curlew. All of the aforementioned species are included on the *Utah Sensitive Species List.*

The information provided in this letter is based on data existing in the Utah Division of Wildlife Resources' central database at the time of the request. It should not be regarded as a final statement on the occurrence of any species on or near the designated site, nor should it be considered a substitute for on-the-ground biological surveys. Moreover, because the Utah Division of Wildlife Resources' central database is continually updated, and because data requests are evaluated for the specific type of proposed action, any given response is only appropriate for its respective request.

In addition to the information you requested, other significant wildlife values might also be present on the designated site. Please contact UDWR's habitat manager for the central region, Mark Farmer, at (801) 491-5653 if you have any questions.

Please contact our office at (801) 538-4759 if you require further assistance.

Sincerely,

Sarah Lindsey

Sarah Lindsey
Information Manager
Utah Natural Heritage Program

cc: Mark Farmer, CRO

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1594 W. North Temple, Suite 2110, PO Box 146301, Salt Lake City, UT 84114-6301
telephone (801) 538-4700 • facsimile (801) 538-4709 • TTY (801) 538-7458 • *www.wildlife.utah.gov*

UTAH DNR WILDLIFE RESOURCES

APPENDIX E

Waters of the U.S. Jurisdictional Assessment for the Little Valley Area

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Appendix C

Soil Sample Results

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Soil Survey Addendum to the Ecological Baseline Report
Bonneville Borrow Area
Magna, Utah

Prepared For:

Kennecott Utah Copper, LLC
4700 Daybreak Building KUC Mine
South Jordan, Utah 84095

Prepared By:

URS

URS Corporation
756 East Winchester Street, Suite 400
Salt Lake City, Utah 84107

July 2011

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Appendix A Site Figures
Appendix B Photograph Log
Appendix C Soil Sample Laboratory Results

TABLES

Table 1. Soil Sample Field Results, Bonneville Borrow Area, April 2011 3
Table 2. ACZ Soil Sample Results, Bonneville Borrow Area, April 2011 4

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ACRONYMS

AGP	Acid Generation Potential
ANP	Acid Neutralization Potential
CEC	Cation Exchange Capacity
cm	centimeter
DOGM	Utah Division of Oil, Gas and Mining
Ec	Conductivity
g	gram
GPS	Global Positioning System
kg	kilogram
KUC	Kennecott Utah Copper
meq	milliequivalent
mg	milligram
mmhos	millimhos
N	Nitrogen
NOI	Notice of Intention to Commence Large Mining Operations
NRCS	Natural Resources Conservation Service
TS	total solids
UCS	Unified Soil Classification
um	micrometer
URS	URS Corporation
USDA	United States Department of Agriculture
SAR	Sodium Absorption Ratio
%	percent
°C	degrees Celsius
°F	degrees Fahrenheit

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1.0 INTRODUCTION

URS Corporation (URS) has prepared this addendum to the Ecological Baseline Report for the proposed Bonneville Borrow Area (Site), in Magna, Salt Lake County, Utah (Appendix A - Figures 1 and 2). This addendum describes the baseline soil survey.

1.1 Purpose

This report provides information to the Utah Division of Oil, Gas and Mining (DOGM) and will be part of a Notice of Intent (NOI) to Commence Large Mining Operations. DOGM requires that an ecological baseline survey be completed. The information from the baseline survey will be used to determine the reclamation standard for the site upon the completion of the mining operation.

2.0 SITE DESCRIPTION

2.1 Regional

The Site is situated within the east foothills of the Oquirrh Mountains in Salt Lake County, Utah. This region is considered a semi-arid landscape and receives approximately 16 inches of precipitation annually (U.S. Census Bureau, 2000).

The ecoregion designations of the Site are Sagebrush Basins and Slopes and Woodland- and Shrub-Covered Low Mountains. The Sagebrush Basins and Slopes ecoregion is semiarid. The potential natural vegetation is Great Basin sagebrush. This ecoregion is dominated by Wyoming big sagebrush with perennial bunchgrasses. The Woodland- and Shrub-Covered Low Mountains ecoregion is covered by woodland or, at higher elevations, by mountain brush (Woods et al., 2001).

The landscape consists of shrub steppe vegetation communities, man-made terraced landscape, dry washes, rock outcroppings, and rolling hills with mountains to the south and west and the Salt Lake Valley to the east. The northeast portion of the Site is fenced off and is currently used for livestock grazing.

2.2 Local Area

The Site is located in an area known as Little Valley on Kennecott Utah Copper, LLC (Kennecott) property. The Site is approximately 300 acres (Figure 1). It is accessed through the Kennecott entrance on 9180 West off of State Route-201, southwest of Magna, Utah (Figure 1). The Site can be found on the United States Geological Survey 7.5 minute Farnsworth Peak, UT (1974) and Magna, UT (1979) quadrangle maps within Township 1 South, Range 2 West, Section 31 and Township 1 South, Range 3 West, Sections 25 and 36. The approximate Site center point is Latitude 40.693° and Longitude 112.25°. Site elevation ranges between approximately 5,240 and 4,800 feet above mean sea level.

The Site is located on the eastern facing slope of the Oquirrh Mountains, which are relatively broad and predominantly comprised of the very thick Pennsylvanian-Permian (39 to 36 million years ago) Oquirrh Formation.

The Site consists of rolling terrain, steep slopes, rock outcrops and man-made terraces. The moisture in this region comes in the form of precipitation and run-off from the mountains. Surface and groundwater flow in a general eastern trend toward the Salt Lake Valley where they infiltrate into a basin-fill shallow aquifer. In the 1920s several flash flood events from storm bursts caused major damage in Magna. In the 1940s there was an historic reservoir constructed above the Site in Little Valley. The reservoir dam failed and flooded Magna. Flood control measures, including the construction of terraces, were installed on the Site (USU, 2000) in 1950's to help alleviate the potential for future flooding events to impact Magna. Most of the area has been revegetated and is dominated by grasses (Neville, 2010). There has not been

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any flooding since the flood control work was completed. The reservoir was not reconstructed (USU, 2000).

Currently, the mining operation consists of a borrow pit on the eastern part of the Site which is made up of three identified sub-areas: Quartzite Borrow Area, Alluvium Borrow Area, and Railroad Embankment Borrow Area (Figure 2). There are two main access roads to the Site, one borders the southern Site boundary and the other borders the northern Site boundary. There is an old railroad bed (track has been removed) outside the southern boundary that is currently being removed.

3.0 OBJECTIVES

The objective of the soil survey report is to accurately depict and document the existing Site conditions prior to the proposed expansion of the borrow area. The existing Site conditions have been recorded so that, upon the completion of the mine operations, the Site can be reclaimed as close to its original condition as possible.

4.0 METHODS

The task was implemented in the field on April 5 and 6, 2011. A MobileMapper 6™ global positioning system (GPS) unit by AshTech was used during the field survey. The study area being considered for the borrow pit is approximately 300 acres.

4.1 Soil Sample Collection

Soil sample collection and analysis was completed to satisfy the requirements of the State of Utah Department of Natural Resources, DOGM, NOI and in accordance with guidance provided verbally from DOGM. Each soil sample collection location was analyzed in the field for texture, color, and pH. Soil sample collection pits were photographed (Appendix B – Photograph Log) and locations were mapped (Figure 3). Two soil samples were collected at each of five soil pits. The sample was first sieved on a <2,000 micrometer (um) sieved and dried at 35 degrees Celsius (°C). Sand particles range from 53um to 850um. Silt particles range from 2um to less than 53um. Clay particles are less than 2um. Soil groups are determined based on the percentage of the three different particles in each soil group in accordance with the USC System. In addition the first sample was collected from soil located zero to six inches below the ground surface and the second sample was collected from soil located six to 12 inches below the ground surface. The samples were packed in a laboratory-supplied ice chest, shipped to ACZ Laboratories at 2773 Downhill Drive, Steamboat Springs, CO 80487, under chain of custody, via Federal Express, and delivered on April 8, 2011. Per requirements of the NOI and discussions with DOGM the laboratory analysis for soil samples included texture, pH, Ec (conductivity), Cation Exchange Capacity (CEC), Sodium Absorption Ratio (SAR), Percent Organic matter, total Nitrogen (N), available Extractable Phosphorus, Total Potassium, and acid/base potential. Nutrient samples were collected for laboratory analysis of Nitrogen, Potassium, and Phosphorus.

5.0 RESULTS

5.1 Soil Sample

The results of the field soil samples are shown in Table 1 and soil sample locations are shown on Figure 3.

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Table 1. Soil Sample Field Results, Bonneville Borrow Area, April 2011

Sample Location	Texture	Color[a]	pH
Area 1 Soil 0-6[b]	Sandy gravelly clay	10YR 3/2	6.5
Area 1 Soil 6-12	Clayey sandy gravel	10YR 3/3	7.0
Area 2 Soil 0-6	Gravelly sand	10YR 5/3	7.0
Area 2 Soil 6-12	Gravelly sand	10YR 5/3	7.5
Area 3 Soil 0-6	Sandy clayey silt	10YR 4/3	7.0
Area 3 Soil 6-12	Gravelly sandy clay	10YR 3/2	5.5
Area 4 Soil 0-6	Sandy silty clay with trace gravel	10YR 3/2	6.5
Area 4 Soil 6-12	Sandy silty clay with trace gravel	10YR 3/2	6.5
Area 5 Soil 0-6	Gravelly clay with sand	10YR 3/3	6.5
Area 5 Soil 6-12	Gravelly clay with sand	10YR 3/3	6.5

[a]Soil color determined using the Munsell Soil Color Chart (Munsell, 2000).
[b]Inches below the ground surface.

5.2 Soil Sample Lab Results

The results from ACZ Laboratories, Inc. have been summarized in Table 2 and the complete report can be viewed in Appendix C.

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Table 2
ACZ Soil Sample Results, Bonneville Borrow Area
April 2011

Analyte (Units)	Reporting Limit	Analytical Result Area 1 @ 0-6"	Analytical Result Area 1 @ 6-12"	Analytical Result Area 2 @ 0-6"	Analytical Result Area 2 @ 6-12"	Analytical Result Area 3 @ 0-6"	Analytical Result Area 3 @ 6-12"	Analytical Result Area 4 @ 0-6"	Analytical Result Area 4 @ 6-12"	Analytical Result Area 5 @ 0-6"	Analytical Result Area 5 @ 6-12"
Total Potassium (mg/kg)	200	1,660	960	1,300	520	3,250	3,620	3,440	3,330	3,000	3,620
Uniform Soil Classification	not applicable	loam	sandy clay loam	sandy loam	sandy loam	clay loam	loam	loam	loam	loam	clay loam
Cation Exchange Capacity (meq/100g-dry)	0.2	7.1	4.1	2.6	1.2	12	9.7	9.2	9.4	9	10
Conductivity (mmhos/cm)	0.01	0.485	0.479	0.585	0.257	0.14	0.115	0.153	0.128	0.38	0.378
pH @ 25 °C	0.1	7.5	8	8.1	9.1	6.4	6	5.8	6.5	7.8	7.6
Extractable Phosphorus (mg/kg)	5	8	3	5	2	15	37	28	16	21	22
Sodium Absorption Ratio (SAR)	0.15	0.39	0.4	0.23	0.3	0.38	0.54	0.51	0.43	0.17	0.17
Total Nitrogen (as N) (%)	0.005	0.08	0.0507	0.0216	0.0113	0.117	0.0717	0.075	0.0728	0.049	0.0697
Sulfur, Total (%)	0.1	0.02	<0.1	0.14	0.03	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acid Generation Potential	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acid Neutralization Potential	5	19	134	405	446	5	5	7	8	41	33
Acid Base Account	5	19	134	401	446	5	5	7	8	41	33

°C - degrees Celsius
g - gram
kg - kilogram
meq - milliequivalent
mg - milligram
mmhos - millimhos
N - nitrogen
% - percent
< - the amount detected was lower than the reporting limit (practical quantitation limit).

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5.3 Soil Analysis

The soils sampled on site were classified according to the Unified Soil Classification (USC) System. Four soil groups were identified in the soil samples: loam, sandy clay loam, sandy loam, and clay loam. The texture analysis was conducted by hydrometer to determine soil particle sizes.

In comparing the soil laboratory results with the Soil Suitability Table 3.1 found the in the *Utah Division of Oil and Gas, Practical Guide to Reclamation in Utah,* the soil properties, including conductivity, pH, SAR, and texture, range from good to fair. Available water holding capacity was not directly comparable with the suitability table. All conductivity results were within the good range. The pH results were within a range from good to fair. SAR results were within the good range. Based on the ratio of the Acid Generation Potential (AGP) with the Acid Neutralization Potential (ANP) for all the soil samples, it appears that these soils are not acid producing. The soils do not appear to be problematic.

The top soil horizon was not visible in the soil pits. Most of the soils on the Site have been disturbed due to the historic reservoir flood and post-flood reclamation. The Site has also been historically disturbed because of past mining and/or railroad activity. The railroad embankment in the Borrow Area appears to be comprised of fill material used for the railroad track installation. The soil in all test pits appeared relatively homogenous from the ground surface to 12 inches deep, therefore not revealing soil horizons. Refer to Appendix B for photographs of the soil pits. Rock outcroppings are present along the southern and southwestern Site boundaries in the area indicated by Natural Resources Conservation Service (NRCS) as stony terrace escarpments (Figure 3) (NRCS, 2011a).

5.4 Natural Resources Conservation Service – Soil Survey

The United States Department of Agriculture (USDA), NRCS Web Soil Survey 2.0, National Cooperative Soil Survey identified three soil types and stony terrace escarpments within the Site (NRCS, 2011a) (Figure 3). Kearns silt loam is located within the lower areas of the valley. The Butterfield extremely stony loam and Harkers-Dry Creek association are indicated by the NRCS on the high escarpment in the southern region of the Site. Scree slopes and rock outcrops occur on the Site where these two soil series are identified by NRCS.

The Kearns series consists of very deep, well drained soils that formed in alluvium and lacustrine deposits derived from sedimentary rocks. Kearns soils are on alluvial fans and lake terraces. Slopes range from zero to 20 percent. The mean annual precipitation is approximately 16 inches and the mean annual temperature is approximately 50 degrees Fahrenheit (°F) (NRCS, 2011b).

The Butterfield series consists of moderately deep, well drained soils that formed in residuum and colluvium from quartzite, andesite, or sedimentary rock. The soils are on mountain slopes. Slopes range from 5 to 50 percent. The mean annual precipitation is approximately 16 inches and the mean annual temperature is 48 °F (NRCS, 2011b).

The Harkers-Dry Creek association is a combination of both Harkers and Dry Creek soil series. Harkers soils are well drained with medium to rapid runoff and slow permeability. They are on short to long sloping alluvial fans to very steep mountain slopes at elevations between 5,500 and 7,500 feet with slope gradients from 6 to 50 percent. The soils formed in alluvium and colluvium from mixed sedimentary rocks. Average annual precipitation is 20 to 25 inches. The Dry Creek series consists of very deep, well drained, slowly permeable soils that formed in alluvium and colluvium from sedimentary rocks. Dry Creek soils are on pre-Bonneville fans and lower mountainsides. Slopes are 3 to 60 percent. Average annual precipitation is approximately 16 inches. Mean annual temperature is approximately 49 °F (NRCS, 2011b).

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6.0 SUMMARY

This baseline report addendum describes the soil characteristics on the Bonneville Borrow Area within Little Valley.

The soils on the Site include a true loam, a sandy clay loam, a sandy loam, and a clay loam. Most of the soils have been disturbed by historic flood and the subsequent reclamation and flood prevention measures that include a man-made terracing landscape. The The railroad embankment in the Borrow Area appears to be dominated by a fill material that was used when the railroad tracks were installed. The Site soils are unlikely to be Problem Soils (acidic, toxic, saline, or sodic), as defined by The Practical Guide to Reclamation in Utah (DOGM 2000). The analytical results for pH, sodium absorption ratio, and acid generation potential were all within acceptable ranges.

7.0 RECLAMATION AND RECOMMENDATIONS

Site reclamation should be conducted in accordance with the *Utah Division of Oil, Gas, and Mining, Practical Guide to Reclamation* (DOGM, 2000). Page 64 in the most recent version is the start of the section that describes soil placement, stockpiling, and preparation guidance. Although top soil horizons were not identified on the Site it may prove beneficial for revegetation efforts to install a topsoil layer when replacing Site soil. Post-mining land should be returned as close as possible to its natural landscape for soil stabilization. Restoration of the topography in Little Valley should be accomplished with care to prevent future flooding Magna.

Soils should be roughened in order to lower the soil loss potential, increase moisture retention, cool surface temperatures, and increase seed germination. For best propagation, seed should be applied in the late fall. Broadcast seeding will limit the amount of soil disturbance. It is recommended that no fertilizer amendments be applied to the revegetated areas because fertilizer can promote the growth of invasive species. Care should be taken to eradicate all noxious weeds and their seeds prior to seeding.

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8.0 REFERENCES

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Appendix A
Site Figures

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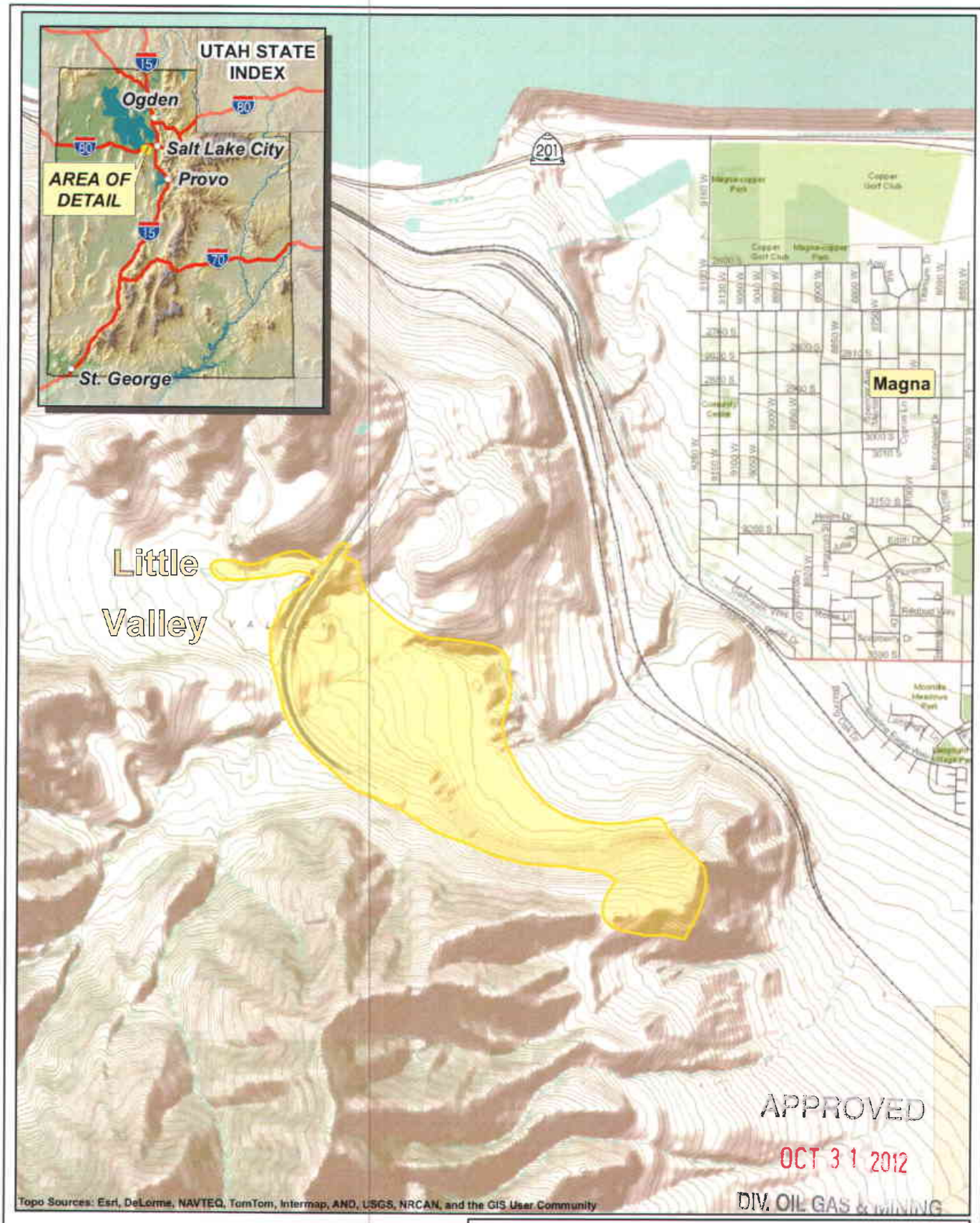
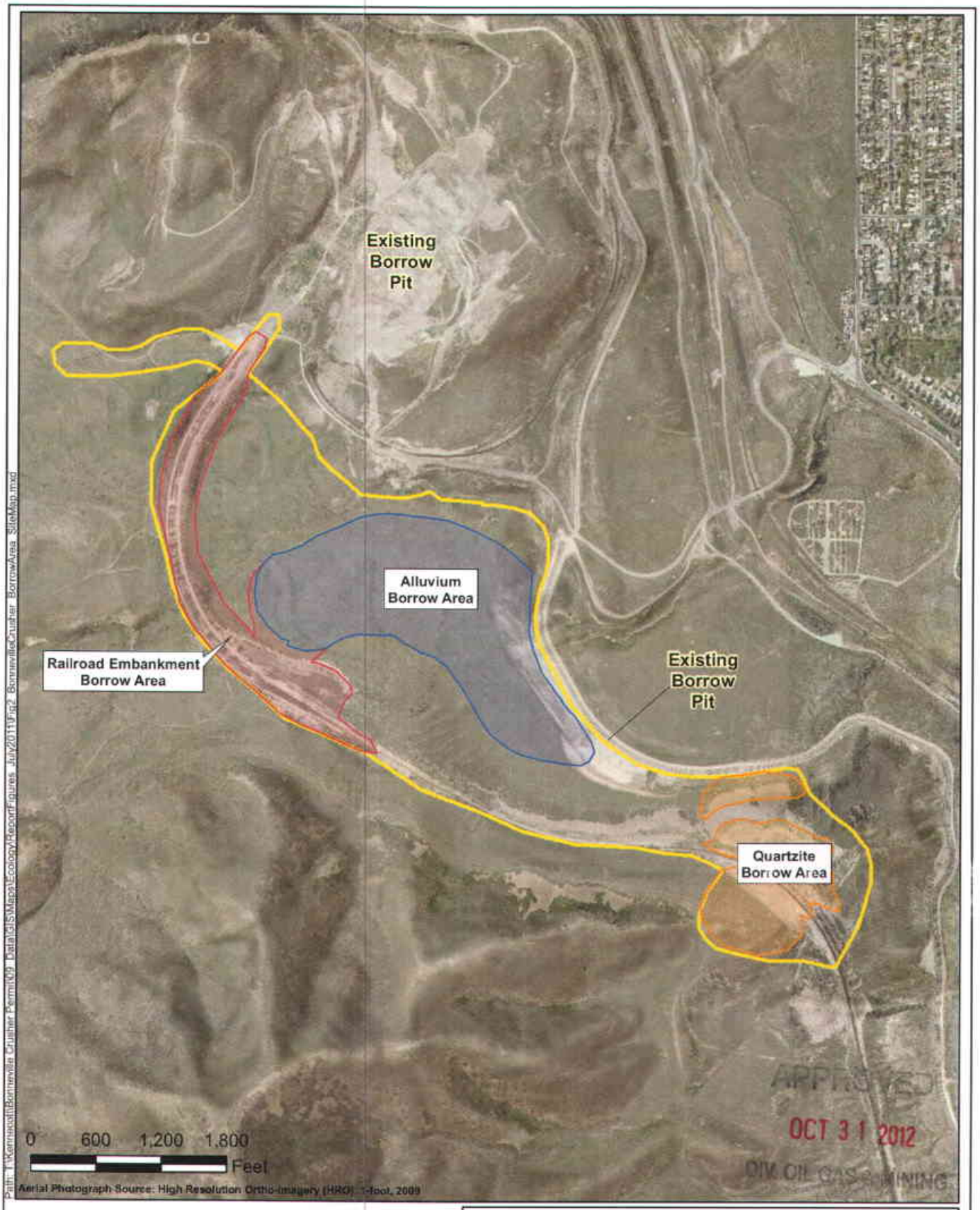


Notice of Intent Permit Boundary

0 1,000 2,000 3,000 Feet

Title: Location Map	
Project: Bonneville Borrow Area	URS Proj No: 24585223
	Figure: 1
Client: Kennecott Utah Copper LLC	Date: July 2011
	URS



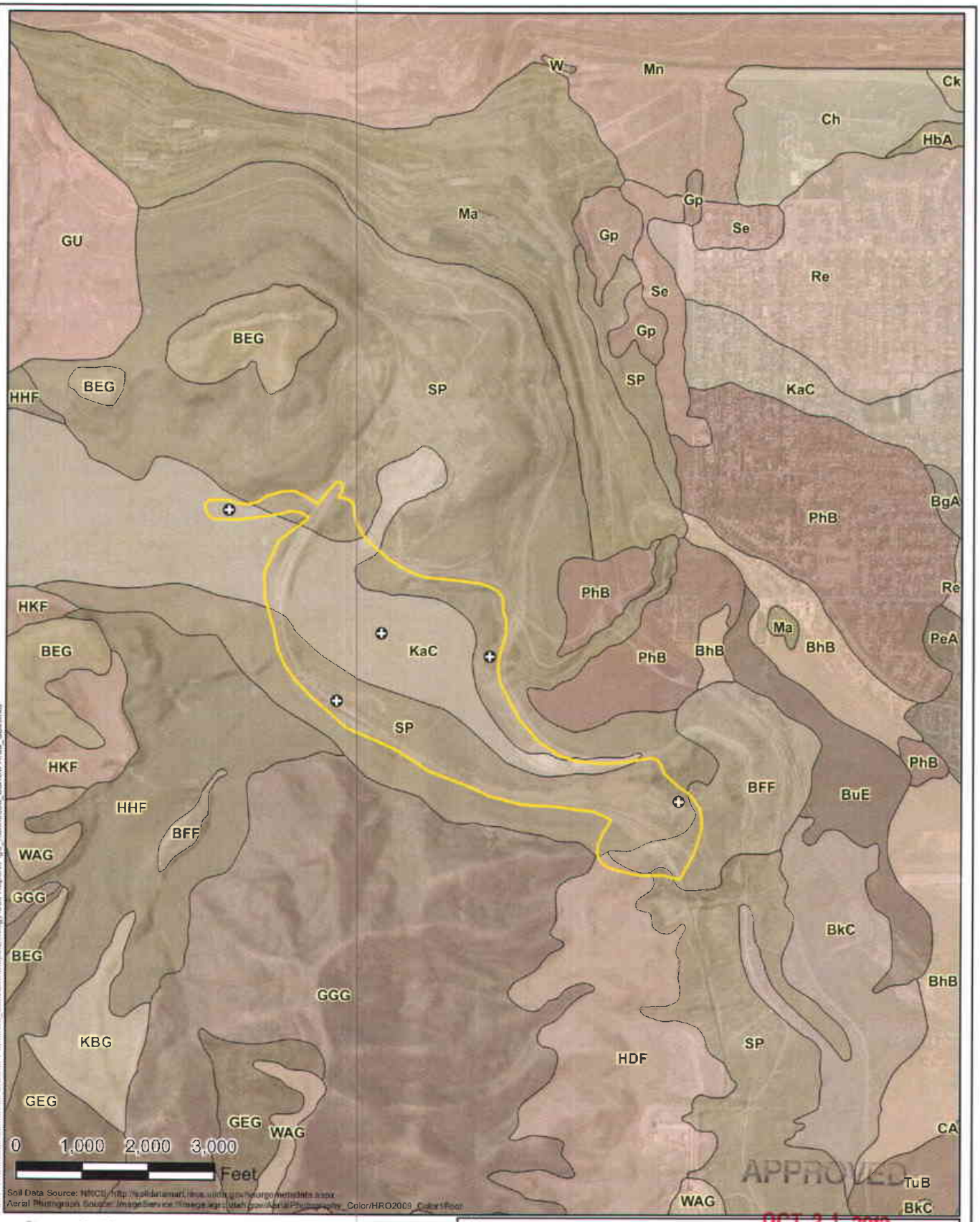
Alluvium Borrow Area

Quartzite Borrow Area

Railroad Embankment Borrow Area

Notice of Intent Permit Boundary

Title: Site Map	
Project: Bonneville Borrow Area	URS Proj No: 24585223
	Figure: 2
Client : Kennecott Utah Copper LLC	Date: July 2011
	URS



⊕	Soil Sample Location
Kac	Kearns silt loam, 3 to 6 percent slopes
SP	Stony terrace escarpments
BFF	Butterfield extremely stony loam, 5 to 50 percent slopes
HDF	Harkers-Dry Creek association, moderately steep
	Notice of Intent Permit Boundary

Title: Soil Map	
Project: **Bonneville Borrow Area**	URS Proj No: 24585223
	Figure: 3
Client : Kennecott Utah Copper LLC	Date: July 2011
	URS

Appendix B
Photograph Log

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 1 of 5**
Client: Kennecott Utah Copper			**Date:** 4/6/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 1

Description:
Soil sample collection pit for Area 1, 0-6 inches deep.

Photograph: 2

Description:
Soil sample collection pit for Area 1, 6-12 inches deep.

Recorded By: Laura Springsteen | Date 4/6/2011

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 2 of 5
Client: Kennecott Utah Copper			**Date:** 4/5/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 3

Description:
Soil sample collection pit for Area 2, 0-6 inches deep.

Photograph: 4

Description:
Soil sample collection pit for Area 2, 6-12 inches deep.

Recorded By: Laura Springsteen	Date 4/5/2011

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 3 of 5
Client: Kennecott Utah Copper			**Date:** 4/5/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 5

Description:
Soil sample collection pit for Area 3, 0-6 inches deep.

Photograph: 6

Description:
Soil sample collection pit for Area 3, 6-12 inches deep.

Recorded By: Laura Springsteen | Date 4/5/2011

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Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page:** 4 of 5
Client: Kennecott Utah Copper			**Date:** 4/6/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 7

Description:
Soil sample collection pit for Area 4, 0-6 inches deep.

Photograph: 8

Description:
Soil sample collection pit for Area 4, 6-12 inches deep.

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Recorded By: Laura Springsteen | Date 4/6/2011

Photograph Log

URS

General Information			
Project Number: 24585223	**Project Name:** Bonneville Borrow Area		**Page: 5 of 5**
Client: Kennecott Utah Copper			**Date:** 4/6/2011
Location: Little Valley, Magna, Utah			
Field Investigator: Laura Springsteen/Andrew Castor			

Photographs

Photograph: 9

Description:
Soil sample collection pit for Area 5, 0-6 inches deep.

Photograph: 10

Description:
Soil sample collection pit for Area 5, 6-12 inches deep.

Recorded By: Laura Springsteen | Date 4/6/2011

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Appendix C
Soil Sample Laboratory Results

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

April 28, 2011

Report to:
Amber Fortner
URS Corporation
756 E. Winchester Suite 400
Salt Lake City, UT 84107

cc: Laura Springsteen

Bill to:
Accounts Payable
URS Corporation
P.O. Box 203970
Austin, TX 78720

Project ID: 24585223.25000
ACZ Project ID: L87353

Amber Fortner:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 09, 2011. This project has been assigned to ACZ's project number, L87353. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L87353. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 28, 2011. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber

Sue Webber has reviewed and approved this report.

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ACCREDITED IN ACCORDANCE WITH nelac

ACIL

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA3 SOIL 0-6

ACZ Sample ID: ***L87353-01***
Date Sampled: *04/05/11 11:45*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 10:33	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	0.43			meq/L	0.01	0.05	04/27/11 14:09	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	12.0		*	meq/100g	0.2	0.8	04/27/11 12:19	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.29			meq/L	0.02	0.08	04/27/11 14:09	wfg
Potassium, total (3050)	M6010B ICP	3250			mg/Kg	30	200	04/21/11 21:06	jjc
Sodium Absorption Ratio	Calculation	0.38				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.23			meq/L	0.01	0.09	04/27/11 14:09	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	5			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	5			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.140		*	mmhos/cm	0.001	0.01	04/21/11 11:45	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	0.5		*	%	0.1	0.5	04/22/11 11:40	meg
Organic Matter	USDA No.60 - Method 24	1.5		*	%	0.3	1	04/21/11 15:45	brd
pH, Saturated Paste	USDA No. 60 (21A)	6.4		*	units	0.1	0.1	04/21/11 11:45	meg
Solids, Percent	CLPSOW390, PART F, D-98	77.4		*	%	0.1	0.5	04/19/11 9:55	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Pyritic Sulfide			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Sulfate			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Total			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Total Sulfur minus Sulfate			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		28.8		*	%	0.1	0.5	04/20/11 0:00	meg
Sand		23.8		*	%	0.1	0.5	04/20/11 0:00	meg
Silt		47.5		*	%	0.1	0.5	04/20/11 0:00	meg
Texture Classification		clay loam		*				04/20/11 0:00	meg

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** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA3 SOIL 0-6

ACZ Sample ID: ***L87353-01***
Date Sampled: *04/05/11 11:45*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 12:16	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 12:00	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 7:38	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 12:00	meg
Digestion - Hot Plate	M3050B ICP							04/20/11 15:22	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:00	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 12:00	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 12:00	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 12:00	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.117		*	%	0.001	0.007	04/23/11 17:55	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	15		*	mg/Kg	1	5	04/21/11 21.42	pjb

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA3 SOIL 6-12

ACZ Sample ID: ***L87353-02***
Date Sampled: *04/05/11 12:00*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 11:22	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	0.35			meq/L	0.01	0.05	04/27/11 14:12	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	9.70		*	meq/100g	0.03	0.2	04/27/11 12:31	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.33			meq/L	0.02	0.08	04/27/11 14:12	wfg
Potassium, total (3050)	M6010B ICP	3620			mg/Kg	30	200	04/21/11 21:16	jjc
Sodium Absorption Ratio	Calculation	0.54				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.32			meq/L	0.01	0.09	04/27/11 14:12	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	5			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	5			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.115		*	mmhos/cm	0.001	0.01	04/21/11 12:11	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	0.5	B	*	%	0.1	0.5	04/22/11 12:20	meg
Organic Matter	USDA No.60 - Method 24	2.4		*	%	0.3	1	04/21/11 18:30	brd
pH, Saturated Paste	USDA No. 60 (21A)	6.0		*	units	0.1	0.1	04/21/11 12:11	meg
Solids, Percent	CLPSOW390, PART F, D-98	84.1		*	%	0.1	0.5	04/19/11 11:50	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Pyritic Sulfide			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Sulfate		0.01	B	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Total		0.01	B	*	%	0.01	0.1	04/21/11 0:00	bsu
Total Sulfur minus Sulfate			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		23.8		*	%	0.1	0.5	04/20/11 0:00	meg
Sand		42.5		*	%	0.1	0.5	04/20/11 0:00	meg
Silt		33.8		*	%	0.1	0.5	04/20/11 0:00	meg
Texture Classification		loam		*				04/20/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA3 SOIL 6-12

ACZ Sample ID: ***L87353-02***
Date Sampled: *04/05/11 12:00*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 12:32	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 12:20	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 8:16	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 12:20	meg
Digestion - Hot Plate	M3050B ICP							04/20/11 18:54	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:06	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 12:20	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 12:20	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 12:20	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.0717		*	%	0.0008	0.004	04/23/11 17:45	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	37		*	mg/Kg	1	5	04/21/11 21:44	pjb

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URS Corporation
Project ID: 24585223.25000
Sample ID: AREA2 SOIL 0-6

ACZ Sample ID: ***L87353-03***
Date Sampled: *04/05/11 12:50*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 12:11	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	3.86			meq/L	0.01	0.05	04/27/11 14:15	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	2.60		*	meq/100g	0.03	0.2	04/27/11 12:34	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	1.15			meq/L	0.02	0.08	04/27/11 14:15	wfg
Potassium, total (3050)	M6010B ICP	1300			mg/Kg	30	200	04/21/11 21:30	jjc
Sodium Absorption Ratio	Calculation	0.23				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.37			meq/L	0.01	0.09	04/27/11 14:15	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	4	B		t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	405			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	401			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.585		*	mmhos/cm	0.001	0.01	04/21/11 12:37	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	40.5		*	%	0.1	0.5	04/22/11 10:30	meg
Organic Matter	USDA No.60 - Method 24	1.4		*	%	0.3	1	04/21/11 19:52	brd
pH, Saturated Paste	USDA No. 60 (21A)	8.1		*	units	0.1	0.1	04/21/11 12:37	meg
Solids, Percent	CLPSOW390, PART F, D-98	90.5		*	%	0.1	0.5	04/19/11 13:46	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue		0.14		*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur HNO3 Residue		0.03	B	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Organic Residual Mod		0.03	B	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Pyritic Sulfide		0.11		*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Sulfate			U	*	%	0.01	0.1	04/21/11 0:00	bsu
Sulfur Total		0.14		*	%	0.01	0.1	04/21/11 0:00	bsu
Total Sulfur minus Sulfate		0.14		*	%	0.01	0.1	04/21/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		12.5		*	%	0.1	0.5	04/20/11 0:00	meg
Sand		55.0		*	%	0.1	0.5	04/20/11 0:00	meg
Silt		32.5		*	%	0.1	0.5	04/20/11 0:00	meg
Texture Classification		sandy loam		*				04/20/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA2 SOIL 0-6

ACZ Sample ID: ***L87353-03***
Date Sampled: *04/05/11 12:50*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 12:49	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 12:40	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 8:54	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 12:40	meg
Digestion - Hot Plate	M3050B ICP							04/20/11 22:25	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:12	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 12:40	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 12:40	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 12:40	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.0216		*	%	0.0004	0.002	04/23/11 17:28	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	5		*	mg/Kg	1	5	04/21/11 21:45	pjb

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Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA2 SOIL 6-12

ACZ Sample ID: ***L87353-04***
Date Sampled: *04/05/11 13:05*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 12:35	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	1.16			meq/L	0.01	0.05	04/27/11 14:18	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	1.20		*	meq/100g	0.03	0.2	04/27/11 12:37	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.69			meq/L	0.02	0.08	04/27/11 14:18	wfg
Potassium, total (3050)	M6010B ICP	520			mg/Kg	30	200	04/21/11 21:33	jjc
Sodium Absorption Ratio	Calculation	0.30				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.29			meq/L	0.01	0.09	04/27/11 14:18	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	446			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	446			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.257		*	mmhos/cm	0.001	0.01	04/21/11 13:03	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	44.6		*	%	0.1	0.5	04/22/11 11:30	meg
Organic Matter	USDA No.60 - Method 24	0.7	B	*	%	0.3	1	04/21/11 21:15	brd
pH, Saturated Paste	USDA No. 60 (21A)	9.1		*	units	0.1	0.1	04/21/11 13:03	meg
Solids, Percent	CLPSOW390, PART F, D-98	92.0		*	%	0.1	0.5	04/19/11 15:41	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue		0.03	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Pyritic Sulfide		0.03	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Total		0.03	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Total Sulfur minus Sulfate		0.03	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		12.5		*	%	0.1	0.5	04/20/11 0:00	meg
Sand		57.5		*	%	0.1	0.5	04/20/11 0:00	meg
Silt		30.0		*	%	0.1	0.5	04/20/11 0:00	meg
Texture Classification		sandy loam		*				04/20/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA2 SOIL 6-12

ACZ Sample ID: ***L87353-04***
Date Sampled: *04/05/11 13:05*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 13:05	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 13:00	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 9:32	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 13:00	meg
Digestion - Hot Plate	M3050B ICP							04/20/11 23:36	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:18	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 13:00	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 13:00	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 13:00	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.0113		*	%	0.0004	0.002	04/23/11 17:29	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	2	B	*	mg/Kg	1	5	04/21/11 21:46	pjb

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA4 SOIL 0-6

ACZ Sample ID: ***L87353-05***
Date Sampled: *04/06/11 09:50*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 12:59	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	0.44			meq/L	0.01	0.05	04/27/11 14:22	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	9.20		*	meq/100g	0.03	0.2	04/27/11 12:40	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.28			meq/L	0.02	0.08	04/27/11 14:22	wfg
Potassium, total (3050)	M6010B ICP	3440			mg/Kg	30	200	04/21/11 21:37	jjc
Sodium Absorption Ratio	Calculation	0.51				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.31			meq/L	0.01	0.09	04/27/11 14:22	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	7			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	7			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.153		*	mmhos/cm	0.001	0.01	04/21/11 13:30	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	0.7		*	%	0.1	0.5	04/22/11 12:40	meg
Organic Matter	USDA No 60 - Method 24	2.2		*	%	0.3	1	04/21/11 22:37	brd
pH, Saturated Paste	USDA No. 60 (21A)	5.8		*	units	0.1	0.1	04/21/11 13:30	meg
Solids, Percent	CLPSOW390, PART F, D-98	84.1		*	%	0.1	0.5	04/19/11 17:36	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Pyritic Sulfide			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Total			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Total Sulfur minus Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		21.3		*	%	0.1	0.5	04/21/11 0:00	meg
Sand		46.3		*	%	0.1	0.5	04/21/11 0:00	meg
Silt		32.5		*	%	0.1	0.5	04/21/11 0:00	meg
Texture Classification		loam		*				04/21/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation

Project ID: 24585223.25000
Sample ID: AREA4 SOIL 0-6

ACZ Sample ID: ***L87353-05***
Date Sampled: *04/06/11 09:50*
Date Received: *04/09/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 13:21	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 13:20	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 10:10	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 13:20	meg
Digestion - Hot Plate	M3050B ICP							04/21/11 0:46	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:24	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 13:20	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 13:20	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 13:20	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.075		*	%	0.001	0.006	04/23/11 17:49	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	28		*	mg/Kg	1	5	04/21/11 21:47	pjb

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA4 SOIL 6-12

ACZ Sample ID: ***L87353-06***
Date Sampled: *04/06/11 10:00*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 13:24	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	0.46			meq/L	0.01	0.05	04/27/11 14:25	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	9.40		*	meq/100g	0.03	0.2	04/27/11 12:52	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.27			meq/L	0.02	0.08	04/27/11 14:25	wfg
Potassium, total (3050)	M6010B ICP	3330			mg/Kg	30	200	04/21/11 21:40	jjc
Sodium Absorption Ratio	Calculation	0.43				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.26			meq/L	0.01	0.09	04/27/11 14:25	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	8			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	8			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.128		*	mmhos/cm	0.001	0.01	04/21/11 13:56	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	0.8		*	%	0.1	0.5	04/22/11 13:00	meg
Organic Matter	USDA No.60 - Method 24	1.9		*	%	0.3	1	04/22/11 0:00	brd
pH, Saturated Paste	USDA No. 60 (21A)	6.5		*	units	0.1	0.1	04/21/11 13:56	meg
Solids, Percent	CLPSOW390, PART F, D-98	82.3		*	%	0.1	0.5	04/19/11 19:32	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Pyritic Sulfide			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Total			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Total Sulfur minus Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		21.3		*	%	0.1	0.5	04/21/11 0:00	meg
Sand		47.5		*	%	0.1	0.5	04/21/11 0:00	meg
Silt		31.3		*	%	0.1	0.5	04/21/11 0:00	meg
Texture Classification		loam		*				04/21/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA4 SOIL 6-12

ACZ Sample ID: ***L87353-06***
Date Sampled: *04/06/11 10:00*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 13:54	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 13:40	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 11:27	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 13:40	meg
Digestion - Hot Plate	M3050B ICP							04/21/11 1:57	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:30	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 13:40	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 13:40	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 13:40	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.0728		*	%	0.0008	0.004	04/23/11 17:50	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	16		*	mg/Kg	1	5	04/21/11 21:49	pjb

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA5 SOIL 0-6

ACZ Sample ID: ***L87353-07***
Date Sampled: *04/06/11 13:30*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 13:48	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	2.52			meq/L	0.01	0.05	04/27/11 14:28	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	9.00		*	meq/100g	0.03	0.2	04/27/11 12:55	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.62			meq/L	0.02	0.08	04/27/11 14:28	wfg
Potassium, total (3050)	M6010B ICP	3000			mg/Kg	30	200	04/21/11 21:44	jjc
Sodium Absorption Ratio	Calculation	0.17				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.22			meq/L	0.01	0.09	04/27/11 14:28	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	41			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	41			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.380		*	mmhos/cm	0.001	0.01	04/21/11 14:22	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	4.1		*	%	0.1	0.5	04/22/11 13:20	meg
Organic Matter	USDA No.60 - Method 24	2.2		*	%	0.3	1	04/22/11 1:22	brd
pH, Saturated Paste	USDA No. 60 (21A)	7.8		*	units	0.1	0.1	04/21/11 14:22	meg
Solids, Percent	CLPSOW390, PART F, D-98	84.0		*	%	0.1	0.5	04/19/11 21:27	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Pyritic Sulfide			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Sulfate		0.03	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Total		0.03	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Total Sulfur minus Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		25.0		*	%	0.1	0.5	04/21/11 0:00	meg
Sand		38.8		*	%	0.1	0.5	04/21/11 0:00	meg
Silt		36.3		*	%	0.1	0.5	04/21/11 0:00	meg
Texture Classification		loam		*				04/21/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA5 SOIL 0-6

ACZ Sample ID: ***L87353-07***
Date Sampled: *04/06/11 13:30*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 14:10	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 14:00	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 12:05	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 14:00	meg
Digestion - Hot Plate	M3050B ICP							04/21/11 3:07	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:36	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 14:00	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 14:00	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 14:00	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.0490		*	%	0.0005	0.003	04/23/11 17:35	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	21		*	mg/Kg	1	5	04/21/11 21:53	pjb

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA5 SOIL 6-12

ACZ Sample ID: ***L87353-08***
Date Sampled: *04/06/11 13:35*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 14:13	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	2.69			meq/L	0.01	0.05	04/27/11 14:31	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	10.00		*	meq/100g	0.03	0.2	04/27/11 12:58	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.63			meq/L	0.02	0.08	04/27/11 14:31	wfg
Potassium, total (3050)	M6010B ICP	3620			mg/Kg	30	200	04/21/11 21:47	jjc
Sodium Absorption Ratio	Calculation	0.17				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.22			meq/L	0.01	0.09	04/27/11 14:31	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	33			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	33			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.378		*	mmhos/cm	0.001	0.01	04/21/11 14:48	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	3.3		*	%	0.1	0.5	04/22/11 13:40	meg
Organic Matter	USDA No.60 - Method 24	1.9		*	%	0.3	1	04/22/11 5:30	brd
pH, Saturated Paste	USDA No. 60 (21A)	7.6		*	units	0.1	0.1	04/21/11 14:48	meg
Solids, Percent	CLPSOW390, PART F, D-98	85.6		*	%	0.1	0.5	04/19/11 23:23	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue		0.02	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Pyritic Sulfide		0.02	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Total		0.02	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Total Sulfur minus Sulfate		0.02	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		27.5		*	%	0.1	0.5	04/21/11 0:00	meg
Sand		32.5		*	%	0.1	0.5	04/21/11 0:00	meg
Silt		40.0		*	%	0.1	0.5	04/21/11 0:00	meg
Texture Classification		clay loam		*				04/21/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA5 SOIL 6-12

ACZ Sample ID: ***L87353-08***
Date Sampled: *04/06/11 13:35*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 14:27	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 14:20	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 12:43	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 14:20	meg
Digestion - Hot Plate	M3050B ICP							04/21/11 4:18	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:42	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 14:20	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 14:20	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 14:20	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.0697		*	%	0.0005	0.003	04/23/11 17:36	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	22		*	mg/Kg	1	5	04/21/11 21:54	pjb

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA1 SOIL 0-6

ACZ Sample ID: ***L87353-09***
Date Sampled: *04/06/11 14:25*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 14:37	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	2.88			meq/L	0.01	0.05	04/27/11 14:34	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	7.10		*	meq/100g	0.03	0.2	04/27/11 13:01	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	1.26			meq/L	0.02	0.08	04/27/11 14:34	wfg
Potassium, total (3050)	M6010B ICP	1660			mg/Kg	30	200	04/21/11 21:51	jjc
Sodium Absorption Ratio	Calculation	0.39				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.57			meq/L	0.01	0.09	04/27/11 14:34	wfg

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	19			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	19			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.485		*	mmhos/cm	0.001	0.01	04/21/11 15:15	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	1.9		*	%	0.1	0.5	04/22/11 14:00	meg
Organic Matter	USDA No.60 - Method 24	2.0		*	%	0.3	1	04/22/11 6:52	brd
pH, Saturated Paste	USDA No. 60 (21A)	7.5		*	units	0.1	0.1	04/21/11 15:15	meg
Solids, Percent	CLPSOW390, PART F, D-98	84.8		*	%	0.1	0.5	04/20/11 1:18	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue		0.01	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur HNO3 Residue		0.02	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Organic Residual Mod		0.02	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Pyritic Sulfide			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Sulfate		0.01	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Total		0.02	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Total Sulfur minus Sulfate		0.01	B	*	%	0.01	0.1	04/22/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		25.0		*	%	0.1	0.5	04/21/11 0:00	meg
Sand		40.0		*	%	0.1	0.5	04/21/11 0:00	meg
Silt		35.0		*	%	0.1	0.5	04/21/11 0:00	meg
Texture Classification		loam		*				04/21/11 0:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA1 SOIL 0-6

ACZ Sample ID: ***L87353-09***
Date Sampled: *04/06/11 14:25*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 14:43	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 14:40	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 13:21	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 14:40	meg
Digestion - Hot Plate	M3050B ICP							04/21/11 5:28	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:48	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 14:40	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 14:40	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 14:40	meg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.080		*	%	0.001	0.005	04/23/11 17:52	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	8		*	mg/Kg	1	5	04/21/11 21:55	pjb

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA1 SOIL 6-12

ACZ Sample ID: ***L87353-10***
Date Sampled: *04/06/11 14:35*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor							04/21/11 15:01	lhb

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, soluble (Sat. Paste)	M6010B ICP	3.01			meq/L	0.01	0.05	04/27/11 14:37	wfg
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	4.10		*	meq/100g	0.03	0.2	04/27/11 13:04	wfg
Magnesium, soluble (Sat. Paste)	M6010B ICP	1.11			meq/L	0.02	0.08	04/27/11 14:37	wfg
Potassium, total (3050)	M6010B ICP	960			mg/Kg	30	200	04/21/11 21:54	jjc
Sodium Absorption Ratio	Calculation	0.40				0.03	0.15	04/28/11 14:20	calc
Sodium, soluble (Sat. Paste)	M6010B ICP	0.58			meq/L	0.01	0.09	04/27/11 14:37	wfg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA1 SOIL 6-12

ACZ Sample ID: ***L87353-10***
Date Sampled: *04/06/11 14:35*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	0			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	134			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	134			t CaCO3/Kt	1	5	04/28/11 14:20	calc
Conductivity @25C	SM2510B	0.479		*	mmhos/cm	0.001	0.01	04/21/11 15:41	meg
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	13.4		*	%	0.1	0.5	04/22/11 12:00	meg
Organic Matter	USDA No.60 - Method 24	1.6		*	%	0.3	1	04/22/11 8:15	brd
pH, Saturated Paste	USDA No. 60 (21A)	8.0		*	units	0.1	0.1	04/21/11 15:41	meg
Solids, Percent	CLPSOW390, PART F, D-98	89.8		*	%	0.1	0.5	04/20/11 3:13	nrc
Sulfur Forms	M600/2-78-054 3.2.4-MOD								
Sulfur HCl Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur HNO3 Residue			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Organic Residual Mod			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Pyritic Sulfide			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Sulfur Total			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Total Sulfur minus Sulfate			U	*	%	0.01	0.1	04/22/11 0:00	bsu
Texture by Hydrometer	ASTM D 422 Hydrometer								
Clay		21.3		*	%	0.1	0.5	04/21/11 0:00	meg
Sand		55.0		*	%	0.1	0.5	04/21/11 0:00	meg
Silt		23.8		*	%	0.1	0.5	04/21/11 0:00	meg
Texture Classification		sandy clay loam		*				04/21/11 0:00	meg

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
AB-DPTA Extraction	ASA No.9, 3-5.2.3							04/20/11 15:00	bsu
Air Dry at 34 Degrees C	USDA No. 1, 1972							04/14/11 15:00	nrc
Cation Exchange Capacity Extraction	USDA No. 60 (19)							04/25/11 14:00	meg
Crush and Pulverize	USDA No. 1, 1972							04/19/11 15:00	meg
Digestion - Hot Plate	M3050B ICP							04/21/11 6:39	bsu
Saturated Paste Extraction	USDA No. 60 (2)							04/20/11 12:54	meg
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2							04/19/11 15:00	meg
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2							04/19/11 15:00	meg
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2							04/19/11 15:00	meg

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

URS Corporation
Project ID: 24585223.25000
Sample ID: AREA1 SOIL 6-12

ACZ Sample ID: ***L87353-10***
Date Sampled: *04/06/11 14:35*
Date Received: *04/08/11*
Sample Matrix: *Soil*

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.0507		*	%	0.0006	0.003	04/23/11 17:38	pjb
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	3	B	*	mg/Kg	1	5	04/21/11 21:56	pjb

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Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5)	EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6)	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 & 20th edition (1998).

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

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ACZ Laboratories, Inc.
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Inorganic QC Summary

URS Corporation ACZ Project ID: ***L87353***

Project ID: 24585223.25000

Calcium, soluble (Sat. Paste) M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300448													
WG300448ICV	ICV	04/27/11 13:54	II110104-1	100		99.66	mg/L	99.7	90	110			
WG300448ICB	ICB	04/27/11 13:57				U	mg/L		-0.6	0.6			
L87353-10DUP	DUP	04/27/11 14:46			3.01	3.031	meq/L				0.7	20	

Cation Exchange Capacity (CEC) USDA No. 60 (19)

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300447													
WG300447ICV	ICV	04/27/11 12:01	II110104-1	100		99.93	mg/L	99.9	90	110			
WG300447ICB	ICB	04/27/11 12:04				U	mg/L		-0.9	0.9			
WG300274PBS	PBS	04/27/11 12:16				.047	meq/100g		-0.09	0.09			
L87353-01AS	AS	04/27/11 12:25	IICECSPIKE	54.3815	12	67.298	meq/100g	101.7	75	125			
L87353-01ASD	ASD	04/27/11 12:28	IICECSPIKE	54.3815	12	67.266	meq/100g	101.6	75	125	0.05	20	
L87353-05DUP	DUP	04/27/11 12:43			9.2	9.1592	meq/100g				0.4	20	

Conductivity @25C SM2510B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300132													
L87353-10DUP	DUP	04/21/11 16:33			.479	.48	nmhos/cn				0.2	20	

Magnesium, soluble (Sat. Paste) M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300448													
WG300448ICV	ICV	04/27/11 13:54	II110104-1	100		102.37	mg/L	102.4	90	110			
WG300448ICB	ICB	04/27/11 13:57				U	mg/L		-0.6	0.6			
L87353-10DUP	DUP	04/27/11 14:46			1.11	1.109	meq/L				0.1	20	

Neutralization Potential as CaCO3 M600/2-78-054 3.2.3

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300174													
WG300174PBS	PBS	04/22/11 9:30				U	%		-0.1	0.1			
WG300174LCSS	LCSS	04/22/11 10:00	PCN33453	100		106.63	%	106.6	80	120			
L87353-03DUP	DUP	04/22/11 11:00			40.5	40.66	%				0.4	20	
WG300175													
WG300175PBS	PBS	04/22/11 11:00				U	%		-0.1	0.1			
WG300175LCSS	LCSS	04/22/11 11:20	PCN33453	100		100.45	%	100.5	80	120			
L87353-01DUP	DUP	04/22/11 12:00			.5	.47	%				6.2	20	RA

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URS Corporation
Project ID: 24585223.25000

ACZ Project ID: ***L87353***

Nitrogen, total Kjeldahl M351.2 - TKN by Block Digester

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300326													
WG300326ICV	ICV	04/23/11 17:19	WI110402-2	4		4.14	mg/L	103.5	90	110			
WG300326ICB	ICB	04/23/11 17:20				U	mg/L		-0.3	0.3			
WG300149PBS	PBS	04/23/11 17:21				U	%		-0.006	0.006			
WG300149LFB	LFB	04/23/11 17:22	WI110209-9	2.5		2.73	%	109.2	85	115			
L87353-02DUP	DUP	04/23/11 17:48			.0717	.08261	%				14.1	20	
L87353-01MS	MS	04/23/11 17:56	5XPTSTKN	.0065	.117	.0922	%	-381.5	75	125			M3

Organic Matter USDA No.60 - Method 24

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300232													
WG300232PBS	PBS	04/21/11 13:00				U	%		-0.3	0.3			
WG300232LCSS	LCSS	04/21/11 14:22	PCN32557	2		2.08	%	104					
L87353-01DUP	DUP	04/21/11 17:07			1.5	1.64	%				8.9	20	RA

Percent Clay ASTM D 422 Hydrometer

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300139													
L87353-10DUP	DUP	04/21/11 16:00			21.3	21.3	%				0	20	

Percent Sand ASTM D 422 Hydrometer

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300139													
L87353-10DUP	DUP	04/21/11 16:00			55	55	%				0	20	

Percent Silt ASTM D 422 Hydrometer

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300139													
L87353-10DUP	DUP	04/21/11 16:00			23.8	23.8	%				0	20	

pH, Saturated Paste USDA No. 60 (21A)

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300132													
WG300132ICV	ICV	04/21/11 11:18	PCN36402	4		3.98	units	99.5	90	110			
L87353-10DUP	DUP	04/21/11 16:33			8	8.05	units				0.6	20	

Phosphorus, extractable (AB-DTPA) M365.1 - Automated Ascorbic Acid

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300263													
WG300263ICV	ICV	04/21/11 21:35	WI110405-5	.65228		.644	mg/L	98.7	90	110			
WG300263ICB	ICB	04/21/11 21:38				U	mg/L		-0.03	0.03			
WG300263LFB	LFB	04/21/11 21:39	WI110415-9	.5		.517	mg/L	103.4	90	110			
WG300153PBS	PBS	04/21/11 21:40				U	mg/L		-3	3			
L87353-01AS	AS	04/21/11 21:43	WI110415-9	50	15	65.5	mg/L	101	90	110			
L87353-05DUP	DUP	04/21/11 21:48			28	28.5	mg/L				1.8	20	

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URS Corporation ACZ Project ID: ***L87353***

Project ID: 24585223.25000

Potassium, total (3050) M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300228													
WG300228ICV	ICV	04/21/11 20:31	II110104-3	20		20.44	mg/L	102.2	90	110			
WG300228ICB	ICB	04/21/11 20:35				U	mg/L		-0.9	0.9			
WG300121PBS	PBS	04/21/11 20:49				U	mg/Kg		-90	90			
WG300121LCSS1	LCSS	04/21/11 20:52	PCN36183	2780		3209	mg/Kg		1920	3640			
WG300121LCSSD1	LCSSD	04/21/11 20:56	PCN36183	2780		3159	mg/Kg		1920	3640	1.6	20	
L87353-01MS	MS	04/21/11 21:09	II110321-2	10194.96528	3250	14737	mg/Kg	112.7	75	125			
L87353-01MSD	MSD	04/21/11 21:13	II110321-2	10194.96528	3250	13540	mg/Kg	100.9	75	125	8.47	20	

Sodium, soluble (Sat. Paste) M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300448													
WG300448ICV	ICV	04/27/11 13:54	II110104-1	100		99.81	mg/L	99.8	90	110			
WG300448ICB	ICB	04/27/11 13:57				U	mg/L		-0.9	0.9			
L87353-10DUP	DUP	04/27/11 14:46			.58	.579	meq/L				0.3	20	

Solids, Percent CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300038													
WG300038PBS	PBS	04/19/11 8:00				U	%		99.9	100.1			
L87353-10DUP	DUP	04/20/11 5:09			89.8	89.34	%				0.5	20	

Sulfur Organic Residual Mod M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300211													
L87353-01DUP	DUP	04/21/11 17:56			U	U	%				0	20	RA

Sulfur Pyritic Sulfide M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300211													
L87353-01DUP	DUP	04/21/11 17:56			U	U	%				0	20	RA

Sulfur Sulfate M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300211													
L87353-01DUP	DUP	04/21/11 17:56			U	.04	%				200	20	RA

Sulfur Total M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300211													
WG300211PBS	PBS	04/21/11 10:30				U	%		-0.03	0.03			
WG300211LCSS	LCSS	04/21/11 12:58	PCN36956	4.24		5.04	%	118.9	3.392	5.088			
L87353-01DUP	DUP	04/21/11 17:56			U	.04	%				200	20	RA

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Inorganic QC Summary

URS Corporation
Project ID: 24585223.25000

ACZ Project ID: ***L87353***

Total Sulfur Minus Sulfate M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG300211													
L87353-01DUP	DUP	04/21/11 17:56			U	U	%				0	20	RA

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

URS Corporation

ACZ Project ID: ***L87353***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L87353-01	WG300447	Cation Exchange Capacity (CEC)	USDA No. 60 (19)	DJ	Sample dilution required due to insufficient sample.
	WG300175	Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
L87353-02	WG300175	Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L87353-03	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
L87353-04	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.

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DIV. OIL GAS & MINING

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

URS Corporation ACZ Project ID: ***L87353***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L87353-05	WG300175	Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
L87353-06	WG300175	Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L87353-07	WG300175	Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
L87353-08	WG300175	Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

URS Corporation

ACZ Project ID: ***L87353***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L87353-09	**WG300175**	**Neutralization Potential as CaCO3**	M600/2-78-054 3.2.3	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.
L87353-10	WG300232	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300211	Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG300326	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG300263	Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	DA	Sample required dilution due to reactivity.
			M365.1 - Automated Ascorbic Acid	HD	Analysis is outside the intended scope of the method, which does not provide hold time information for soil extracts. No hold time is observed for collection to extraction. The referenced method hold time is observed for extraction-to-analysis.

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Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Cation Exchange Capacity (CEC)	USDA No. 60 (19)

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Clay	ASTM D 422 Hydrometer
Conductivity @25C	SM2510B
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3
Organic Matter	USDA No.60 - Method 24
pH, Saturated Paste	USDA No. 60 (21A)
Sand	ASTM D 422 Hydrometer
Silt	ASTM D 422 Hydrometer
Solids, Percent	CLPSOW390, PART F, D-98
Sulfur HCl Residue	M600/2-78-054 3.2.4-MOD
Sulfur HNO3 Residue	M600/2-78-054 3.2.4-MOD
Sulfur Organic Residual Mod	M600/2-78-054 3.2.4-MOD
Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD
Sulfur Sulfate	M600/2-78-054 3.2.4-MOD
Sulfur Total	M600/2-78-054 3.2.4-MOD
Texture Classification	ASTM D 422 Hydrometer
Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD

Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid

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ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

URS Corporation
24585223.25000

ACZ Project ID: L87353
Date Received: 04/09/2011 11:02
Received By: gac
Date Printed: 4/11/2011

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?	X		
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Are the trip blanks (VOA and/or Cyanide) present?			X
12) Are samples requiring no headspace, headspace free?			X
13) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

N/A

Contact (For any discrepancies, the client must be contacted)

N/A

Shipping Containers

Cooler Id		Temp (°C)	Rad (µR/hr)
2897		14.3	20
2300		14.5	17

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

Cross out in Analysis section.

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DIV. OIL GAS & MINING

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

URS Corporation
24585223.25000

ACZ Project ID: L87353
Date Received: 04/09/2011 11:02
Received By: gac
Date Printed: 4/11/2011

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L87353-01	AREA3 SOIL 0-6									X		
L87353-02	AREA3 SOIL 6-12									X		
L87353-03	AREA2 SOIL 0-6									X		
L87353-04	AREA2 SOIL 6-12									X		
L87353-05	AREA4 SOIL 0-6									X		
L87353-06	AREA4 SOIL 6-12									X		
L87353-07	AREA5 SOIL 0-6									X		
L87353-08	AREA5 SOIL 6-12									X		
L87353-09	AREA1 SOIL 0-6									X		
L87353-10	AREA1 SOIL 6-12									X		

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Sulfuric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: gac

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ACZ Laboratories, Inc. L87353 — CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Amber Fortner
Company: URS Corp
E-mail: amber_fortner@urscorp.com
Address: 756 E Winchester St. Suite 400
Salt Lake City, UT 84107
Telephone: 801-904-4000

Copy of Report to:

Name: Laura Springsteen
Company: URS Corp
E-mail: laura_springsteen@urscorp.com
Telephone: 801-904-4110

Invoice to:

Name: Amber Fortner
Company: URS Corp
E-mail: amber_fortner@urscorp.com
Address: 756 E. Winchester St Suite 400
Salt Lake City, UT 84107
Telephone: 801-904-4000

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [ ] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for SDWA Compliance Monitoring? Yes [ ] No [X]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: L. Springsteen Sampler's site Information State: UT Zip code: 84106 Time Zone: MDT

PROJECT INFORMATION

Quote #: BASELINE-ALL
Project/PO #: 24585223.25000
Reporting state for compliance testing: UT
Check box if samples include NRC licensed material? [ ]

ANALYSIS REQUESTED (attach list or use quote number)

SEE ATTACHED QUOTE FOR ANALYSES. PLEASE RUN ~~EAC~~ ALL ANALYSES ON EACH SAMPLE

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers
area 3 soil 0-6	4/5/11	1145	SO	2
area 3 soil 6-12	4/5/11	1200		2
area 2 soil 0-6		1250		
area 2 soil 6-12		1305		
area 4 soil 0-6	4/6	950		
area 4 soil 6-12	4/6	1000		
area 5 soil 0-6	4/6	1330		
area 5 soil 6-12	4/6	1335		
area 1 soil 0-6	4/6	1425		
area 1 soil 6-12	4/6	1435		

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

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Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
[signature]	4/7/11 1200		
		[signature]	4-8-11 10:00

L87353 Chain of Custody

FRMAD050.02.11.11 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

3/16/2011

Amber Fortner
URS Corporation
756 E. Winchester Suite 400
Salt Lake City, UT 84107

Quote Number: BASELINE-ALL

Matrix: Soil — 12 samples/ one time analysis- Baseline parameters and ABA.

Parameter	Method	Detection Limit	Cost/Sample
Inorganic Prep			
Nitrogen, total Kjeldahl Prep	M351.2 - Block Digestor		$0.00
Metals Analysis			
Calcium, soluble (Sat. Paste)	M6010B ICP	0.2 meq/L	$9.00
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	0.032625 meq/100g	$21.60
Magnesium, soluble (Sat. Paste)	M6010B ICP	0.2 meq/L	$9.00
Potassium, total (3050)	M6010B ICP	30 mg/Kg	$8.10
Sodium Absorption Ratio	Calculation	Calculation	$0.00
Sodium, soluble (Sat. Paste)	M6010B ICP	0.3 meq/L	$9.00
Misc.			
Electronic Data Deliverable			$0.00
Quality Control Summary			$0.00
Setup charge for ICP, total			$36.00
Sample Preparation			
AB-DPTA Extraction	ASA No.9, 3-5.2.3		$10.80
Air Dry at 34 Degrees C	USDA No. 1, 1972		$7.20
Cation Exchange Capacity Extraction	USDA No. 60 (19)		$0.00
Crush and Pulverize	USDA No. 1, 1972		$10.80
Digestion - Hot Plate	M3050B ICP		$14.40
Saturated Paste Extraction	USDA No. 60 (2)		$16.20
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2		$10.80
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2		$10.80
Sieve-500 um (0.5mm)	ASA No.9, 15-4.2.2		$10.80
Soil Analysis			
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 1.3	Calculation	$0.00
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	Calculation	$0.00
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	Calculation	$0.00
Conductivity @25C	SM2510B	0.001 mmhos/cm	$7.20
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	0.1 %	$14.40
Organic Matter	USDA No.60 - Method 24	0.3 %	$22.50
pH, Saturated Paste	USDA No. 60 (21A)	0.1 units	$7.20
Solids, Percent	CLPSOW390, PART F, D-98	0.1 %	$7.20
Sulfur Forms	M600/2-78-054 3.2.4-MOD	0.01 %	$66.60

REPAD.09.06.05.01

S/ m D/ ## P/

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ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

3/16/2011

Amber Fortner
URS Corporation
756 E. Winchester Suite 400
Salt Lake City, UT 84107

Texture by Hydrometer	ASTM D 422 Hydrometer	0.1 %	$16.20
Wet Chemistry			
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	0.1 %	$21.60
Phosphorus, extractable (AB-DTPA)	M365.1 - Automated Ascorbic Acid	1 mg/Kg	$14.40
		Cost/Sample:	**$361.80**

This quote is based on a Standard Turn Around Time of approximately 21 days. All projects received are subject to a $125.00 Minimum Charge. Soil preparation charges may fluctuate dependant on the condition of samples upon receipt. Please note that method detection limits are estimates and may be elevated depending on sample matrix.

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REPAD.09.06.05.01

S/ m D/ ## P/

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Amber Fortner
URS Corporation
756 E. Winchester Suite 400
Salt Lake City, UT 84107

3/16/2011

Quote Number: BASELINE-ALL

Pricing includes shipment of all standard sample containers and related paperwork by UPS Ground Service. Please allow three to five days for delivery when ordering containers. ACZ must be notified prior to receiving samples of all special requests such as electronic data deliverables or special reporting reqirements. The client will be charged for special sample containers or express shipping and additional charges may apply for non-standard requests.

This quotation is valid for six months from the bid date unless specified otherwise in the bid. All bids must be signed and returned to ACZ before project(s) is received. The authorized signature represents acceptance of the pricing as well as the general terms and conditions of ACZ Laboratories, Inc. Our general terms and conditions can be downloaded from our web site at http://www.acz.com/PDF/termsconditions.pdf. Please note that MDL's in this quote may possibly increase due to sample matrix or samples with high TDS.

All orders that require shipping of coolers are subject to a minimum charge of $200.00. Local orders without shipping are subject to a minimum charge of $125.00. Samples may incur a $10.00/sample disposal fee for any samples deemed to be hazardous.

ACZ Representative (Authorized signature and date) _____

Client Representative (Authorized signature and date) _____

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Appendix D

Correspondence

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URS

December 9, 2010

Sarah Lindsey
Utah Division of Wildlife Resources
1594 W. North Temple, Suite 2110
Salt Lake City, Utah 84116

Re: **Request for Information**
Bonneville Crusher Area Borrow Site, Kennecott Utah Copper LLC, Salt Lake County, Utah

Dear Ms. Lindsey:

URS Corporation, on behalf of Kennecott Utah Copper LLC, is conducting a baseline survey in order to prepare a Notice of Intent (NOI) for a Large Mine Operation (LMO) Mine and Reclamation Plan (MFRP) for the Bonneville Crusher Area Borrow Site located in Township 1 South, Range 2 West, Section 31 and Township 1 South, Range 3 West, Sections 36 and 25 on the USGS Farnsworth Peak and Magna 7.5 minute quadrangle maps. The Site is located in Salt Lake County, approximately one mile southeast of Magna, Utah. The Site is approximately 300 acres. The approximate center point of the Site is longitude -112.25, latitude 40.693. A topographic site location map and an aerial photographic site map are enclosed for your review.

In order to assist with our review of the site, URS Corporation is requesting additional information regarding rare animal and plant species located within the project site.

I look forward to your response so that we may continue to move forward with this project. If you have any questions please do not hesitate to contact me at (801) 904-4110.

Thank you,

URS Corporation

Laura Springsteen

Laura Springsteen
Environmental Planner

Enclosure

cc: Amber Fortner, URS

URS Corporation
756 East Winchester Street
Suite 400
Salt Lake City, Utah 84107
Tel: 801.904.4000
Fax: 801.904.4100
www.urscorp.com

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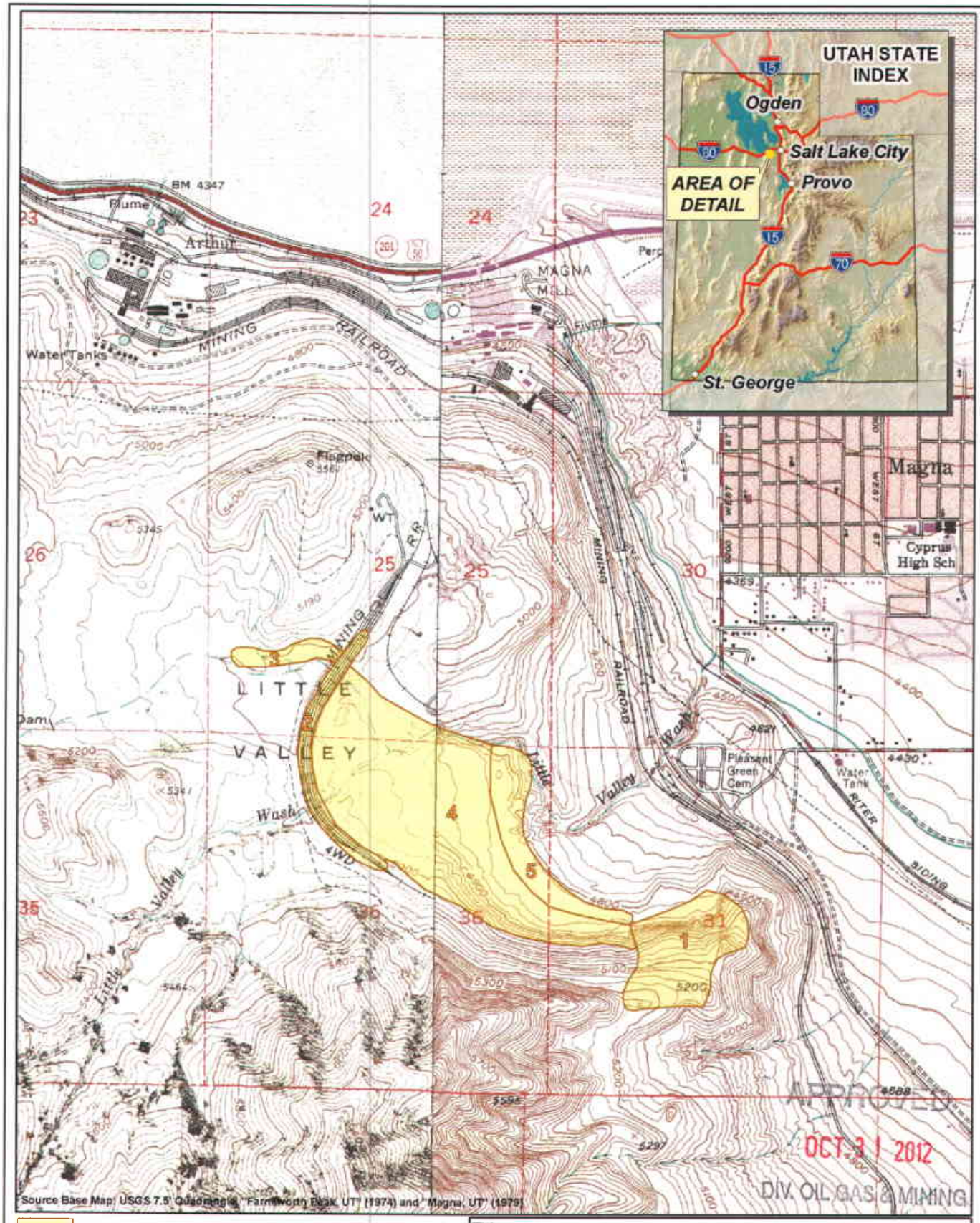

Borrow Area Permit Bondaries

0 1,000 2,000 3,000 Feet

Title: Location Map	
Project: Bonneville Crusher Areas Borrow Pit	Proj No:
	Figure: 1
Client : Kennecott, Utah Copper	Date: November 2010
	URS

Source Aerial Photograph: High Resolution Ortho-Imagery (HRO), 1-foot, 2009, http://gis.utah.gov/aerial-photography/2009-hro-1-foot-color-orthophotography

Borrow Area Permit Bondaries

0 800 1,600 2,400 Feet

Title: Ecology Site Map	
Project: Bonneville Crusher Areas Borrow Pit	Proj No:
	Figure: 2
Client : Kennecott, Utah Copper	Date: November 2010
	URS

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Wildlife Resources

JAMES F. KARPOWITZ
Division Director

December 13, 2010

Laura Springsteen
URS Corporation
756 East Winchester, Suite 400
Salt Lake City, Utah

Subject: Species of Concern Near the Bonneville Crusher Area Borrow Site

Dear Laura Springsteen:

I am writing in response to your letter dated December 9, 2010 regarding information on species of special concern proximal to the Kennecott Bonneville Crusher Area Borrow Site located in Section 31 of Township 1 South, Range 2 West, and Sections 25 and 36 of Township 1 South, Range 3 West, SLB&M, near Magna in Salt Lake County, Utah.

The Utah Division of Wildlife Resources (UDWR) does not have records of occurrence for any threatened, endangered, or sensitive species within the project area noted above. However, in the vicinity there are recent records of occurrence for ferruginous hawk and long-billed curlew. All of the aforementioned species are included on the *Utah Sensitive Species List.*

The information provided in this letter is based on data existing in the Utah Division of Wildlife Resources' central database at the time of the request. It should not be regarded as a final statement on the occurrence of any species on or near the designated site, nor should it be considered a substitute for on-the-ground biological surveys. Moreover, because the Utah Division of Wildlife Resources' central database is continually updated, and because data requests are evaluated for the specific type of proposed action, any given response is only appropriate for its respective request.

In addition to the information you requested, other significant wildlife values might also be present on the designated site. Please contact UDWR's habitat manager for the central region, Mark Farmer, at (801) 491-5653 if you have any questions.

Please contact our office at (801) 538-4759 if you require further assistance.

Sincerely,

Sarah Lindsey

Sarah Lindsey
Information Manager
Utah Natural Heritage Program

cc: Mark Farmer, CRO

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1594 W. North Temple, Suite 2110, PO Box 146301, Salt Lake City, UT 84114-6301
telephone (801) 538-4700 • facsimile (801) 538-4709 • TTY (801) 538-7458 • *www.wildlife.utah.gov*

UTAH DNR WILDLIFE RESOURCES

STATE OF UTAH – DIVISION OF WATER RIGHTS – DATA PRINT OUT for 59-4773(A55357)

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 08/26/2011

WATER RIGHT: 59-4773 APPLICATION/CLAIM NO.: A55357 CERT. NO.:

OWNERSHIP**********

NAME: Kennecott Land Company
ADDR: c/o Van F. King, Manager Assets
PO Box 95550
South Jordan, Utah 84095-0550
INTEREST: 0% REMARKS: Interested Party Only

NAME: Kennecott Utah Copper Corporation
ADDR: c/o Van F. King, Manager Assets
PO Box 95550
South Jordan, Utah 84095-0550

DATES, ETC.**********

LAND OWNED BY APPLICANT? Yes COUNTY TAX ID#:
FILED: 10/22/1980|PRIORITY: 10/22/1980|PUB BEGAN: 12/18/1980|PUB ENDED: |NEWSPAPER:
ProtestEnd: |PROTESTED: [No]|HEARNG HLD: |SE ACTION: [ ]|ActionDate:03/09/1981|PROOF DUE:
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF: |CERT/WUC: |LAP, ETC: 04/04/1986|LAPS LETTER:
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE: [ ]

PD BOOK: [59-]|MAP: [ ]|PUB DATE:

Type of Right: Application to Appropriate Source of Info: Application to Appropriate Status: Lapsed

LOCATION OF WATER RIGHT**********

FLOW: 1.0 cfs SOURCE: Underground Water Well

COUNTY: Salt Lake COMMON DESCRIPTION:

POINT OF DIVERSION -- UNDERGROUND:
(1) S 150 ft E 390 ft from N4 cor, Sec 31, T 1S, R 2W, SLBM
DIAMETER OF WELL: 12 ins. DEPTH: 500 to ft. YEAR DRILLED: WELL LOG? No WELL ID#:

USES OF WATER RIGHT******** ELU -- Equivalent Livestock Unit (cow, horse, etc.) ******** EDU -- Equivalent Domestic Unit or 1 Family

SUPPLEMENTAL GROUP NO. 421187.

IRRIGATION: 11.0 acres Div Limit: 0.0 acft. PERIOD OF USE: 04/01 TO 10/31

DOMESTIC: 171.0000 EDUs Div Limit: PERIOD OF USE: 01/01 TO 12/31

###PLACE OF USE:	NORTH WEST QUARTER				NORTH EAST QUARTER				SOUTH WEST QUARTER				SOUTH EAST QUARTER				Section Totals
	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	
Sec 31 T 1S R 2W SLBM					11.0000												11.0000
																GROUP ACREAGE TOTAL:	11.0000

DIVERSION & DEPLETION ESTIMATES**********

(All values in acre-feet, Growing Season in days)

	IRRIGATION	STOCK	DOMESTIC	MUNICIPAL	MINING	POWER	OTHER	MANUALLY EVALUATED	ACRE-FEET EXPORTED	DIVERSION DUTY	DEPLETION DUTY	GROWING SEASON	WATER-USE REPORTING
DIV:								Yes					
DEP:													

**********E N D O F D A T A**********

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utah gov | Online Services | Agency List | Business | Search

Utah Division of Water Rights

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 09/13/2011 Page 1

CHANGE: **a14561** WATER RIGHT: 59-1295 CERT. NO.: COUNTY TAX ID#: AMENDATORY? No
BASE WATER RIGHTS: 59-1295
RIGHT EVIDENCED BY: 59-1295 (A28685)
CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [ ], Reservoir Storage [ ].

NAME: Magna Water Company
ADDR: an Improvement District
P.O. Box 303
Magna UT 84044-0303
REMARKS:

FILED: 01/11/1988 | PRIORITY: 01/11/1988 | ADV BEGAN: 03/03/1988 | ADV ENDED: | NEWSPAPER: Deseret News
ProtestEnd:04/16/1988 | PROTESTED: [No] | HEARNG ELD: | SE ACTION: [Approved] | ActionDate:06/30/1988 | PROOF DUE:
EXTENSION: | ELEC/PROOF:[ ] | ELEC/PROOF: | CERT/WUC: | LAP, ETC: 08/30/1991 | LAPS LETTER:
RUSH LETTR:02/17/1988 | RENOVATE: | RECON REQ: | TYPE: [ ]
Status: **Withdrawn**

HERETOFORE

FLOW: 1.0 cfs

SOURCE: Underground Water Well

COUNTY: Salt Lake

A recent test hole at the location described in paragraph 14 indicates an adequate supply of good quality water is available. It is not possible to drill a well at the location described in paragraph 7; the applicant needs water of the quality available to serve it's customers and the site is strategically located with regard to existing facilities of the district.

POINT(S) OF DIVERSION ------> **MAP VIEWER***GOOGLE VIEW

Point Underground:
(1) N 200 ft W 600 ft from S4 cor, Sec 32, T 1S, R 2W, SLBM
Diameter: 16 ins. Depth: 350 to ft. WELL ID#: 000000

PLACE OF USE ------>

	--NW¼--	--NE¼--	--SW¼--	--SE¼--
	N N S S	N N S S	N N S S	N N S S
	W E W E	W E W E	W E W E	W E W E
Sec 19 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 20 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 21 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 28 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 29 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 30 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 31 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 32 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 33 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*

NATURE OF USE ------>
IRR = values are in acres.
STK = values are in ELUs meaning Cattle or Equivalent.
DOM = values are in EDUs meaning Equivalent Domestic Units (or Families).

SUPPLEMENTAL to Other Water Rights: No

MUN: Magna USED 01/01 - 12/31

HEREAFTER

FLOW: 1.0 cfs

SOURCE: Underground Water Well

COUNTY: Salt Lake COM DESC: Approx. 3500 So. & 9200 West.

The existing well at the present location did not produce a sufficient quantity of water. It is therefore, desireable to drill a new well at the proposed location where it is thought water of sufficient quantity and quality will be found.

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

UNDERGROUND: (Click Link for PLAT data, Well ID# link for data.)
(1) S 755 ft E 283 ft from N4 cor, Sec 31, T 1S, R 2W, SLBM
Diameter: 16 ins. Depth: 400 to ft. WELL ID#:

CHANGED as follows:

	--NW¼--	--NE¼--	--SW¼--	--SE¼--
	N N S S	N N S S	N N S S	N N S S
	W E W E	W E W E	W E W E	W E W E
Sec 16 T 1S R 2W SLBM	* : : :	** : : :	**X:X:X:X	**X:X:X:X*
Sec 19 T 1S R 2W SLBM	* : : :	** : : :	** : : :	**X:X:X:X*
Sec 20 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 21 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 23 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 27 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	** : : :	** : : : *
Sec 27 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	** : : :	** : : : *
Sec 28 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 29 T 1S R 2W SLBM	*X.X.X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 31 T 1S R 2W SLBM	* : : :	**X:X:X:X	** : : :	** : : : *
Sec 32 T 1S R 2W SLBM	*X.X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*
Sec 33 T 1S R 2W SLBM	*X:X:X:X	**X:X:X:X	**X:X:X:X	**X:X:X:X*

SAME AS HERETOFORE

SUPPLEMENTAL to Other Water Rights: No

MUN: Magna USED 01/01 - 12/31

END OF DATA

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OCT 3 1 2012

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Utah Division of Water Rights | 1594 West North Temple Suite 220, P.O. Box 146300, Salt Lake City, Utah 84114-6300 | 801-538-7240
Natural Resources | Contact | Disclaimer | Privacy Policy | Accessibility Policy | Emergency Evacuation Plan

Form 113-524-12-60

Examined _____
Recorded: B. C. _____ T. B. _____
Inspection Sheet _____
Copied _____

REPORT OF WELL DRILLER
STATE OF UTAH

Application No. 59-1295
Claim No. a 14561
Coordinate No. _____

GENERAL STATEMENT: Report of well driller is hereby made and filed with the State Engineer, in accordance with the laws of Utah. (This report shall be filed with the State Engineer within 30 days after the completion or abandonment of the well. Failure to file such reports constitutes a misdemeanor.)

(1) WELL OWNER:
Name: Magna Water Company
Address: 2711 So. 8600 West, Magna, Ut. 84044

(2) LOCATION OF WELL:
County: Magna Ground Water Basin (leave blank) _____
North/South _____ feet, West/East _____ feet from _____ Corner
Northwest Quarter of the Northeast Quarter of Section 31, T 1 N/S, R 2 E/W SLBM/USM (strike out words not needed)

(3) NATURE OF WORK (check): New Well ☒
Replacement Well ☐ Deepening ☐ Repair ☐ Abandon ☐
If abandonment, describe material and procedure: _____

(4) NATURE OF USE (check):
Domestic ☐ Industrial ☐ Municipal ☐ Stockwater ☐
Irrigation ☐ Mining ☐ Other ☐ Test Well ☒

(5) TYPE OF CONSTRUCTION (check):
Rotary ☒ Dug ☐ Jetted ☐
Cable ☐ Driven ☐ Bored ☐

(6) CASING SCHEDULE: Threaded ☐ Welded ☒
6" Diam. from 0 feet to 120 feet Gage 280
_____" Diam. from _____ feet to _____ feet Gage _____
_____" Diam. from _____ feet to _____ feet Gage _____
New ☐ Reject ☐ Used ☐

(7) PERFORATIONS: Perforated? Yes ☐ No ☐
Type of perforator used _____
Size of perforations _____ inches by _____ inches
_____ perforations from _____ feet to _____ feet
_____ perforations from _____ feet to _____ feet
_____ perforations from _____ feet to _____ feet
_____ perforations from _____ feet to _____ feet
_____ perforations from _____ feet to _____ feet

(8) SCREENS: Well screen installed? Yes ☐ No ☐
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ Set from _____ ft. to _____
Diam. _____ Slot size _____ Set from _____ ft. to _____

(9) CONSTRUCTION:
Was well gravel packed? Yes ☐ No ☐ Size of gravel: _____
Gravel placed from _____ feet to _____ feet
Was a surface seal provided? Yes ☐ No ☐
To what depth? _____ feet
Material used in seal: _____
Did any strata contain unusable water? Yes ☐ No ☐
Type of water: _____ Depth of strata _____
Method of sealing strata off: _____

Was surface casing used? Yes ☐ No ☐
Was it cemented in place? Yes ☐ No ☐

(10) WATER LEVELS:
Static level _____ feet below land surface Date _____
Artesian pressure _____ feet above land surface Date _____

LOG RECEIVED: 8/31/88

(11) FLOWING WELL:
Controlled by (check) Valve ☐
Cap ☐ Plug ☐ No Control ☐
Does well leak around casing? Yes ☐ No ☐

(12) WELL TESTS: Drawdown is the distance in feet the water level is lowered below static level.
Was a pump test made? Yes ☐ No ☐ If so, by whom? _____
Yield: _____ gal./min. with _____ feet drawdown after _____ hours
" _____ " _____ " _____ " _____ "
" _____ " _____ " _____ " _____ "
Bailer test _____ gal./min. with _____ feet drawdown after _____ hours
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? No ☐ Yes ☐

(13) WELL LOG: Diameter of well 6 inches
Depth drilled 550 feet. Depth of completed well _____ feet.

NOTE: Place an "X" in the space or combination of spaces needed to designate the material or combination of materials encountered in each depth interval. Under REMARKS make any desirable notes as to occurrence of water and the color, size, nature, etc., of material encountered in each depth interval. Use additional sheet if needed.

DEPTH From	DEPTH To	Clay	Silt	Sand	Gravel	Cobbles	Boulders	Hardpan	Conglomerate	Bedrock	Other	REMARKS
0	25											Sandstone & Quartz
25	50											" "
50	75											" "
75	100											" "
100	125											" "
125	150											" "
150	175											" "
175	200											" "
200	225											" "
225	250											" "
250	275											" "
275	300											" "
325	350											" "
350	375											" "
375	400											" "
400	425											" "
425	450											" "
450	475											" "
475	500											
500	525			X								20 G.P.M.
525	550											Sandstone & Quartz

Work started May 3, 19 88 Completed May 25, 19 88

(14) PUMP:
Manufacturer's Name _____ H. P. _____
Type: _____
Depth to pump or bowles _____ feet

Well Driller's Statement:
This well was drilled under my supervision, and this report is true to the best of my knowledge and belief.
Name: Dave's Drilling Company (Person, firm, or corporation) (Type or print)
Address: 577 West 3410 South, S.L.C., UT 84115
(Signed) [signature] (Well Driller)
License No. 405 Date May 25, 19 88

APPROVED OCT 31 2012 DIV. OIL GAS & MINING

USE OTHER SIDE FOR ADDITIONAL REMARKS

County Lists of Utah's Federally Listed Threatened(T), Endangered(E), and Candidate(C) Species

Disclaimer: This list was compiled using known species occurrences and species observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS); other federally listed species likely occur in Utah Counties. This list includes both current and historic records. (Last updated on March 29, 2011).

Beaver County

Common Name	Scientific Name	Status
Greater Sage-grouse	*Centrocercus urophasianus*	C
Utah Prairie-dog	*Cynomys parvidens*	T
Ostler Peppergrass	*Lepidium ostleri*	C
Frisco Clover	*Trifolium friscanum*	C
Frisco Buckwheat	*Eriogonum soredium*	C

Box Elder County

Common Name	Scientific Name	Status
Goose Creek Milkvetch	*Astragalus anserinus*	C
Least Chub	*Iotichthys phlegethontis*	C
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawii*	T
June Sucker	*Chasmistes liorus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Gray Wolf	*Canis lupus*	E

Cache County

Common Name	Scientific Name	Status
Maguire Primrose	*Primula maguirei*	T
Ute Ladies' Tresses	*Spiranthes diluvialis*	LT
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T

Carbon County

Common Name	Scientific Name	Status
Uinta Basin Hookless Cactus	*Sclerocactus wetlandicus*	T
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Black-footed Ferret	*Mustela nigripes*	E Extirpated
Gray Wolf	*Canis lupus*	E

Daggett County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Humpback Chub	*Gila cypha*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C

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Created by the Utah Division of Wildlife Resources - March 29, 2011

Daggett County - continued

Common Name	Scientific Name	Status
Black-footed Ferret	*Mustela nigripes*	E Extirpated
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T

Davis County

Common Name	Scientific Name	Status
Least Chub	*Iotichthys phlegethontis*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C

Duchesne County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Shrubby Reed-mustard	*Glaucocarpum suffrutescens*	E
Barneby Ridge-cress	*Lepidium barnebyanum*	E
Pariette Cactus	*Sclerocactus brevispinus*	T
Uinta Basin Hookless Cactus	*Sclerocactus wetlandicus*	T
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Black-footed Ferret	*Mustela nigripes*	E Experimental
Gray Wolf	*Canis lupus*	E
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated

Emery County

Common Name	Scientific Name	Status
Jones Cycladenia	*Cycladenia humilis var jonesii*	T
Last Chance Townsendia	*Townsendia aprica*	T
Barneby Reed-mustard	*Schoenocrambe barnebyi*	E
San Rafael Cactus	*Pediocactus despainii*	E
Winkler Pincushion Cactus	*Pediocactus winkleri*	T
Wright Fishhook Cactus	*Sclerocactus wrightiae*	E
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Black-footed Ferret	*Mustela nigripes*	E Extirpated
Canada Lynx	*Lynx canadensis*	T
Gray Wolf	*Canis lupus*	E

Garfield County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Jones Cycladenia	*Cycladenia humilis var jonesii*	T
Autumn Buttercup	*Ranunculus aestivalis*	E
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C

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Garfield County - continued

Common Name	Scientific Name	Status
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Utah Prairie-dog	*Cynomys parvidens*	T
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated

Grand County

Common Name	Scientific Name	Status
Jones Cycladenia	*Cycladenia humilis var jonesii*	T
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Gunnison Sage-grouse	*Centrocercus minimus*	C
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Black-footed Ferret	*Mustela nigripes*	E Extirpated

Iron County

Common Name	Scientific Name	Status
Least Chub	*Iotichthys phlegethontis*	C
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Utah Prairie-dog	*Cynomys parvidens*	T
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated

Juab County

Common Name	Scientific Name	Status
Least Chub	*Iotichthys phlegethontis*	C
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C

Kane County

Common Name	Scientific Name	Status
Welsh's Milkweed	*Asclepias welshii*	T
Kodachrome Bladderpod	*Lesquerella tumulosa*	E
Siler Pincushion Cactus	*Pediocactus sileri*	T
Jones Cycladenia	*Cycladenia humilis var jonesii*	T
Kanab Ambersnail	*Oxyloma kanabense*	E
Coral Pink Sand Dunes Tiger Beetle	*Cicindela limbata albissima*	C
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E
Utah Prairie-dog	*Cynomys parvidens*	T

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Millard County

Common Name	Scientific Name	Status
Least Chub	*Iotichthys phlegethontis*	C
Greater Sage-grouse	*Centrocercus urophasianus*	C
Utah Prairie-dog	*Cynomys parvidens*	T
Frisco Clover	*Trifolium friscanum*	C

Morgan County

Common Name	Scientific Name	Status
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Gray Wolf	*Canis lupus*	E

Piute County

Common Name	Scientific Name	Status
Greater Sage-grouse	*Centrocercus urophasianus*	C
Utah Prairie-dog	*Cynomys parvidens*	T
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated

Rich County

Common Name	Scientific Name	Status
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Black-footed Ferret	*Mustela nigripes*	E Extirpated

Salt Lake County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Least Chub	*Iotichthys phlegethontis*	C
Greater Sage-grouse	*Centrocercus urophasianus*	C
June Sucker	*Chasmistes liorus*	E
Yellow-billed Cuckoo	*Coccyzus americanus*	C

San Juan County

Common Name	Scientific Name	Status
Navajo Sedge	*Carex specuicola*	T
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E
Black-footed Ferret	*Mustela nigripes*	E Extirpated
Gray Wolf	*Canis lupus*	E

Sanpete County

Common Name	Scientific Name	Status
Heliotrope Milkvetch	*Astragalus montii*	T
Greater Sage-grouse	*Centrocercus urophasianus*	C
Utah Prairie-dog	*Cynomys parvidens*	T

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Sanpete County - continued

Common Name	Scientific Name	Status
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T

Sevier County

Common Name	Scientific Name	Status
Last Chance Townsendia	*Townsendia aprica*	T
Wright Fishhook Cactus	*Sclerocactus wrightiae*	E
Heliotrope Milkvetch	*Astragalus montii*	T
Greater Sage-grouse	*Centrocercus urophasianus*	C
Utah Prairie-dog	*Cynomys parvidens*	T
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T

Summit County

Common Name	Scientific Name	Status
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T
Greater Sage-grouse	*Centrocercus urophasianus*	C

Tooele County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Least Chub	*Iotichthys phlegethontis*	C
Bonytail	*Gila elegans*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C

Uintah County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Shrubby Reed-mustard	*Glaucocarpum suffrutescens*	E
Clay Reed-mustard	*Schoenocrambe argillacea*	T
Pariette Cactus	*Sclerocactus brevispinus*	T
Uinta Basin Hookless Cactus	*Sclerocactus wetlandicus*	T
White River Beardtongue	*Penstemon scariosus var albifluvis*	C
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Black-footed Ferret	*Mustela nigripes*	E Experimental
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T

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Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Deseret Milkvetch	*Astragalus desereticus*	T
Clay Phacelia	*Phacelia argillacea*	E

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Utah County - continued

Common Name	Scientific Name	Status
Least Chub	*Iotichthys phlegethontis*	C
June Sucker	*Chasmistes liorus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated

Wasatch County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Clay Phacelia	*Phacelia argillacea*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T

Washington County

Common Name	Scientific Name	Status
Siler Pincushion Cactus	*Pediocactus sileri*	T
Shivwits or Shem Milkvetch	*Astragalus ampullarioides*	E
Holmgren Milkvetch	*Astragalus holmgreniorum*	E
Gierisch Mallow	*Sphaeralcea gierischii*	C
Dwarf Bearclaw-poppy	*Arctomecon humilis*	E
Virgin Chub	*Gila seminuda*	E
Woundfin	*Plagopterus argentissimus*	E
Relict Leopard Frog	*Rana onca*	C Extirpated
Desert Tortoise	*Gopherus agassizii*	T
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E
Utah Prairie-dog	*Cynomys parvidens*	T
Gray Wolf	*Canis lupus*	E
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated

Wayne County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Barneby Reed-mustard	*Schoenocrambe barnebyi*	E
Winkler Pincushion Cactus	*Pediocactus winkleri*	T
Wright Fishhook Cactus	*Sclerocactus wrightiae*	E
Last Chance Townsendia	*Townsendia aprica*	T
San Rafael Cactus	*Pediocactus despainii*	E
Humpback Chub	*Gila cypha*	E
Razorback Sucker	*Xyrauchen texanus*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Utah Prairie-dog	*Cynomys parvidens*	T

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Weber County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
June Sucker	*Chasmistes liorus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Gray Wolf	*Canis lupus*	E

DEFINITIONS

E

A taxon that is listed by the U.S. Fish and Wildlife Service as "endangered" with the probability of worldwide extinction.

E Experimental

An "endangered" taxon that is considered by the U.S. Fish and Wildlife Service to be "experimental and non-essential" in its designated use areas in Utah.

E, T, or C Extirpated

An "endangered," "threatened," or "candidate" taxon that is "extirpated" and considered by the U.S. Fish and Wildlife Service to no longer occur in Utah.

E or T Proposed

A taxon "proposed" to be listed as "endangered" or "threatened" by the U.S. Fish and Wildlife Service.

T

A taxon that is listed by the U.S. Fish and Wildlife Service as "threatened" with becoming endangered.

C

A taxon for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threats to justify it being a "candidate" for listing as endangered or threatened.

Note: Please contact the U.S. Fish and Wildlife Service (801-975-3330) for the purpose of consultation under the Endangered Species Act.

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Utah's State Listed Species by County

Disclaimer: This list was compiled using known species occurrences and species observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS); other species of special concern likely occur in Utah Counties. This list includes both current and historic records. (Last updated on March 29, 2011).

Beaver County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BURROWING OWL	ATHENE CUNICULARIA	SPC
DARK KANGAROO MOUSE	MICRODIPODOPS MEGACEPHALUS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HAMLIN VALLEY PYRG	PYRGULOPSIS HAMLINENSIS	SPC
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
WESTERN TOAD	BUFO BOREAS	SPC

Box Elder County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
DESERET MOUNTAINSNAIL	OREOHELIX PERIPHERICA	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GRAY WOLF	CANIS LUPUS	S-ESA
GREAT PLAINS TOAD	BUFO COGNATUS	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
JUNE SUCKER	CHASMISTES LIORUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC

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Box Elder County (con't)

Common Name	Scientific Name	State Status
LAHONTAN CUTTHROAT TROUT	ONCORHYNCHUS CLARKII HENSHAWI	S-ESA
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
LYRATE MOUNTAINSNAIL	OREOHELIX HAYDENI	SPC
MOUNTAIN PLOVER	CHARADRIUS MONTANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
NORTHWEST BONNEVILLE PYRG	PYRGULOPSIS VARIEGATA	SPC
PREBLE'S SHREW	SOREX PREBLEI	SPC
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHARP-TAILED GROUSE	TYMPANUCHUS PHASIANELLUS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PHYSA	PHYSELLA UTAHENSIS	SPC
WESTERN PEARLSHELL	MARGARITIFERA FALCATA	SPC
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA
YELLOWSTONE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII BOUVIERI	SPC

Cache County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
CANADA LYNX	LYNX CANADENSIS	S-ESA
DESERET MOUNTAINSNAIL	OREOHELIX PERIPHERICA	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GREAT PLAINS TOAD	BUFO COGNATUS	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
LYRATE MOUNTAINSNAIL	OREOHELIX HAYDENI	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHARP-TAILED GROUSE	TYMPANUCHUS PHASIANELLUS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WESTERN RED BAT	LASIURUS BLOSSEVILLII	SPC

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Cache County (con't)

Common Name	Scientific Name	State Status
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Carbon County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BONYTAIL	GILA ELEGANS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HUMPBACK CHUB	GILA CYPHA	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
RAZORBACK SUCKER	XYRAUCHEN TEXANUS	S-ESA
ROUNDTAIL CHUB	GILA ROBUSTA	CS
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WESTERN RED BAT	LASIURUS BLOSSEVILLII	SPC
WESTERN TOAD	BUFO BOREAS	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC

Daggett County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BEAR LAKE SCULPIN	COTTUS EXTENSUS	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
CANADA LYNX	LYNX CANADENSIS	S-ESA
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HUMPBACK CHUB	GILA CYPHA	S-ESA
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
RAZORBACK SUCKER	XYRAUCHEN TEXANUS	S-ESA
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC

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Daggett County (con't)

Common Name	Scientific Name	State Status
WESTERN TOAD	BUFO BOREAS	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC

Davis County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WESTERN PEARLSHELL	MARGARITIFERA FALCATA	SPC
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Duchesne County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
EUREKA MOUNTAINSNAIL	OREOHELIX EUREKENSIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GRAY WOLF	CANIS LUPUS	S-ESA
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
MOUNTAIN PLOVER	CHARADRUS MONTANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC

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Duchesne County (con't)

Common Name	Scientific Name	State Status
SPOTTED BAT	EUDERMA MACULATUM	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WESTERN TOAD	BUFO BOREAS	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Emery County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BONYTAIL	GILA ELEGANS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
CANADA LYNX	LYNX CANADENSIS	S-ESA
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
CORNSNAKE	ELAPHE GUTTATA	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
GRAY WOLF	CANIS LUPUS	S-ESA
GREAT PLAINS TOAD	BUFO COGNATUS	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HUMPBACK CHUB	GILA CYPHA	S-ESA
KIT FOX	VULPES MACROTIS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
RAZORBACK SUCKER	XYRAUCHEN TEXANUS	S-ESA
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WESTERN TOAD	BUFO BOREAS	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Garfield County

Common Name	Scientific Name	State Status
ALLEN'S BIG-EARED BAT	IDIONYCTERIS PHYLLOTIS	SPC
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
ARIZONA TOAD	BUFO MICROSCAPHUS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK CANYON PYRG	PYRGULOPSIS PLICATA	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BONYTAIL	GILA ELEGANS	S-ESA
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA

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Garfield County (con't)

Common Name	Scientific Name	State Status
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
COMMON CHUCKWALLA	SAUROMALUS ATER	SPC
DESERT NIGHT LIZARD	XANTUSIA VIGILIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HUMPBACK CHUB	GILA CYPHA	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PHYSA	PHYSELLA UTAHENSIS	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
WESTERN TOAD	BUFO BOREAS	SPC

Grand County

Common Name	Scientific Name	State Status
ALLEN'S BIG-EARED BAT	IDIONYCTERIS PHYLLOTIS	SPC
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BONYTAIL	GILA ELEGANS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA
CORNSNAKE	ELAPHE GUTTATA	SPC
EUREKA MOUNTAINSNAIL	OREOHELIX EUREKENSIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREAT PLAINS TOAD	BUFO COGNATUS	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
GUNNISON SAGE-GROUSE	CENTROCERCUS MINIMUS	S-ESA, CS
GUNNISON'S PRAIRIE-DOG	CYNOMYS GUNNISONI	SPC
HUMPBACK CHUB	GILA CYPHA	S-ESA
KIT FOX	VULPES MACROTIS	SPC

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Grand County (con't)

Common Name	Scientific Name	State Status
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
MOUNTAIN PLOVER	CHARADRIUS MONTANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
RAZORBACK SUCKER	XYRAUCHEN TEXANUS	S-ESA
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Iron County

Common Name	Scientific Name	State Status
ARIZONA TOAD	BUFO MICROSCAPHUS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BRIAN HEAD MOUNTAINSNAIL	OREOHELIX PARAWANENSIS	SPC
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
DARK KANGAROO MOUSE	MICRODIPODOPS MEGACEPHALUS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Juab County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS

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Juab County (con't)

Common Name	Scientific Name	State Status
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
DARK KANGAROO MOUSE	MICRODIPODOPS MEGACEPHALUS	SPC
EUREKA MOUNTAINSNAIL	OREOHELIX EUREKENSIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PHYSA	PHYSELLA UTAHENSIS	SPC
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Kane County

Common Name	Scientific Name	State Status
ALLEN'S BIG-EARED BAT	IDIONYCTERIS PHYLLOTIS	SPC
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
ARIZONA TOAD	BUFO MICROSCAPHUS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BONYTAIL	GILA ELEGANS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COMMON CHUCKWALLA	SAUROMALUS ATER	SPC
CORAL PINK SAND DUNES TIGER BEETLE	CICINDELA LIMBATA ALBISSIMA	S-ESA
DESERT NIGHT LIZARD	XANTUSIA VIGILIS	SPC
DESERT SUCKER	CATOSTOMUS CLARKII	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREAT PLAINS TOAD	BUFO COGNATUS	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HUMPBACK CHUB	GILA CYPHA	S-ESA
KANAB AMBERSNAIL	OXYLOMA KANABENSE	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS

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Kane County (con't)

Common Name	Scientific Name	State Status
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
SOUTHWESTERN WILLOW FLYCATCHER	EMPIDONAX TRAILLII EXTIMUS	S-ESA
SPOTTED BAT	EUDERMA MACULATUM	SPC
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
VIRGIN SPINEDACE	LEPIDOMEDA MOLLISPINIS	CS
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Millard County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIFID DUCT PYRG	PYRGULOPSIS PECULIARIS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
CLOAKED PHYSA	PHYSA MEGALOCHLAMYS	SPC
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
DARK KANGAROO MOUSE	MICRODIPODOPS MEGACEPHALUS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
LONGITUDINAL GLAND PYRG	PYRGULOPSIS ANGUINA	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
SUB-GLOBOSE SNAKE PYRG	PYRGULOPSIS SAXATILIS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
WESTERN TOAD	BUFO BOREAS	SPC

Morgan County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
DESERET MOUNTAINSNAIL	OREOHELIX PERIPHERICA	SPC

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Morgan County (con't)

Common Name	Scientific Name	State Status
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GRAY WOLF	CANIS LUPUS	S-ESA
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LYRATE MOUNTAINSNAIL	OREOHELIX HAYDENI	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
SHARP-TAILED GROUSE	TYMPANUCHUS PHASIANELLUS	SPC
WESTERN PEARLSHELL	MARGARITIFERA FALCATA	SPC
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Piute County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
OTTER CREEK PYRG	PYRGULOPSIS FUSCA	SPC
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PHYSA	PHYSELLA UTAHENSIS	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
WESTERN TOAD	BUFO BOREAS	SPC

Rich County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BEAR LAKE SCULPIN	COTTUS EXTENSUS	SPC
BEAR LAKE SPRINGSNAIL	PYRGULOPSIS PILSBRYANA	SPC
BEAR LAKE WHITEFISH	PROSOPIUM ABYSSICOLA	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CISCO	PROSOPIUM GEMMIFER	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BONNEVILLE WHITEFISH	PROSOPIUM SPILONOTUS	SPC
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA

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Rich County (con't)

Common Name	Scientific Name	State Status
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LYRATE MOUNTAINSNAIL	OREOHELIX HAYDENI	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
WESTERN PEARLSHELL	MARGARITIFERA FALCATA	SPC
WESTERN TOAD	BUFO BOREAS	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Salt Lake County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
JUNE SUCKER	CHASMISTES LIORUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
LYRATE MOUNTAINSNAIL	OREOHELIX HAYDENI	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WESTERN PEARLSHELL	MARGARITIFERA FALCATA	SPC
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

San Juan County

Common Name	Scientific Name	State Status
ALLEN'S BIG-EARED BAT	IDIONYCTERIS PHYLLOTIS	SPC
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
ARIZONA TOAD	BUFO MICROSCAPHUS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS

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San Juan County (con't)

Common Name	Scientific Name	State Status
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONYTAIL	GILA ELEGANS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA
COMMON CHUCKWALLA	SAUROMALUS ATER	SPC
DESERT NIGHT LIZARD	XANTUSIA VIGILIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GRAY WOLF	CANIS LUPUS	S-ESA
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
GUNNISON SAGE-GROUSE	CENTROCERCUS MINIMUS	S-ESA, CS
GUNNISON'S PRAIRIE-DOG	CYNOMYS GUNNISONI	SPC
HUMPBACK CHUB	GILA CYPHA	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENUIS AMERICANUS	SPC
MOGOLLON VOLE	MICROTUS MOGOLLONENSIS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
RAZORBACK SUCKER	XYRAUCHEN TEXANUS	S-ESA
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SILKY POCKET MOUSE	PEROGNATHUS FLAVUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
SOUTHWESTERN WILLOW FLYCATCHER	EMPIDONAX TRAILLII EXTIMUS	S-ESA
SPOTTED BAT	EUDERMA MACULATUM	SPC
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC
YAVAPAI MOUNTAINSNAIL	OREOHELIX YAVAPAI	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Sanpete County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
CANADA LYNX	LYNX CANADENSIS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC

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Sanpete County (con't)

Common Name	Scientific Name	State Status
NINEMILE PYRG	PYRGULOPSIS NONARIA	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
SOUTHERN BONNEVILLE SPRINGSNAIL	PYRGULOPSIS TRANSVERSA	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
WESTERN TOAD	BUFO BOREAS	SPC

Sevier County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
CANADA LYNX	LYNX CANADENSIS	S-ESA
CARINATE GLENWOOD PYRG	PYRGULOPSIS INOPINATA	SPC
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
OTTER CREEK PYRG	PYRGULOPSIS FUSCA	SPC
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GLENWOOD PYRG	PYRGULOPSIS CHAMBERLINI	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
WESTERN TOAD	BUFO BOREAS	SPC

Summit County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
CANADA LYNX	LYNX CANADENSIS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS

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Summit County (con't)

Common Name	Scientific Name	State Status
DESERET MOUNTAINSNAIL	OREOHELIX PERIPHERICA	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
NORTHERN LEATHERSIDE CHUB	LEPIDOMEDA COPEI	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
WESTERN PEARLSHELL	MARGARITIFERA FALCATA	SPC
WESTERN TOAD	BUFO BOREAS	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC

Tooele County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BONYTAIL	GILA ELEGANS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
DARK KANGAROO MOUSE	MICRODIPODOPS MEGACEPHALUS	SPC
EUREKA MOUNTAINSNAIL	OREOHELIX EUREKENSIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
LYRATE MOUNTAINSNAIL	OREOHELIX HAYDENI	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
NORTHWEST BONNEVILLE PYRG	PYRGULOPSIS VARIEGATA	SPC
PREBLE'S SHREW	SOREX PREBLEI	SPC
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN BONNEVILLE SPRINGSNAIL	PYRGULOPSIS TRANSVERSA	SPC
SOUTHERN TIGHTCOIL	OGARIDISCUS SUBRUPICOLA	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PHYSA	PHYSELLA UTAHENSIS	SPC

Uintah County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC

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Uintah County (con't)

Common Name	Scientific Name	State Status
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BLACK-FOOTED FERRET	MUSTELA NIGRIPES	S-ESA
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONYTAIL	GILA ELEGANS	S-ESA
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
CANADA LYNX	LYNX CANADENSIS	S-ESA
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
CORNSNAKE	ELAPHE GUTTATA	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HUMPBACK CHUB	GILA CYPHA	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
MOUNTAIN PLOVER	CHARADRIUS MONTANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
RAZORBACK SUCKER	XYRAUCHEN TEXANUS	S-ESA
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Utah County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
CALIFORNIA FLOATER	ANODONTA CALIFORNIENSIS	SPC
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
EUREKA MOUNTAINSNAIL	OREOHELIX EUREKENSIS	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC

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Common Name	Scientific Name	State Status
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
JUNE SUCKER	CHASMISTES LIORUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEAST CHUB	IOTICHTHYS PHLEGETHONTIS	S-ESA, CS
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
SOUTHERN BONNEVILLE SPRINGSNAIL	PYRGULOPSIS TRANSVERSA	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PHYSA	PHYSELLA UTAHENSIS	SPC
WESTERN RED BAT	LASIURUS BLOSSEVILLII	SPC
WESTERN TOAD	BUFO BOREAS	SPC
WHITE-TAILED PRAIRIE-DOG	CYNOMYS LEUCURUS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Wasatch County

Common Name	Scientific Name	State Status
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
CANADA LYNX	LYNX CANADENSIS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

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Washington County

Common Name	Scientific Name	State Status
ALLEN'S BIG-EARED BAT	IDIONYCTERIS PHYLLOTIS	SPC
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
ARIZONA TOAD	BUFO MICROSCAPHUS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BLACK SWIFT	CYPSELOIDES NIGER	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BROWN (GRIZZLY) BEAR	URSUS ARCTOS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COMMON CHUCKWALLA	SAUROMALUS ATER	SPC
DESERT IGUANA	DIPSOSAURUS DORSALIS	SPC
DESERT NIGHT LIZARD	XANTUSIA VIGILIS	SPC
DESERT SPRINGSNAIL	PYRGULOPSIS DESERTA	SPC
DESERT SUCKER	CATOSTOMUS CLARKII	SPC
DESERT TORTOISE	GOPHERUS AGASSIZII	S-ESA
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GILA MONSTER	HELODERMA SUSPECTUM	SPC
GRAY WOLF	CANIS LUPUS	S-ESA
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
MOJAVE RATTLESNAKE	CROTALUS SCUTULATUS	SPC
MOUNTAIN PLOVER	CHARADRIUS MONTANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
RELICT LEOPARD FROG	RANA ONCA	S-ESA
SHORT-EATRED OWL	ASIO FLAMMEUS	SPC
SIDEWINDER	CROTALUS CERASTES	SPC
SOUTHWESTERN WILLOW FLYCATCHER	EMPIDONAX TRAILLII EXTIMUS	S-ESA
SPECKLED RATTLESNAKE	CROTALUS MITCHELLII	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
THREE-TOED WOODPECKER	PICOIDES TRIDACTYLUS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
VIRGIN CHUB	GILA SEMINUDA	S-ESA
VIRGIN SPINEDACE	LEPIDOMEDA MOLLISPINIS	CS
WESTERN BANDED GECKO	COLEONYX VARIEGATUS	SPC
WESTERN RED BAT	LASIURUS BLOSSEVILLII	SPC
WESTERN THREADSNAKE	LEPTOTYPHLOPS HUMILIS	SPC
WESTERN TOAD	BUFO BOREAS	SPC
WET-ROCK PHYSA	PHYSELLA ZIONIS	SPC
WOUNDFIN	PLAGOPTERUS ARGENTISSIMUS	S-ESA

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Washington County (con't)

Common Name	Scientific Name	State Status
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA
ZEBRA-TAILED LIZARD	CALLISAURUS DRACONOIDES	SPC

Wayne County

Common Name	Scientific Name	State Status
ALLEN'S BIG-EARED BAT	IDIONYCTERIS PHYLLOTIS	SPC
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BIG FREE-TAILED BAT	NYCTINOMOPS MACROTIS	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONYTAIL	GILA ELEGANS	S-ESA
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLORADO PIKEMINNOW	PTYCHOCHEILUS LUCIUS	S-ESA
COLORADO RIVER CUTTHROAT TROUT	ONCORHYNCHUS CLARKII PLEURITICUS	CS
FERRUGINOUS HAWK	BUTEO REGALIS	SPC
FLANNELMOUTH SUCKER	CATOSTOMUS LATIPINNIS	CS
FRINGED MYOTIS	MYOTIS THYSANODES	SPC
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
HUMPBACK CHUB	GILA CYPHA	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
PYGMY RABBIT	BRACHYLAGUS IDAHOENSIS	SPC
RAZORBACK SUCKER	XYRAUCHEN TEXANUS	S-ESA
ROUNDTAIL CHUB	GILA ROBUSTA	CS
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SOUTHERN LEATHERSIDE CHUB	LEPIDOMEDA ALICIAE	SPC
SPOTTED BAT	EUDERMA MACULATUM	SPC
SPOTTED OWL	STRIX OCCIDENTALIS	S-ESA
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
UTAH PRAIRIE-DOG	CYNOMYS PARVIDENS	S-ESA
WESTERN TOAD	BUFO BOREAS	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Weber County

Common Name	Scientific Name	State Status
AMERICAN WHITE PELICAN	PELECANUS ERYTHRORHYNCHOS	SPC
BALD EAGLE	HALIAEETUS LEUCOCEPHALUS	SPC
BLUEHEAD SUCKER	CATOSTOMUS DISCOBOLUS	CS
BOBOLINK	DOLICHONYX ORYZIVORUS	SPC
BONNEVILLE CUTTHROAT TROUT	ONCORHYNCHUS CLARKII UTAH	CS
BURROWING OWL	ATHENE CUNICULARIA	SPC
COLUMBIA SPOTTED FROG	RANA LUTEIVENTRIS	CS
DESERET MOUNTAINSNAIL	OREOHELIX PERIPHERICA	SPC
FERRUGINOUS HAWK	BUTEO REGALIS	SPC

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Weber County (con't)

Common Name	Scientific Name	State Status
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SPC
GRAY WOLF	CANIS LUPUS	S-ESA
GREATER SAGE-GROUSE	CENTROCERCUS UROPHASIANUS	S-ESA
JUNE SUCKER	CHASMISTES LIORUS	S-ESA
KIT FOX	VULPES MACROTIS	SPC
LEWIS'S WOODPECKER	MELANERPES LEWIS	SPC
LONG-BILLED CURLEW	NUMENIUS AMERICANUS	SPC
LYRATE MOUNTAINSNAIL	OREOHELIX HAYDENI	SPC
MOUNTAIN PLOVER	CHARADRIUS MONTANUS	SPC
NORTHERN GOSHAWK	ACCIPITER GENTILIS	CS
SHARP-TAILED GROUSE	TYMPANUCHUS PHASIANELLUS	SPC
SHORT-EARED OWL	ASIO FLAMMEUS	SPC
SMOOTH GREENSNAKE	OPHEODRYS VERNALIS	SPC
TOWNSEND'S BIG-EARED BAT	CORYNORHINUS TOWNSENDII	SPC
YELLOW-BILLED CUCKOO	COCCYZUS AMERICANUS	S-ESA

Key to State Status Field

Symbol	Definition
S-ESA	Federally-listed or candidate species under the Endangered Species Act.
SPC	Wildlife species of concern.
CS	Species receiving special management under a Conservation Agreement in order to preclude the need for Federal listing.

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Appendix E

Other Permits

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AIR PERMIT / APPROVAL ORDER

FINAL REPORT

Kennecott Utah Copper LLC

Notice of Intent for Bonneville Borrow Area Plant

Submitted to

Utah Division of Air Quality

Prepared for

Kennecott Utah Copper LLC

Prepared by:

CH2MHILL.

September 2011

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FINAL REPORT

Notice of Intent for Bonneville Borrow Area Plant

Prepared for

Kennecott Utah Copper

Prepared by

CH2MHILL.

215 S State Street, Suite 1000
Salt Lake City, Utah 84111

SEPTEMBER 2011

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OCT 31 2012

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A Emissions Calculations

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Acronyms and Abbreviations

AO	Approval Order
BACT	best available control technology
CFR	*Code of Federal Regulations*
EPA	United States Environmental Protection Agency
ESP	electrostatic precipitator
KUC	Kennecott Utah Copper LLC
N/A	not applicable
NOI	Notice of Intent
NO_x	nitrogen oxide
NSPS	New Source Performance Standards
PM	particulate matter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
RBLC	Reasonably Available Control Technology/Best Available Control Technology/Lowest Achievable Emission Rate Clearinghouse
SO_2	sulfur dioxide
tpy	ton per year
UAC	Utah Administrative Code
UDAQ	Utah Division of Air Quality

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1.0 Introduction

Kennecott Utah Copper LLC (KUC) is submitting this Notice of Intent (NOI) for a crushed stone processing plant. The product from the Bonneville Borrow Area plant will be used to supply building materials related to the construction of the expansion of the Tailings Impoundment. (KUC will submit a separate application for the expansion of the Tailings Impoundment itself, and KUC understands that it may not commence construction on the tailings expansion until an Approval Order [AO] for the Tailings Impoundment is issued). The Bonneville Borrow Area plant will be a new crushed stone processing plant, specifically a crushing and screening plant.

This NOI document contains a process description for the proposed project, emissions information, regulatory review, and control technology analysis. For additional information or questions, please contact Cassady Kristensen at 801-204-2129.

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2.0 Process Description

The Bonneville Borrow Area consists of three areas. These include the quartzite borrow, the alluvial borrow, and the existing railroad Embankment Borrow Area (see Figure 2-1). A portable crusher and screening plant will operate next to the quartzite and alluvial borrow areas.

2.1 Alluvial Borrow Area

The portable crusher and screening plant is located within the alluvial borrow areas, immediately below the quartzite borrow to minimize the total disturbance and the haulage distance to the plant from the quartzite borrow. The location of the plant takes advantage of the existing terrain and is sited to reduce the plant's visibility from the town of Magna. Development of the alluvial borrow will begin with removal of suitable growth media and either direct placement or stockpiling for later use. To minimize stockpiles and rehandle costs, growth media will only be removed just in advance of mining.

2.2 Quartzite Borrow Area

Development of the quartzite borrow will begin with construction of an access road from west to east through the existing talus slope along the rail grade. The northernmost face of the east side of the rail cut consists of quartzite talus overlaying dolomite. The dolomite is much less fractured than the quartzite and therefore will be difficult to mine without blasting. In an effort to minimize impacts to the community, blasting will be kept to a minimum. As the east side of the existing rail cut is being mined, the western side of the rail cut will be developed by first salvaging growth media, then ripping and dozing material generally northwest into the cut. Salvaged growth media will be dozed into an elongated stockpile. Material will be hauled to the Crushing Plant along the previously described road.

2.3 Crusher and Screening Plant Design

The Crusher and Screening Plant are required to produce the products sourced from the quartzite borrow area. The plant will operate an average of 10 hours per day and 5 days per week. The Crusher Plant includes a primary/secondary crushing section, a tertiary crushing section, a quaternary crushing section, and a sand processing section.

The quartzite borrow material will be either drilled and shot or ripped and then loaded and hauled to the plant feed stockpile.

Dust will be controlled with wet suppression at the crusher, screen, and conveyor transfer points. Water will also be sprayed in the Crushing and Screening Plant area and on the stockpiles as necessary.

Table 2-1 provides a list of all emission sources at the Crusher and Screening Plant.

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TABLE 2-1
Crusher and Screening Plant Emission Sources

Emission Source	Emission Factor Category	Emissions Controls
Drilling	Drilling	Wet drilling.
Blasting	Blasting	Minimizing blasting footprint. Prewetting the area to be blasted. Leaving native vegetation in place. Watering as soon as "all clear is given."
Initial Batch Loading of Grizzly	Transfer Point	Minimize drop distance and water sprays.
Grizzly Exit Transfer Point	Transfer Point	Minimize drop distance and water sprays.
Jaw Crusher Loading	Transfer Point	Minimize drop distance and water sprays.
Jaw Crusher	Crusher	Water sprays.
Jaw Crusher Exit and Grizzly Troughs onto Conveyor	Transfer Point	Minimize drop distance and water sprays.
Secondary Screen Loading	Transfer Point	Minimize drop distance and water sprays.
Secondary Screening	Screen	Water sprays.
Secondary Screen Exit Transfer Point to Secondary Crusher	Transfer Point	Minimize drop distance and water sprays.
Secondary Screen Exit Transfer Point to 3-inch Storage Pile	Transfer Point	Minimize drop distance and water sprays.
Load Into Secondary Crusher	Transfer Point	Minimize drop distance and water sprays.
Secondary Crusher	Crusher	Water sprays.
Secondary Crusher Exit onto Conveyor	Transfer Point	Minimize drop distance and water sprays.
3-inch Rock Pile Loading	Transfer Point	Minimize drop distance and water sprays.
3-inch Rock Pile	Transfer Point	Minimize drop distance and water sprays.
Feed Loading Conveyor from 3-inch pile Load Out	Transfer Point	Minimize drop distance and water sprays.
Tertiary Screen Loading	Transfer Point	Minimize drop distance and water sprays.
Tertiary Screening	Screen	Water sprays.

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TABLE 2-1
Crusher and Screening Plant Emission Sources

Emission Source	Emission Factor Category	Emissions Controls
Tertiary Screening Exit to Conveyor Leading to Tertiary Crusher	Transfer Point	Minimize drop distance and water sprays.
Tertiary Crusher Loading Transfer Point	Transfer Point	Minimize drop distance and water sprays.
Tertiary Crusher	Crusher	Water sprays.
Tertiary Crusher Exit Transfer Point	Transfer Point	Minimize drop distance and water sprays.
Tertiary Screening Exit to Conveyor Leading to Wet Screens	Transfer Point	Minimize drop distance and water sprays.
Wet Screens Loading Transfer Point	Transfer Point	Minimize drop distance and water sprays.
Truck Loading and Unloading	Haul Truck Loading and Unloading	Minimize drop distance and water sprays.
Stock Piles	Stock Piles	Water sprays.
Haul Roads	Haul Roads	Commercial dust suppressants and water sprays.
Loaders	Loaders	Water sprays.

NOTE:
Material after the wet screens will be saturated with water and will not result in any emissions. To provide a complete overview of the Bonneville Borrow Area operations, KUC has included the non-emissions-generating process equipment on the Flow Diagram in Figure 2-2.

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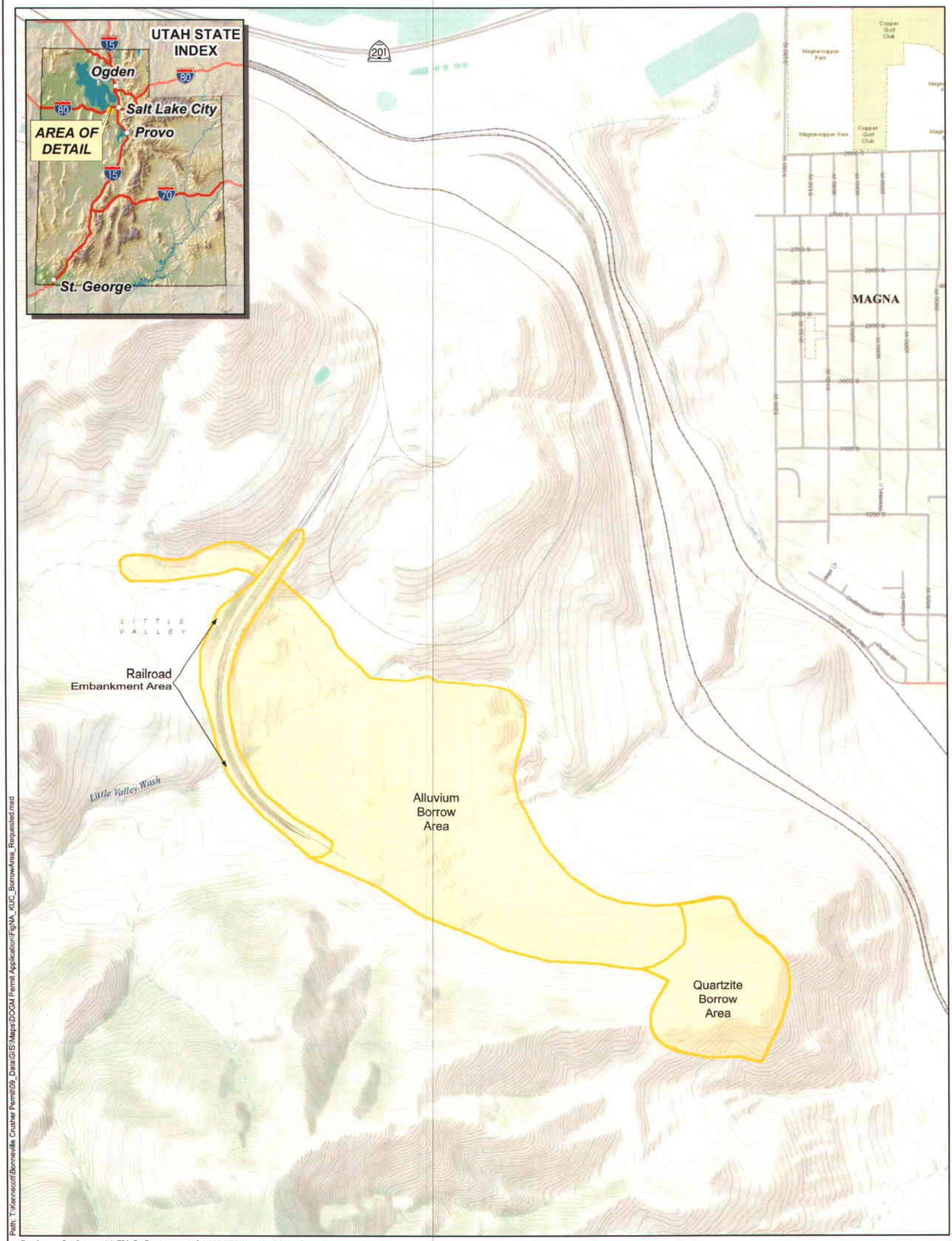

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FIGURE 2-1
Location Map
Notice of Intent for Bonneville Borrow Area Plan

KUC Bonneville Borrow Area: Flow Diagram

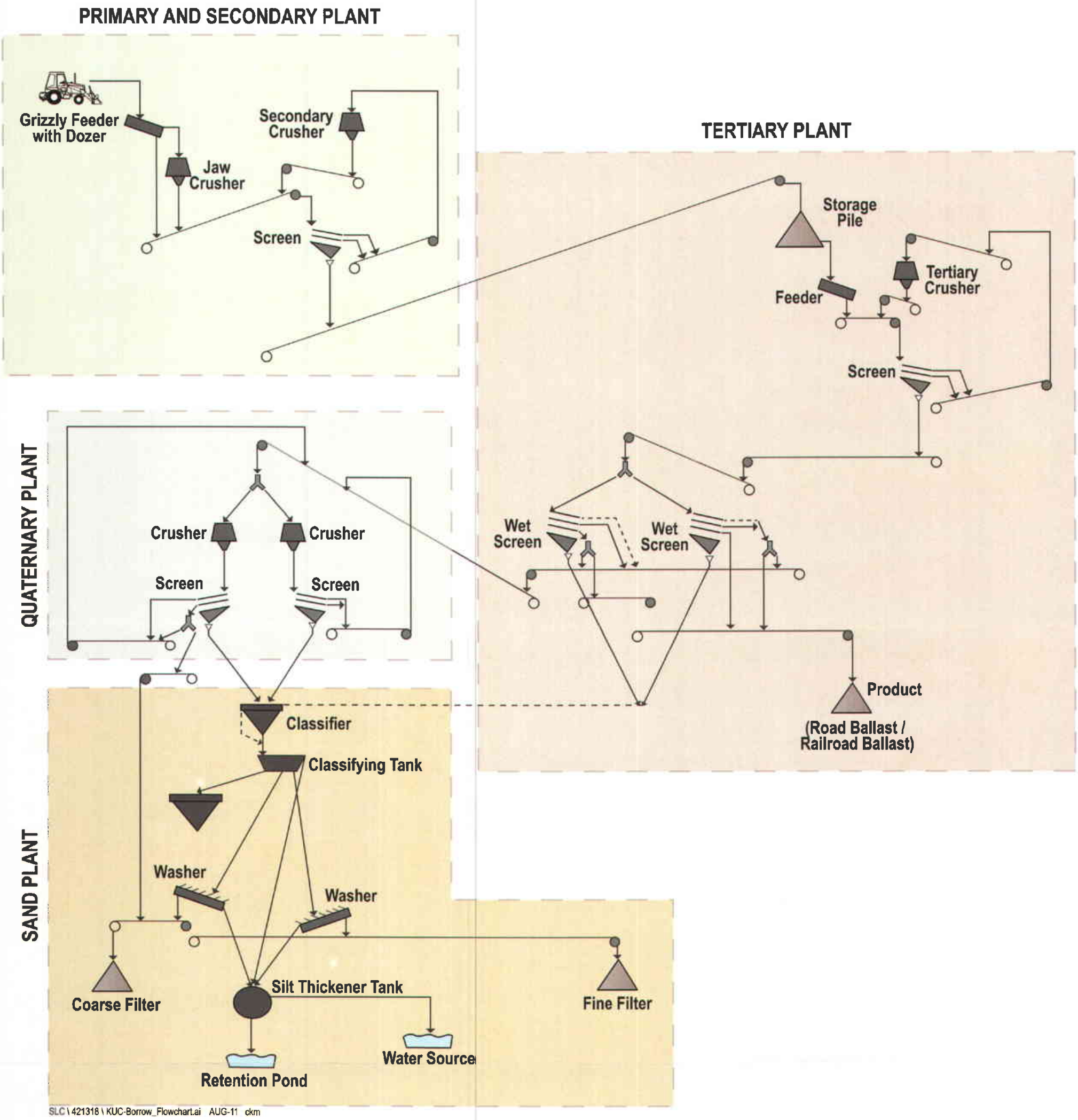

FIGURE 2-2
Process Flow Diagram
Notice of Intent for Bonneville Borrow Area Plan

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3.0 Emissions Information

This section provides a summary of emissions from the proposed crushing and screening plant.

3.1 Emission Factors and Calculation Methodology

3.1.1 Transfer Points

Emissions of particulate matter (PM) less than 10 micrometers in aerodynamic diameter (PM_{10}) and PM less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) from the conveyor transfer points are estimated using emissions factors from Table 11.19.2-2 of *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*, Fifth Edition (AP-42). Consistent with discussion in AP-42, Chapter 11.19.2, the moisture content of the material 2 inches in diameter and smaller will be in the range of 1.3 percent to 2.88 percent or greater to allow the use of controlled-emission factors from this section.

3.1.2 Crushers and Screens

For each of the crushers and screens, PM_{10} and $PM_{2.5}$ emissions are estimated using emission factors from the United States Environmental Protection Agency's (EPA's) *AP-42, Fifth Edition*, Table 11.19.2-2 (EPA, 2004). Consistent with discussion in AP-42, Chapter 11.19.2, the moisture of the material 2 inches in diameter and smaller will be in the range of 1.3 percent to 2.88 percent or greater to allow the use of controlled emission factors from this section.

3.1.3 Stock Piles

Emissions of PM_{10} are estimated using methodology from the EPA's *AP-42, Fifth Edition*, Section 11.9.1 (EPA, 1998) and ratio of transfer particle size multipliers in AP-42, *Fifth Edition*, Table 13.2.4, Page 4 (EPA, 2006). The ratio of transfer particle size multipliers in AP-42, *Fifth Edition*, Table 13.2.4 (EPA, 2006) are 0.74 for PM, 0.35 for PM_{10}, and 0.053 for $PM_{2.5}$. Therefore, PM_{10} is estimated to be 47 percent of PM and $PM_{2.5}$ is estimated to be 15 percent of PM_{10}. Water will be sprayed on these areas to minimize dust, and, therefore, consistent with UDAQ policy for water application on haul roads, a control efficiency of 70 percent is used to estimate controlled emissions from these sources. KUC believes that control efficiency on these storage piles with frequent watering per *AP-42, Fifth Edition*, Section 13.2.2 (EPA, 2006) approaches 95 percent, but emissions summarized herein are based on the Utah Division of Air Quality's (UDAQ's) default control factors, which are conservative.

3.1.4 Blasting and Drilling

For drilling operations, PM_{10} and $PM_{2.5}$ emissions were derived from the total PM emission factors estimated using methodology from the EPA's *AP-42, Fifth Edition*, Table 11.9-4 (EPA, 1998) and ratio of transfer particle size multipliers in AP-42, *Fifth Edition*, Table 13.2.4, Page 4 (EPA, 2006). The ratio of transfer particle size multipliers in AP-42, *Fifth Edition*, Table 13.2.4 (EPA, 2006) are 0.74 for PM, 0.35 for PM_{10}, and 0.053 for $PM_{2.5}$. Therefore, PM_{10}

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is estimated to be 47 percent of PM and $PM_{2.5}$ is estimated to be 15 percent of PM_{10}. For blasting operations, PM_{10} and $PM_{2.5}$ emissions were estimated using emission factors from EPA's *AP-42, Fifth Edition*, Table 11.9-1 (EPA, 1998).

3.1.5 Loaders

Fugitive emissions of PM_{10} and $PM_{2.5}$ are estimated using emission factors from EPA's *AP-42, Fifth Edition*, Table 11.9-1 (EPA, 1998). Water will be sprayed on these areas to minimize dust, and, therefore, consistent with UDAQ policy for water application on haul roads, a control efficiency of 70 percent is used to estimate controlled emissions from these sources.

3.1.6 Truck Loading and Unloading

Emissions of PM_{10} and $PM_{2.5}$ resulting from the transfer of material are estimated using methodology from EPA's *AP-42, Fifth Edition*, Table 11.19.2-2 (EPA, 2004). The material will be frequently sprayed with water, and drop heights will be minimized to reduce fugitive emissions from these sources.

3.1.7 Haul roads

Emissions of PM_{10} and $PM_{2.5}$ were estimated using methodology from EPA's *AP-42, Fifth Edition*, Section 13.2.2 (EPA, 2006). Consistent with UDAQ policy, a control efficiency of 85 percent is used for application of commercial dust suppressants. KUC believes that control efficiency on the haul roads with frequent watering and chemical dust suppressants per *AP-42, Fifth Edition*, Section 13.2.2 (EPA, 2006) approaches 95 percent, but emissions summarized herein are based on UDAQ's default control factors, which are conservative.

3.2 Emissions Summary

Using the emission factors described previously, KUC has estimated emissions for emission sources from the crushing and screening plant (Bonneville Borrow Area plant). Table 3-1 provides emissions of PM_{10} and $PM_{2.5}$ from emission sources from the proposed plant. Detailed emissions calculations are provided in Appendix A.

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TABLE 3-1
PM_{10} and $PM_{2.5}$ Emission Sources from the Proposed Bonneville Borrow Area Plant

Emission Sources	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)
Wet Drilling	0.04	0.01
Blasting	0.00	0.00
All Transfer Points	0.72	0.20
Primary Jaw Crusher	0.34	0.06
Secondary Screen	1.33	0.09
Secondary Crusher	0.30	0.06
Tertiary Scalp Screen	1.33	0.09
Tertiary Crusher	0.30	0.06
Stock Piles	39.87	6.04
Front End Loaders	16.79	3.37
Truck Loading	0.12	0.12
Unpaved Road Hauling	118.71	11.87
Truck Unloading	0.12	0.12
Total Fugitive Sources	**180**	**22.1**

NOTE:
tpy = ton(s) per year

Table 3-2 summarizes the potential to emit emissions from the proposed Bonneville Borrow Area plant.

TABLE 3-2
Bonneville Borrow Area plant Emissions Summary

	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)	Major Source Thresholds (tpy)	Modeling Thresholds (UAC R307-410-4)
Point Sources	0	0	100	NA
Fugitive Sources	180	22.1	NA	NA
Total	**180**	**22.1**	**NA**	**NA**

NOTES:
NA = not applicable
UAC = Utah Administrative Code

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4.0 Regulatory Review

This section provides a regulatory review of the applicability of state and federal air quality permitting requirements for the Bonneville Borrow Area plant.

The Bonneville Borrow Area plant will be used to supply building materials necessary to construct infrastructure (for example, engineered structures and drainage blanket) necessary for expansion of the tailings area. This construction activity is distinct from and must be completed before operation of the tailings impoundment expansion. Emissions associated with the Bonneville Borrow Area plant will be incident to the construction, not the operation, of the Tailings Impoundment expansion and, as such, constitute secondary emissions that are distinct from operation of the tailings impoundment source. (Reference definitions of "secondary emissions" and "potential to emit" in R307-101-2). Therefore, KUC is requesting that UDAQ issue a separate AO for the Bonneville Borrow Area plant.

4.1 State of Utah Air Permitting Requirements

The State of Utah has been granted authority to implement and enforce the permitting requirements specified by the federal Clean Air Act. The general requirements for permits and permit revisions are codified under the state environmental protection regulations, UAC R307-401.

4.1.1 Notice of Intent and Approval Order (UAC R307-401)

The Bonneville Borrow Area plant will result in an increase of emissions, necessitating the issuance of an AO pursuant to UAC R307-401, Permits. The Bonneville Borrow Area plant will not trigger Title V or major source New Source Review permitting as the emissions of PM_{10} from point sources will be less than 100 tpy. KUC is required by UAC R307-401 to submit this NOI application to UDAQ and obtain a UDAQ-issued AO before initiation of activities associated with the Bonneville Borrow Area plant.

According to UAC R307-401-5, the NOI must include the following:

- A description of the project (provided in Section 1.0 of the NOI)
- A description and characteristics of emissions and control equipment (provided in Sections 2.0 and 3.0 of the NOI)
- An analysis of the best available control technology (BACT) for the proposed source (provided in Section 5.0 of the NOI)
- Location map (provided in Section 2.0 of the NOI)

4.1.2 Enforceable Offsets (UAC R307-403-5, UAC R307-420, and UAC R307-421)

UAC R307-403-5(1)(b) states that enforceable offsets of 1.2:1 are required for new sources or modifications that would produce an emission increase greater than or equal to 50 tpy of any combination of PM_{10}, sulfur dioxide (SO_2), and nitrogen oxide (NO_x).

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UAC R307-403-5(1)(c) states that enforceable offsets of 1.1:1 are required for new sources or modifications that would produce an emissions increase greater than or equal to 25 tpy but less than 50 tpy of any combination of PM_{10}, SO_2, and NO_x.

UAC R307-403-5(2) specifically states that for offset determinations, PM_{10}, SO_2, and NO_x will be considered on an equal basis.

Consistent with the requirements of R307-403-5(1)(b), KUC will offset the total emissions from the Bonneville Borrow Area plant with 216 tons of banked credits included in the Emission Reduction Credits Registry.

4.1.3 Emissions Impact Analysis (UAC R307-410)

The Bonneville Borrow Area plant is not subject to UAC R307-410, which describes the emissions impact analysis requirements, since the emissions increases from the project do not trigger any modeling thresholds. Because the facility is located in a nonattainment area for PM_{10} and $PM_{2.5}$, modeling is not required for these pollutants; however, offsets are being provided consistent with UAC 307-403-5.

4.2 Federal Air Quality Permitting Requirements—New Source Performance Standards (40 CFR 60)

The Bonneville Borrow Area plant will be a new nonmetallic mineral processing plant, one of the source categories subject to the New Source Performance Standards (NSPS), specifically 40 *Code of Federal Regulations* (CFR) 60, Subpart OOO. The NSPS apply to any facility that is constructed, reconstructed, or modified after April 22, 2008.

4.2.1 General Provisions for Standards of Performance for New Sources (40 CFR 60, Subpart A)

Subpart A describes general provisions that are applicable to any source that is subject to NSPS. The Bonneville Borrow Area plant will be subject to 40 CFR 60, Subpart OOO, Standards of Performance for Non-Metallic Mineral Processing Plants, and therefore subject to 40 CFR 60, Subpart A, the General Provisions for Standards of Performance for New Sources.

4.2.2 Standards for Particulate Matter (40 CFR 60, Subpart OOO, 60.672)

Particulate matter emissions resulting from the proposed Bonneville Borrow Area plant include process fugitive emissions from the conveyor belt transfer points, crushers, and screens. Fugitive emissions are defined in 40 CFR 60.671 as PM that is not collected by a capture system and is released to the atmosphere at the point of generation.

Therefore, the fugitive emissions from the Bonneville Borrow Area plant screens and conveyor belt transfer points will be subject to 40 CFR 60.672, which limits opacity of non-crusher fugitive emissions to 7 percent.

Crusher is defined in 40 CFR 60.671 as a machine used to crush any nonmetallic minerals and includes, but is not limited to, the following types: jaw, gyratory, cone, roll, rod mill, hammermill, and impactor. Therefore, the emissions from the Bonneville Borrow Area plant

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from the crushers for which a capture system is not used will be subject to 40 CFR 60.672, which limits opacity of crusher fugitive emissions to 12 percent.

4.2.3 Monitoring and Testing (40 CFR 60, Subpart OOO, 60.674)

40 CFR 60.674 describes requirements for an affected facility that uses wet suppression to control emissions, such as the Bonneville Borrow Area plant. KUC must comply with 40 CFR 60.674 (b), which requires monthly periodic inspections to check that water is flowing to discharge spray nozzles in the wet suppression systems and initiate corrective action within 24 hours and complete corrective action as expediently as practical if KUC finds that water is not flowing properly during an inspection of the water spray nozzles.

4.2.4 Recordkeeping and Reporting (40 CFR 60, Subpart OOO, 60.676)

40 CFR 60.676 lists recordkeeping requirements for wet suppression systems. Per these requirements, each inspection of the water spray nozzles, including the date of each inspection and any corrective actions taken, will be recorded in a logbook (in written or electronic form), and the logbooks (in written or electronic form) will be maintained onsite and made available upon request by UDAQ.

4.2.5 Test Methods and Procedures (40 CFR 60, Subpart OOO, 60.675)

40 CFR 60.675 requires that KUC determine compliance with the PM standard from 40 CFR 60.672, which restricts opacity emissions to 7 percent for conveyor belt transfer points and screens; and to 12 percent for crushers, using Method 9.

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5.0 Best Available Control Technology

This section describes the BACT analysis for the new emissions sources that will be added as part of a new stationary source.

According to UAC R307-401-8, "The Executive Secretary will issue an approval order if the following conditions have been met: The degree of pollution control for emissions, to include fugitive emissions and fugitive dust, is at least best available control technology."

5.1.1 Crushers

Particulate emissions will be emitted from the primary, secondary, and tertiary crushers, and this section presents a BACT analysis for the proposed crushers.

- **Step 1—Identify All Control Technologies.** The following five control technologies have been identified for particulate control:
  - Electrostatic precipitators (ESPs)
  - Wet scrubbers
  - Fabric filters
  - Water sprays
  - Enclosures
- **Step 2—Eliminate Technically Infeasible Options.** Because the location of the crushers may change over the course of the construction activities, enclosures are not feasible. As the crushers cannot be fully enclosed, ESPs, wet scrubbers, and fabric filters are also not technically feasible.
- **Step 3—Rank Remaining Control Technologies by Control Effectiveness.** Water sprays/wet suppression is effective in minimizing emissions from crushers.
- **Step 4—Evaluate Most-Effective Controls and Document Results.** Since the remaining control technologies are proposed, no further evaluation is warranted.
- **Step 5—Select BACT.** Based on this analysis and review of the EPA's Reasonably Available Control Technology/BACT/Lowest Achievable Emission Rate Clearinghouse (RBLC) database, water spray/wet suppression, is selected as BACT for the crushers.

5.1.2 Transfer Points

Particulate emissions will be emitted from the material transfer points from one conveyor to another. The following presents a BACT analysis for the proposed transfer points:

- **Step 1—Identify All Control Technologies.** The following six control technologies have been identified for particulate control:
  - ESPs
  - Wet scrubbers
  - Fabric filters

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- Water sprays
- Partial enclosures
- Minimizing drop point heights

- **Step 2—Eliminate Technically Infeasible Options.** Because the location of the conveyors may change over the course of the construction activities, enclosures of the drop point between conveyors are not feasible. As the conveyor drop points cannot be fully enclosed, ESPs, wet scrubbers, and fabric filters are also not technically feasible.
- **Step 3—Rank Remaining Control Technologies by Control Effectiveness.** Both minimizing the drop point heights and water sprays/wet suppression are effective in minimizing emissions from the transfer points.
- **Step 4—Evaluate Most Effective Controls and Document Results.** Since both of the remaining control technologies are proposed, no further evaluation is warranted.
- **Step 5—Select BACT.** Based on this analysis and review of the EPA's RBLC database, water sprays/wet suppression and minimizing drop point heights are selected as BACT for the transfer points.

5.1.3 Screens

Particulate emissions will be emitted from the secondary and tertiary screens, and this section presents a BACT analysis for the proposed screens.

- **Step 1—Identify All Control Technologies.** The following five control technologies have been identified for particulate control:
  - ESPs
  - Wet scrubbers
  - Fabric filters
  - Water sprays
  - Enclosures
- **Step 2—Eliminate Technically Infeasible Options.** Because the location of the screens may change over the course of the construction activities, enclosures are not feasible. As the screens cannot be fully enclosed, ESPs, wet scrubbers, and fabric filters are also not technically feasible.
- **Step 3—Rank Remaining Control Technologies by Control Effectiveness.** Water sprays/wet suppression is effective in minimizing emissions from screens.
- **Step 4—Evaluate Most Effective Controls and Document Results.** Since the remaining control technologies are proposed, no further evaluation is warranted.
- **Step 5—Select BACT.** Based on this analysis and review of the EPA's RBLC database, water spray/wet suppression is selected as BACT for the screens.

5.1.4 Haul Truck Loading/Unloading and Loader Operation

Particulate emissions will be emitted from the loading and unloading of material in haul trucks and loader operation to move material around. This section presents a BACT analysis for the [illegible]

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- **Step 1—Identify All Control Technologies.** The following five control technologies have been identified for particulate control:
  - ESPs
  - Wet scrubbers
  - Fabric filters
  - Water sprays
  - Enclosures
- **Step 2—Eliminate Technically Infeasible Options.** Because of the nature of haul trucks loading/unloading and loader operations, enclosures are not feasible. As these emissions sources cannot be fully enclosed, ESPs, wet scrubbers, and fabric filters are also not technically feasible.
- **Step 3—Rank Remaining Control Technologies by Control Effectiveness.** Water sprays/Wet suppression is effective in minimizing emissions from these sources.
- **Step 4—Evaluate Most-Effective Controls and Document Results.** Since the remaining control technologies are proposed, no further evaluation is warranted.
- **Step 5—Select BACT.** Based on this analysis and review of the EPA's RBLC database, water spray/wet suppression is selected as BACT for these emission sources.

5.1.5 Unpaved Haul roads

Particulate emissions will be generated from haul trucks travelling on haul roads between the Bonneville Borrow Area and the Tailings Impoundment. This section presents a BACT analysis for the unpaved haul roads.

- **Step 1—Identify All Control Technologies.** The following three control technologies have been identified for particulate control from unpaved haul roads:
  - Water application
  - Chemical dust suppressants
  - Paving unpaved haul roads
- **Step 2—Eliminate Technically Infeasible Options.** Due to rapid deterioration and other permitting issues, paving the haul roads is not technically feasible.
- **Step 3—Rank Remaining Control Technologies by Control Effectiveness.** Application of chemical dust suppressants is more effective than just watering in minimizing emissions from these sources. Based on their control effectiveness, the remaining control technologies will be ranked as follows: (1) chemical dust suppressant and (2) water application.
- **Step 4—Evaluate Most-Effective Controls and Document Results.** Since the most effective control technology is being proposed, no further evaluation is warranted.

Step 5—Select BACT. Based on this analysis and review of the EPA's RBLC database, chemical dust suppression is selected as BACT for the unpaved haul roads.

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5.1.6 Stock Piles

Windblown particulate emissions/dust will be generated from the stock piles. This section presents a BACT analysis for the stock piles.

- **Step 1—Identify All Control Technologies.** The following three control technologies have been identified for particulate control:
  - Water application
  - Enclosures
  - Chemical suppressants
- **Step 2—Eliminate Technically Infeasible Options.** Because of frequently changing locations of the stock piles, permanent enclosures are not feasible. These stock piles will be continually replenished, so sealing the stock piles with chemical suppressants is also not technically feasible.
- **Step 3—Rank Remaining Control Technologies by Control Effectiveness.** Water sprays/wet suppression is effective in minimizing emissions from these sources.
- **Step 4—Evaluate Most Effective Controls and Document Results.** Since the remaining control technology is proposed, no further evaluation is warranted.
- **Step 5—Select BACT.** Based on this analysis and review of the EPA's RBLC database, water spray/wet suppression is selected as BACT for the stock piles.

5.1.7 Drilling and Blasting

Particulate emissions will be emitted from drilling and blasting operations at the Bonneville Borrow Area. This section presents a BACT analysis for these sources.

- **Step 1—Identify All Control Technologies.** The following five control technologies have been identified for particulate control:
  - Minimizing blasting footprint
  - Prewatering
  - Leaving native vegetation as intact as possible
  - Watering as soon as the "all clear" is given
  - Water spays during drilling
- **Step 2—Eliminate Technically Infeasible Options.** All controls are technologically feasible.
- **Step 3—Rank Remaining Control Technologies by Control Effectiveness.** The technologies are ranked in the order provided.
- **Step 4—Evaluate Most Effective Controls and Document Results.** Since the remaining control technologies are proposed, no further evaluation is warranted.
- **Step 5—Select BACT.** Based on this analysis and review of the EPA's RBLC database, water spray/wet suppression is selected as BACT for drilling operations. Minimizing the blasting footprint, prewatering, leaving native vegetation as intact as possible, and watering as soon as the "all clear" is given are all selected as BACT for blasting.

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6.0 References

United States Environmental Protection Agency (EPA). 1998 to 2006. *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*. Fifth Edition. Office of Air Quality Planning and Standards; Office of Air and Radiation. Accessed August 2011.

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APPENDIX A

Emissions Calculations

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Units	Definitions
ft^2	square foot
hr	hour
lb	pound
mph	mile per hour
tpy	ton per year

Acronyms	Definitions
BACT	best available control technology
CO_2	carbon dioxide
EPA	United States Environmental Protection Agency
GHG	greenhouse gas
NH_3	ammonia
NO_x	nitrogen oxide
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
PM_{15}	particulate matter less than 15 micrometers in aerodynamic diameter
PM_{30}	particulate matter less than 30 micrometers in aerodynamic diameter
SO_2	sulfur dioxide
UDAQ	Utah Division of Air Quality
VMT	vehicle miles traveled
VOC	volatile organic compound

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TABLE A-1
Potential to Emit Summary
Notice of Intent for the Bonneville Borrow Area Plant

	Potential Emissions in Tons Per Year							
Fugitive Sources	PM_{10}	$PM_{2.5}$	NO_x	SO_2	VOC	CO	CO_2^e	GHG
Wet Drilling	0.04	0.01	-	-	-	-	-	-
Blasting	0.00	0.00	-	-	-	-	-	-
All Transfer Points	0.72	0.20	-	-	-	-	-	-
Primary Jaw Crusher	0.34	0.06	-	-	-	-	-	-
Secondary Screen	1.33	0.09	-	-	-	-	-	-
Secondary Crusher	0.30	0.06	-	-	-	-	-	-
Tertiary Scalp Screen	1.33	0.09	-	-	-	-	-	-
Tertiary Crusher	0.30	0.06	-	-	-	-	-	-
Stock Piles	39.87	6.04	-	-	-	-	-	-
Front End Loaders	16.79	3.37	-	-	-	-	-	-
Truck Loading	0.12	0.12	-	-	-	-	-	-
Unpaved Road Hauling	118.71	11.87	-	-	-	-	-	-
Truck Unloading	0.12	0.12	-	-	-	-	-	-
Total Fugitive Sources	**179.97**	22.07	-	-	-	-	-	-
Total Emissions	**179.97**	**22.07**	-	-	-	-	-	-

Process Assumptions		**Source**
Haul Road Silt Content (%)	3.9	Assumed 3.9% based on EPA default for Utah
Moisture Content (%)	2.0	URS Borrow Area Design Estimates
Average Wind Speed (mph)	8.6	http://www.wrcc.dri.edu/htmlfiles/westwind.final.html
Product Stockpile # 1 (tpy)	438,750	URS Borrow Area Design Estimates
Product Stockpile # 2 (tpy)	1,316,250	URS Borrow Area Design Estimates
Product Stockpile # 3 (tpy)	585,000	URS Borrow Area Design Estimates

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TABLE A-2
Wet Drilling
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	PM Emission Factor (lb/hole)	PM_{10} Emission Factor (lb/hole)	$PM_{2.5}$ Emission Factor (lb/hole)	Number of Holes (holes/yr)	Uncontrolled PM_{10} Emissions (tpy)	Uncontrolled $PM_{2.5}$ Emissions (tpy)	Primary Control Efficiency (%)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Wet Drilling	1.3	0.615	0.093	1,352	0.4	0.1	90	0.04	0.01	Water injection at 90 percent efficiency

NOTES:
PM Emission factor obtained from AP-42, Table 11.9-4. Ratio of transfer particle size multipliers in AP 42, Fifth Edition, Table 13.2.4 (EPA, 2006), assume PM_{10} to be 47 percent of PM and $PM_{2.5}$ to be 15 percent of PM_{10}.
As discussed in the study, holes will be drilled at a rate of 26 per week—URS, 2011.
The control efficiency listed is based on previous determinations of BACT by UDAQ.

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TABLE A-3
Blasting
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Blasting Area (ft^2)	PM_{10} Emission Factor (lb/blast)	$PM_{2.5}$ Emission Factor (lb/blast)	Blasts per Year	PM_{10} Emissions (tpy)	$PM_{2.5}$ Emissions (tpy)	Control System and Comments	NH_3 Emission Factor (lb/blast)	NH_3 Emissions (tpy)
Blasting	100	0.01	0.0004	52	0.000	0.0000	Minimizing blasting footprint. Prewetting the area to be blasted. Leaving native vegetation in place. Watering as soon as "all clear is given"	4.62	0.1

NOTES:
Emission factors for PM_{10} and $PM_{2.5}$ obtained from AP-42, Table 11.9-1.
Blasting Area information is obtained from URS design estimates.
Blasts will be conducted at a rate of 1 per week - URS, 2011.
Emission factor for Ammonia based on a historical Industrial Hygiene assessment completed onsite.

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TABLE A-4
Initial Batch Loading Transfer Point (into Grizzly and Storage Bin)
Notice of Intent for the Bonneville Borrow Area Plant

	PM_{10} Emission Factor (lb/ton)	$PM_{2.5}$ Emission Factor (lb/ton)
Controlled Conveyor Transfer Point	0.00005	0.00001

NOTES:
Emission factors obtained from AP-42 Chapter 11 Table 11.19.2-2 controlled conveyor transfer point.
Annual process rate provided by URS design team.

Source Name	Material Throughput (tpy)	Uncontrolled PM_{10} Emissions (tpy)	Uncontrolled $PM_{2.5}$ Emissions (tpy)	Control System and Comments	Number of Transfer Points
Initial Batch Loading Of Grizzly	2,486,250	0.06	0.02	Wet suppression and minimizing drop distance	1
Transfer from Grizzly Exit onto conveyors	2,486,250	0.06	0.02	Wet suppression and minimizing drop distance	1
Jaw Crusher Loading	1,243,125	0.03	0.01	Wet suppression and minimizing drop distance	1
Jaw Crusher Exit onto conveyor	1,243,125	0.03	0.01	Wet suppression and minimizing drop distance	1
Secondary Screen Loading	3,605,063	0.08	0.02	Wet suppression and minimizing drop distance	1
Secondary Screen Exit Transfer onto conveyor	3,605,063	0.08	0.02	Wet suppression and minimizing drop distance	1
Transfer into Secondary Crusher	1,118,813	0.03	0.01	Wet suppression and minimizing drop distance	1
Transfer onto 3-inch storage pile	2,486,250	0.06	0.02	Wet suppression and minimizing drop distance	1
Feed Loading Conveyor from 3-inch pile Load Out	2,486,250	0.06	0.02	Wet suppression and minimizing drop distance	1
Tertiary Scalp Screen Loading	3,605,063	0.08	0.02	Wet suppression and minimizing drop distance	1
Tertiary Scalp Screen Exit Transfer onto conveyor	3,605,063	0.08	0.02	Wet suppression and minimizing drop distance	1
Tertiary Crusher Loading	1,118,813	0.03	0.01	Wet suppression and minimizing drop distance	1
Loading into Tertiary Wet Screens	585,000	0.05	0.02	Wet suppression and minimizing drop distance	4
Total		**0.72**	**0.20**		

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TABLE A-5
Primary Jaw Crusher
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Wet Suppression Control PM_{10} Emission Factor (lb/ton)	Wet Suppression Control $PM_{2.5}$ Emission Factor (lb/ton)	Process Flow Rate (tpy)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Primary Crusher	0.00054	0.0001	1,243,125	0.34	0.06	Emissions controlled with wet suppression

NOTES:
Wet suppression emission factors for PM_{10} and $PM_{2.5}$ taken from AP-42 Chapter 11 table 11.19.2-2 controlled tertiary crushing as an upper limit for controlled primary crushing.
Process flow rate provided by URS design team.

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TABLE A-6
Secondary Screen
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Wet Suppression Control PM_{10} Emission Factor (lb/ton)	Wet Suppression Control $PM_{2.5}$ Emission Factor (lb/ton)	Process Flow Rate (tpy)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Secondary Screen	0.00074	0.00005	3,605,063	1.33	0.09	Emissions controlled with wet suppression

NOTES:
Wet suppression emission factors for PM_{10} and $PM_{2.5}$ taken from AP-42 Chapter 11 table 11.19.2-2 controlled screening.
Process flow rate provided by URS design team.

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TABLE A-7
Secondary Crusher
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Wet Suppression Control PM_{10} Emission Factor (lb/ton)	Wet Suppression Control $PM_{2.5}$ Emission Factor (lb/ton)	Process Flow Rate (tpy)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Secondary Crusher	0.00054	0.0001	1,118,813	0.30	0.06	Emissions controlled with wet suppression

NOTES:
Wet suppression emission factors for PM_{10} and $PM_{2.5}$ taken from AP-42 Chapter 11 table 11.19.2-2 controlled tertiary crushing as an upper limit for controlled secondary crushing.
Process flow rate provided by URS design team.

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TABLE A-8
Tertiary Scalp Screening
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Wet Suppression Control PM_{10} Emission Factor (lb/ton)	Wet Suppression Control $PM_{2.5}$ Emission Factor (lb/ton)	Process Flow Rate (tpy)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Tertiary Scalp Screen	0.00074	0.00005	3,605,063	1.33	0.09	Emissions controlled with wet suppression

NOTES:
Wet suppression emission factors for PM_{10} and $PM_{2.5}$ taken from AP-42 Chapter 11 table 11.19.2-2 controlled screening.
Process flow rate provided by URS design team.

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TABLE A-9
Tertiary Crusher
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Wet Suppression Control PM_{10} Emission Factor (lb/ton)	Wet Suppression Control $PM_{2.5}$ Emission Factor (lb/ton)	Process Flow Rate (tpy)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Tertiary Crusher	0.00054	0.0001	1,118,813	0.30	0.06	Emissions controlled with wet suppression

NOTES:
Wet suppression emission factors for PM_{10} and $PM_{2.5}$ taken from AP-42 Chapter 11 table 11.19.2-2 controlled tertiary crushing.
Process flow rate provided by URS design team.

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TABLE A-11
Stock Piles (3 Piles)
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Hours of Operation	Wind Speed (mph)	PM Emission Factor (lb/(acre×hr))	PM_{10} Emission Factor (lb/(acre×hr))	$PM_{2.5}$ Emission Factor (lb/(acre×hr))	Surface Area of Each Pile (acre)	Uncontrolled PM Emissions (tpy)	Uncontrolled PM_{10} Emissions (tpy)	Uncontrolled $PM_{2.5}$ Emissions (tpy)	Control Efficiency	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Feed Stockpile	8760	8.6	6.19	2.17	0.33	3	81.36	28.48	4.31	70%	8.54	1.29	Water sprays are used to reduce emissions
3-inch Rock Stock Pile	8760	8.6	6.19	2.17	0.33	2	54.24	18.98	2.87	70%	5.70	0.86	Water sprays are used to reduce emissions
Product Stockpile # 1	8760	8.6	6.19	2.17	0.33	3	81.36	28.48	4.31	70%	8.54	1.29	Water sprays are used to reduce emissions
Product Stockpile # 2	8760	8.6	6.19	2.17	0.33	3	81.36	28.48	4.31	70%	8.54	1.29	Water sprays are used to reduce emissions
Product Stockpile # 3	8760	8.6	6.19	2.17	0.33	3	81.36	28.48	4.31	70%	8.54	1.29	Water sprays are used to reduce emissions

NOTES:

Emission factor estimated using methodology in AP-42 Chapter 11 Section 11.9-1.

PM_{10} and $PM_{2.5}$ scaling factors taken form AP-42 Chapter 13 Section 13.2.4.1.

70 percent Control Efficiency for water application in the areas where loaders are operated, per UDAQ policy.

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TABLE A-12
Front-end Loaders
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	Moisture Content (%)	PM_{10} Emission Factor (lb/ton)	$PM_{2.5}$ Emission Factor (lb/ton)	Annual Process Rate (tons/yr)	Uncontrolled PM_{10} Emissions (ton)	Uncontrolled $PM_{2.5}$ Emissions (ton)	Primary Control Efficiency (%)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Front-end Loaders	2	0.0478	0.0096	2,340,000	56.0	11.22	70	16.8	3.4	Water Sprays

NOTES:
Emissions estimated using methodology outlined in AP-42 Chapter 11 Table 11.9-1.
70 percent Control Efficiency for water application in the areas where loaders are operated, per UDAQ policy.
Annual process rate based on material hauled from product storages piles to tailings impoundment. Loaders will assist with haul truck loading.

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TABLE A-13
Truck Loading
Notice of Intent for the Bonneville Borrow Area Plant

Source Name	PM_{10} Emission Factor (lb/ton)	$PM_{2.5}$ Emission Factor (lb/ton)	Process Rate (tons/year)	Control Efficiency	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Truck Loading	0.00010	0.00010	2,340,000	0%	0.12	0.12	Minimal drop distance and water application

NOTES:
Emission factor for PM_{10} taken from AP-42 Chapter 11 table 11.19.2-2 truck loading.
Annual process rate based on material hauled from product storages piles to tailings impoundment.
Emission factor for $PM_{2.5}$ was unavailable, therefore was assumed to be same as PM_{10}.

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TABLE A-14
Haul Roads
Notice of Intent for the Bonneville Borrow Area Plant

Activity & Road Description	Number of days of precipitation >0.01"	PM Emission Factor (lb/VMT)	PM_{10} Emission Factor (lb/VMT)	$PM_{2.5}$ Emission Factor (lb/VMT)	Material Hauled (tons)	Round Trip Haul Distance (miles)	Number of Round Trips	Vehicle Miles Traveled (VMT)	Uncontrolled PM_{10} Emissions (tpy)	Uncontrolled $PM_{2.5}$ Emissions (tpy)	Control Efficiency (%)	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Unpaved Haul Roads	92	6.34	1.55	0.16	2,340,000	19.0	53,742	1,021,107	791	79	85	118.7	11.9	Chemical Suppressants and Water Sprays

	Haul Trucks
Average Vehicle Weight - Full (tons)	80
Average Vehicle Weight - Empty (tons)	36
S = Silt Content (%)	4
Vehicle Capacity (tons)	44
W = Average Vehicle Weight (tons)	58

NOTES:
Days of precipitation data obtained from http://www.wrcc.dri.edu/htmlfiles/ut/ut.01.html.
Haul Road Distances and Maximum Material Hauled based on URS design estimates.
Average Vehicle Weight is used in the calculation.
Silt value based on EPA default for Utah.
85 percent Control Efficiency for chemical suppressant application, per UDAQ policy.
Haul trucks are CAT740 articulated trucks. Vehicle weight and capacity taken from caterpillar.com.

AP-42 emission calculations for unpaved roads. Chapter 13.2.2 (11/06)

Equation (1a):

$$E = k \times \left(\frac{s}{12}\right)^a \times \left(\frac{W}{3}\right)^b \times \left(\frac{365-p}{365}\right)$$

	Unpaved		
	PM	PM_{10}	$PM_{2.5}$
k =	4.9	1.5	0.150
a =	0.7	0.9	0.9
b =	0.45	0.45	0.45

NOTES:
E: emission factor (lb/VMT) VMT = vehicle miles traveled
k, a, b: dimensionless constants from Table 13.2.2-2
S: silt content (%) of road surface
W: mean vehicle weight (tons); = (wt.loaded + wt.unloaded / 2)
p: number of days with at least 0.01 inches of precipitation per year; not used for calculating hourly emissions (default = 90)

Particle Size Multipliers for Paved Roads from AP-42 Chapter 13 Table 13.2.1-1 and Table 13.2.1-2

	k (lb/VMT)	C (lb/VMT)
$PM_{2.5}$	0.0024	0.00036
PM_{10}	0.016	0.00047
PM_{15}	0.02	0.00047
PM_{30}	0.082	0.00047

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TABLE A-15

Truck Unloading at Tailings Impoundment

Notice of Intent for the Bonneville Borrow Area Plant

Source Name	PM_{10} Emission Factor (lb/ton)	$PM_{2.5}$ Emission Factor (lb/ton)	Process Rate (tons/year)	Control Efficiency	Controlled PM_{10} Emissions (tpy)	Controlled $PM_{2.5}$ Emissions (tpy)	Control System and Comments
Truck Unloading	0.00010	0.00010	2,340,000	0%	0.12	0.12	Minimal drop distance and water application

NOTES:

Emission factor for PM_{10} taken from AP-42 Chapter 11 Table 11.19.2-2 truck loading.

Because a truck unloading emission factor for crushed stone was unavailable in AP-42, Table 11.19.2-2, emission factor for truck loading was used in the calculations.

Annual process rate based on material hauled from product storages piles to tailings impoundment.

Emission factor for $PM_{2.5}$ was unavailable, therefore was assumed to be same as PM_{10}. .

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UDWQ-SURFACE WATER

- Kennecott Utah Copper LLC has in effect UPDES permit Number UT000051
- A comprehensive SWPP has been developed for UT000051
- Specific to the Bonneville Borrow Area, Kennecott has developed a site specific SWPPP that will become an appendix to the UT000051 SWPPP during the construction-phase of the Bonneville Borrow Area
- Upon entering operational-phase, the construction-phase SWPPP will be integrated into the KUC UPDES SWPPP
- Discussions with the UDWQ UPDES Section (November 2011; Shelley, George) indicates addressing stormwater through the mechanism described above is acceptable
- To facilitate the construction-phase of the Bonneville Borrow Area, a Construction General Stormwater Permit will be applied for through UDWQ and obtained prior to construction of the Bonneville Borrow Area

UDWQ-GROUNDWATER

- Kennecott contacted UDWQ Groundwater Protection (September 2011; Herbert)
- Given no chemicals or process reagents are proposed, no UGW permit for the stormwater / sand wash water settling basins will be as these are permitted by rule under R3117-6-6.2 Groundwater Discharge Permit By Rule
- UDWQ formal notification is required prior to star-up

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Water of the U.S. Jurisdictional Assessment

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Kennecott Utah Copper LLC

Waters of the U.S. Jurisdictional Assessment
for the Bonneville Borrow Area

Prepared for

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4700 Daybreak Parkway
South Jordan, UT 84095

and

US Army Corps of Engineers
Sacramento District
Nevada-Utah Regulatory Branch
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1. Executive Summary

In the summer of 2011, Kennecott Utah Copper LLC (KUC) contracted WP Natural Resource Consulting, Inc. (WPNRC) to delineate potential wetlands and waters of the US (waters, collectively WoUS) on KUC lands in the vicinity of lower Little Valley Wash as a result of KUCs planning effort for a borrow pit (Bonneville Borrow Area) and associated haul roads.

The wetland and waters investigations were conducted following technical guidelines set forth in the U.S. Army Corps of Engineers Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE 2008) and the guidance document "*Information Needed for Jurisdictional Determinations- US Army Corps of Engineers*", "*Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States*" (USACE 2010), and "*Distribution of Ordinary High Water mark (OHWM) Indicators and Their Reliability in Identifying the Limits of 'Waters of the United States' in Arid Southwestern Channels*" (USACE 2006) by WPNRC in August and September of 2011.

The Investigation Area is located at an elevation of 4,800 to 5,240 feet in unincorporated Salt Lake County, Utah (Section 31, Township 1 South, Range 2 West and Sections 25 and 36 of Township 1 South, Range 3 West, 26th Principal Meridian), west of Magna, Utah in the lower reaches of Little Valley in the foothills of the Oquirrh Mountains. The Investigation Area is within the Farnsworth Peak and Magna USGS Topographic Quadrangles. Refer to **Figures 1** and **2** for a vicinity map and specific project location map with existing hydric features.

Field surveys occurred on August 25, and September 23, 2011. No potential jurisdictional wetlands within the Investigation Area were identified. Evidence of hydrology was generally absent, aside from stormwater flows into Little Valley Wash from KUCs road runoff. More discussion on hydrology and investigations for Ordinary High Water Marks (OHWM) is presented below on a site-by-site basis. In order to determine a nexus to any potential WoUS, Little Valley Wash was followed to its confluence with the Utah Salt Lake Canal immediately west of Magna.

The surface lands in the area are owned by KUC. Upland areas are dominated by sagebrush (*Artemisia tridentata*) shrublands and Gambel's oak woodlands (includes Gambel's oak [*Quercus gambelii*), intermediate wheatgrass (*Elymus hispidus*), bluebunch wheatgrass [*Pseudoroegneria spicata*], cheatgrass [*Bromus tectorum*], and yellow sweetclover [*Melilotus officinalis*]). The bottoms of the gulches were dominated by the same upland vegetation types, with scattered areas that include a few mesic plants, including coyote willow (*Salix exigua*-OBL), and Russian olive (*Eleagnus angustifolia*) (FACW).

Historic Use of Area

In 1934, post-wildfire floods from Little Valley Wash severely damaged much of western Magna. As a result of these floods, Little Valley was terraced by the Civilian Conservation Corps (CCC) and additionally there were redundant flood control structures installed in Little Valley Wash. The Little Valley area also harbored a previous Kennecott concentrator facility (Bonneville Concentrator) from the early 1960s to the early 2000s. The concentrator operations were moved to the current location near the Bingham Canyon Mine and the old Bonneville Concentrator was decommissioned in 2000 and demolished in 2006. As part of the Concentrator operations, three runoff control structures were situated to contain fluids and runoff below the old Concentrator site. These structures have emergency overflow culverts that are between 10 and 25 feet above the current base level of the wash. These structures were used as settling ponds for the Concentrator- this likely resulted in the deposition of the light gray and finely textured silts and

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clays in the area. Below the three runoff control structures associated with the Concentrator there is an additional flood control structure which remains in place.

The middle reaches of Little Valley were also used for recent industrial uses in the early 1990s. The area west of the Investigation Area and southeast of the old railroad grade was used as a staging area for retrieval (previously buried) and processing of storage tanks and equipment which were no longer needed. There was also historic use of the Little Valley area as a landfill near the railroad grade, and the area was a laydown yard for operations at different times.

Photo of Little Valley Wash and one of the historic runoff containment structures.

Although the Little Valley Wash settling ponds are no longer used, they still receive stormwater from the old Bonneville Quarry to the north as well as from area roads and the old railroad grade. The runoff control structures and the additional CCC flood control structures in the Wash still effectively halt surface water flows from continuing down Little Valley Wash. Only one culvert near the northern end of the Investigation Area still allows for stormwater to flow down from the old quarry and underneath an old railroad grade into the old settling ponds (see **Figure 3**).

The results of these investigations reveal that there are no jurisdictional wetlands within the Investigation Area, and no Waters of the U.S., as defined by the EPA and the U.S. Army Corps of Engineers (RGL 05-05, Lichvar et al. 2006, USACE 2008, EPA 2008). Little Valley Wash failed to support Observed High Water Marks, likely due to the presence of multiple flood control devices.

Reclaimed quarry and old Bonneville Concentrator site

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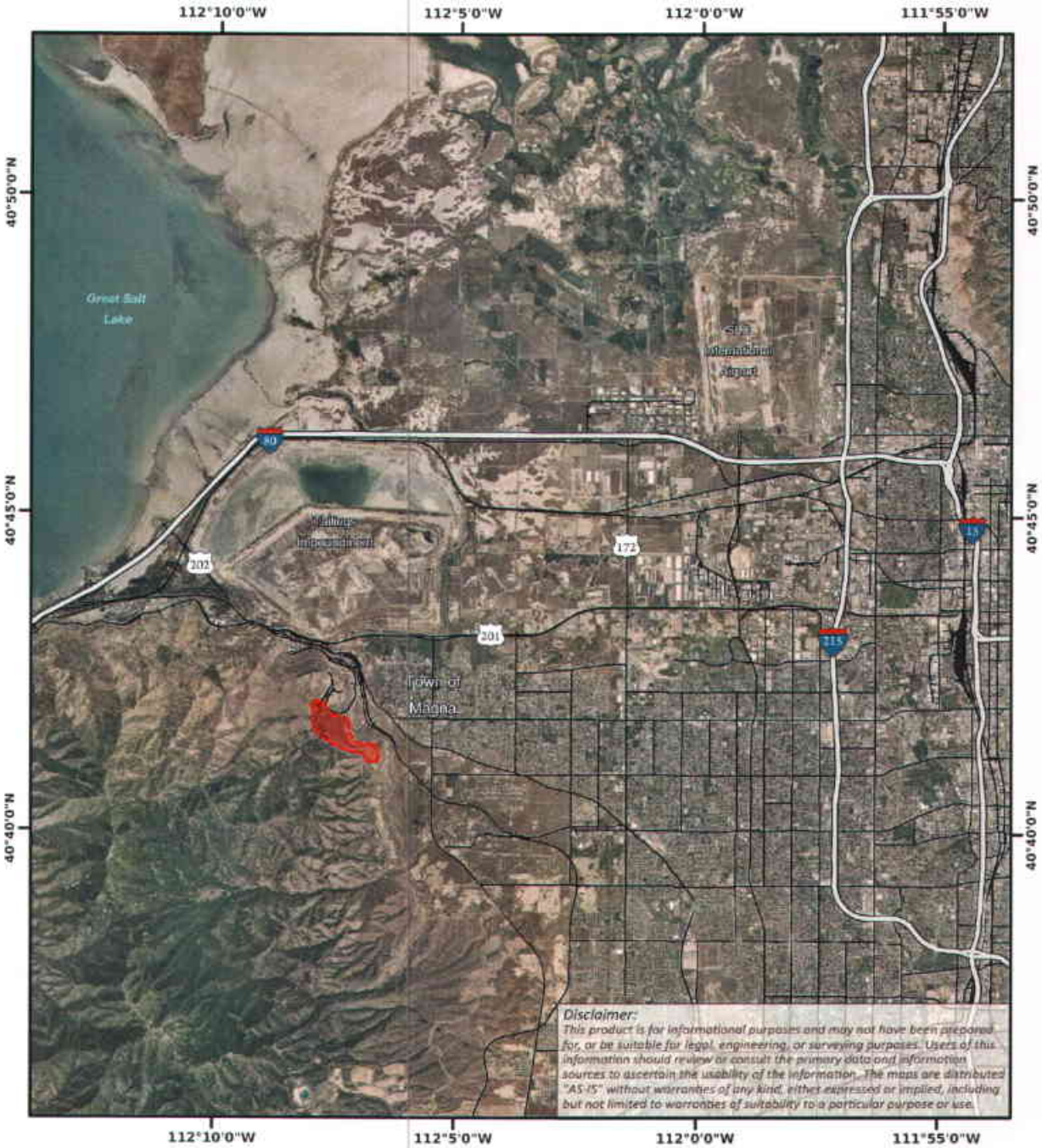

Municipal Boundary

Analysis Area

Interstate

State Highway

Minor Road

Railroad

RioTinto

Kennecott Utah Copper LLC

2011 Bonneville Borrow Area

FIGURE 1

Analysis Area Locations

Prepared By: WPNRC Inc.
Prepared For: Kennecott Utah Copper
Date: October 2011

0 15,000 30,000 Feet

Scale: 1" = 15,000

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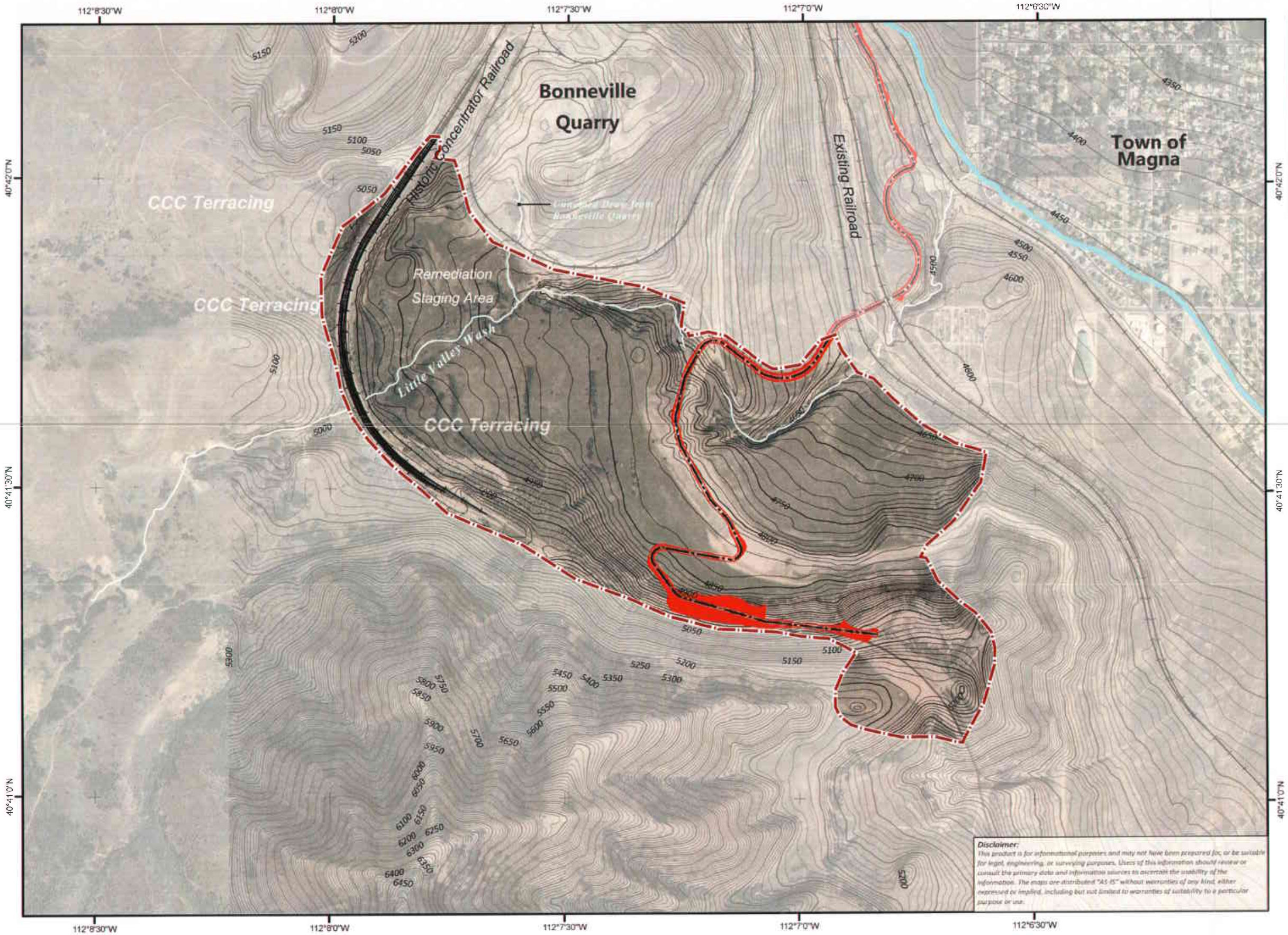

RioTinto

Kennecott Utah Copper LLC

2011 Bonneville Borrow Area

FIGURE 2

Investigation Area

Investigation Area — 424.0 Acres

Proposed Haul Road

Railroad

0 500 1,000 2,000 Feet

Scale: 1" = 1,000'

Prepared By: WPNRC Inc.
Prepared For: Kennecott Utah Copper
Date: October 2011

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2. Methods

The wetlands and waters investigations were conducted following technical guidelines set forth in the *U.S. Army Corps of Engineers Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008) and the guidance document "*Information Needed for Jurisdictional Determinations- US Army Corps of Engineers*" and the guidance documents "*Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* " (USACE 2010), and "*Distribution of Ordinary High Water mark (OHWM) Indicators and Their Reliability in Identifying the Limits of 'Waters of the United States' in Arid Southwestern Channels*" (USACE 2006). Pre-field work included review of pertinent background information and discussions with individuals familiar with the Investigation Area and down gradient hydric resources. Additionally, maps, aerial photos, and soil map unit descriptions of the project area were obtained and reviewed by URS Corporation and WPNRC in 2011.

Upon completion of the pre-field work the investigation areas were traversed in August and September of 2011 by WPNRC staff and in April of 2011 by URS Corporation staff. A total of 4 wetland data points and 3 OHWM data points were used in the Investigation Area. Given the lack of wetlands and OHWM indicators and homogenous conditions in the Investigation Area, additional data points were not justified. Ecosystem parameters (vegetation, soils, and hydrology) were characterized and recorded on field data forms (**Appendix A**) at each of the wetland data points, and channel morphology and OHWM field forms (**Appendix B**) were generated at the 3 OHWM data point locations. The centerline and lowest points of the gulches were walked their entire lengths within the Investigation Areas. These features are shown in **Figures 3** and **4**. While walking the gulches, any evidence of OHWMs was recorded and the source of the flow was ascertained.

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3. Results of Investigations

Little Valley Wash is located within the Jordan River watershed (HUC 16020204). The headwaters of Little Valley Wash are located approximately 2.5 miles to the west of the Investigation Area and the Little Valley drainage area is approximately 3,000 acres (URS 2011).

Vegetation

Little Valley was dominated by Gambel's oak woodlands with expansive meadows. Within the actual gully of Little Valley Wash, dominant vegetation included Gambel's oak (NI), sagebrush (NI), cactus (*Opuntia polyacantha*- NI), rabbitbrush (*Chrysothamnus nauseosus*- NI), and intermediate wheatgrass (*Elymus hispidus*- UPL). These dominant plant species are not wetland indicator species.

In the old settling ponds, small areas supported more mesic vegetation. In the two sites supporting more hydric vegetation types, wetland determination data points were established. The mesic sites supported salt cedar (*Tamarix ramossissima*- FACW), Russian olive (*Eleagnus angustifolia*- FACW), cheatgrass (*Bromus tectorum*- UPL), ragweed (*Ambrosia psilostachya*- FACU), bulbous bluegrass (*Poa bulbosa* -FACU), and blazingstar (*Mentzelia* spp.- no plants of this genus are listed as wetland indicators). However, at the three hydric data points (i.e., not including "upland" data points), wetland prevalence indicators were 4.45, 3.09, and 4.18 which indicates that the site does not support a preponderance of hydrophitic vegetation.

Soils

Soil survey information compiled by the Natural Resources Conservation Service (NRCS) identifies four mapping units within the limits of the Investigation Area. These datasets provide a suitable level of context for delineating potential Investigation Area wetlands. The following narrative provides a description of these mapping units. While these descriptions are published by the NRCS, the actual on-the-ground conditions will vary with more recent land management activities, and were recorded accordingly on the wetland determination data forms (**Appendix A**).

<u>Stony Terrace Escarpments</u>
This series is not described by the NRCS. On-site reviews indicated that this soil type is comprised of large, rounded cobbles, with light gray silty clays occurring as an infill within the stones. In some areas we observed this series as being previously quarried and it also occurred as large escarpments along Little Valley Wash. This series is not on the National Hydric Soils List.

Stony Terrace Escarpments above the investigation area

<u>Butterfield Extremely Stony Loam, 5 to 50% Slopes</u>
This soil occurs on south-facing mountain slope and on northeast-facing slopes below an elevation of 5,300 feet. It formed in colluvium and residuum from andesite igneous and sedimentary rocks. Average annual precipitation ranges from 17 to 20 inches. Typical profiles have a dark grayish-brown and grayish-brown extremely stony loam, and very cobbly loam about 10 inches thick. Subsoils are brown and light-brown very cobbly clay loam about 20 inches thick over bedrock. The intake of water is moderate and permeability is moderately slow. Runoff is very rapid. Included in the mapped area are areas of Horrocks

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extremely stony loam- these are small areas of shallow rocky soils on ridges, and on the fringes below the old Lake Bonneville. This series is not on the National Hydric Soils List.

Pleasant Grove Gravelly Loam, 2 to 6% Slopes

The Pleasant Grove series consists of well-drained soils on lake terraces in the west-central part of the survey area. These soils formed in mixed gravelly alluvium from sedimentary and igneous rocks. The vegetation is bunchgrasses and shrubs, such as wheatgrasses and sagebrush. Elevations range from 4,300 to 4,800 feet. Annual precipitation ranges from 14 to 16 inches. In representative profiles, the surface layer is grayish-brown gravelly loam about 28 inches thick. The underlying layers of lime accumulation are stratified, very pale brown very gravelly fine sandy loam, white silt loam, and light-gray very cobbly silt loam about 21 inches thick. Below a depth of 49 inches is very pale brown, stratified gravelly loam and loamy coarse sand. The surface layer is moderately calcareous and the underlying layers are strongly calcareous. Intake of water is moderate, permeability is rapid and runoff is slow. This series is not on the National Hydric Soils List

Kearns Silt Loam, 3 to 6% Slopes

The Kearns series consists of very deep, well drained soils that formed in alluvium and lacustrine deposits derived from sedimentary rocks. Kearns soils are on alluvial fans and lake terraces. Slopes range from zero to 20 percent. The mean annual precipitation is approximately 16 inches. In representative profiles, the surface layer is grayish-brown silt loam about 17 inches thick. The subsoil is light brownish-gray silt loam and silty clay loam about 13 inches thick. This series is not on the National Hydric Soils List.

Harkers Soils, 6 to 40% Slopes

The Harkers soil type was formed in alluvium and colluvium from sedimentary rocks. Mean annual temperature is 45 to 53°F mean summer temperature is 68 to 70° F and average annual precipitation ranges from 14 to 25 inches. The freeze-free period is 100 to 150 days. The frost-free period is around 100 days. It is well-drained; medium to rapid runoff and has slow permeability; the Harkers series is more associated with foothills. Harkers soils have very dark grayish brown, neutral, loam Al horizons, and brown, neutral, gravelly clay and B horizons over very gravelly clay loam C horizons. They are on short to long sloping alluvial fans to very steep mountain slopes at elevations between 5,500 and 7,500. This series is not on the National Hydric Soils List.

The fine, light gray soils in the old settling ponds were likely related to historic operations in the area, and are not a result of area parent soils.

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Hydrology

Existing conditions were assessed within the Investigation Area and at the tributary scale in order to document the flow characteristics and functions performed by Little Valley Wash. Little Valley Wash within the Investigation Area failed to support evidence of an OHWM, with the exception of shelving in the old settling ponds. Other OHWM features that were not observed included the following features (RGL 05-05):

- Natural line impressed on the bank
- Changes in the character of soil
- Destruction of terrestrial vegetation
- Presence of litter and debris
- Wracking
- Vegetation matted down, bent, or absent
- Sediment sorting
- Leaf litter disturbed or washed away
- Scour
- Deposition
- Multiple observed flow events
- Bed and banks
- Water staining
- Change in plant community

Given the past use of Little Valley Wash as settling ponds, the deposition of fine sediments in the Wash is likely related to historic operations and not the result of overland flows. These sediments are not consistent with natural flow patterns as one would expect from a Water of the US as sediment deposition and sorting is not from native soils, nor does the wash show evidence of recent flow since the decommissioning of the Bonneville Concentrator.

The Little Valley Wash is influenced and bisected by multiple features which influence overall hydrology patterns. The historic railroad used to deliver crushed ore from the Bingham Canyon Mine to the Bonneville Concentrator. This railroad grade is still in place, and has large 8-foot diameter culverts, with protective levees around the up-gradient sides. The levees preclude all surface flows into the culverts. The southern fork of Little Valley Wash is bisected by the historic railroad grade as well. A culvert passes through the railroad grade; however the up-gradient side of the culvert is protected by a levee system (see adjacent photos). There was no evidence of OHWMs in the southern fork, and no

Photo of additional flood control structures and protective levees above railroad grade in the southwest fork of Little Valley Wash

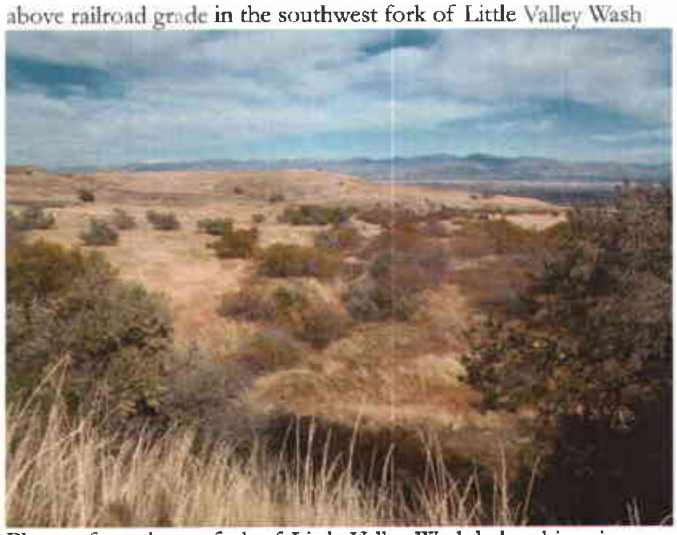

Photo of southwest fork of Little Valley Wash below historic railroad grade

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evidence of flows. The southern fork merges with the northern fork at the first settling pond within the investigation area.

Below the settling pond runoff control structures and location of data points is the roadway with another 8-foot culvert. The mouth of this culvert is protected by large rocks, and surface flows aside from large flood events are prevented from passing through the culvert due to a positive grade created by the rocks (see photos above). Below the road culvert is a fourth flood control structure, built to protect Magna from floods. Below the fourth control structure is another large roadway with a culvert, which empties into a catchment basin at the newer Kennecott railroad grade (see photos below). Below the newer railroad grade the Wash continues down to the Utah Salt Lake Canal. Some of these features have been in place since the 1930s, and more recently in the 1960s. Because of these redundant features, Little Valley Wash showed no signs of regular or frequent high water events needed to produce OHWMs.

Conclusion

While past or historic flow events have likely shaped Little Valley Wash topography to form a concave shape, current flow events in the lower reaches of Little Valley Wash are rare, very short lived, and low volume events. The likelihood of a flow event occurring on regular intervals is extremely low, given that there are regularly spaced structures designed to capture and hold overland flows. This was further evidenced by the lack of standard OHWM features (RGL 05-05, TR-06-5 [USACE 2006]). No wetlands/waters were observed within the Investigation Area or below the Investigation Area to the confluence of Little Valley Wash with the Utah Salt Lake Canal.

Per the EPA (2008),

> *"Swales or Erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow) are generally not waters of the United States because they are not tributaries or they do not have a significant nexus to downstream traditional navigable waters…"*

Therefore, it appears Little Valley Wash would not have a nexus to a Water of the US, or a Traditional Navigable Waterway. Based on investigations completed in April and the fall of 2011, Little Valley Wash through the Investigation Area does not support the frequency, duration or volume of overland water flow to produce OHWMs, and therefore Little Valley Wash does not exhibit any characteristics of a potential WoUS (for Section 404 permitting purposes).

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Culvert outfall in tributary to Little Valley Wash- this site was the culvert into the first settling pond below the decommissioned Bonneville Concentrator.

Old "shelving" in deposited fine materials in settling pond.

Upgradient side of first runoff control structure, showing fill of fine sediments

First Settling Pond runoff control structure in Little Valley Wash, and overflow control culverts

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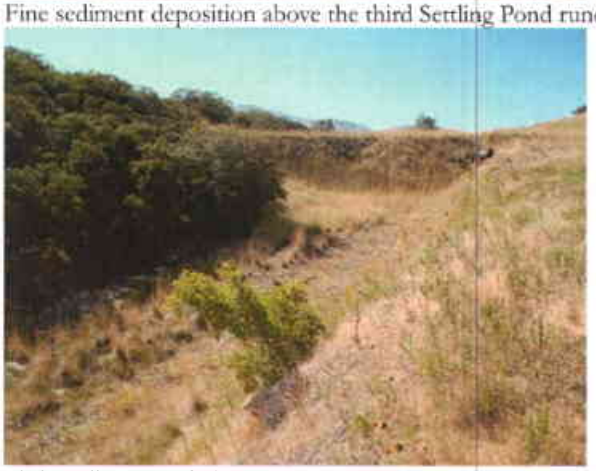
Fine sediment deposition above the third Settling Pond runoff control structure.



Little Valley Wash below second runoff control structure.

View down gradient

Little Valley Wash below second runoff control structure.

Below third runoff control structure is an 8' diameter, 850-foot corrugated culvert going underneath roadway.

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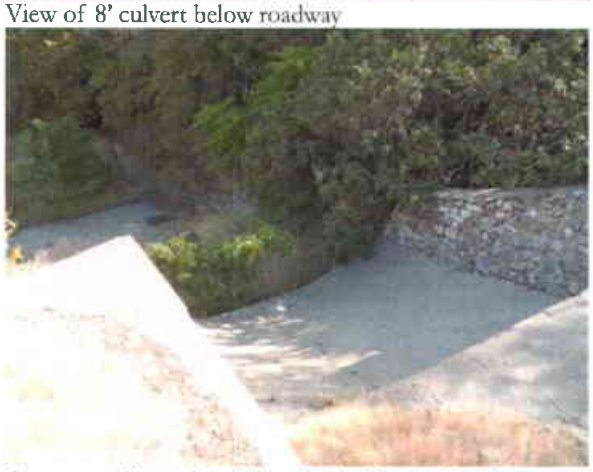
View of 8' culvert below roadway

View of Wash below culvert- no OHWMs.



Concrete spillway from historic flood control efforts.

View looking up Wash from lower road and RR tracks at fourth flood control structure

Large catchment basin up-gradient of RR grade.

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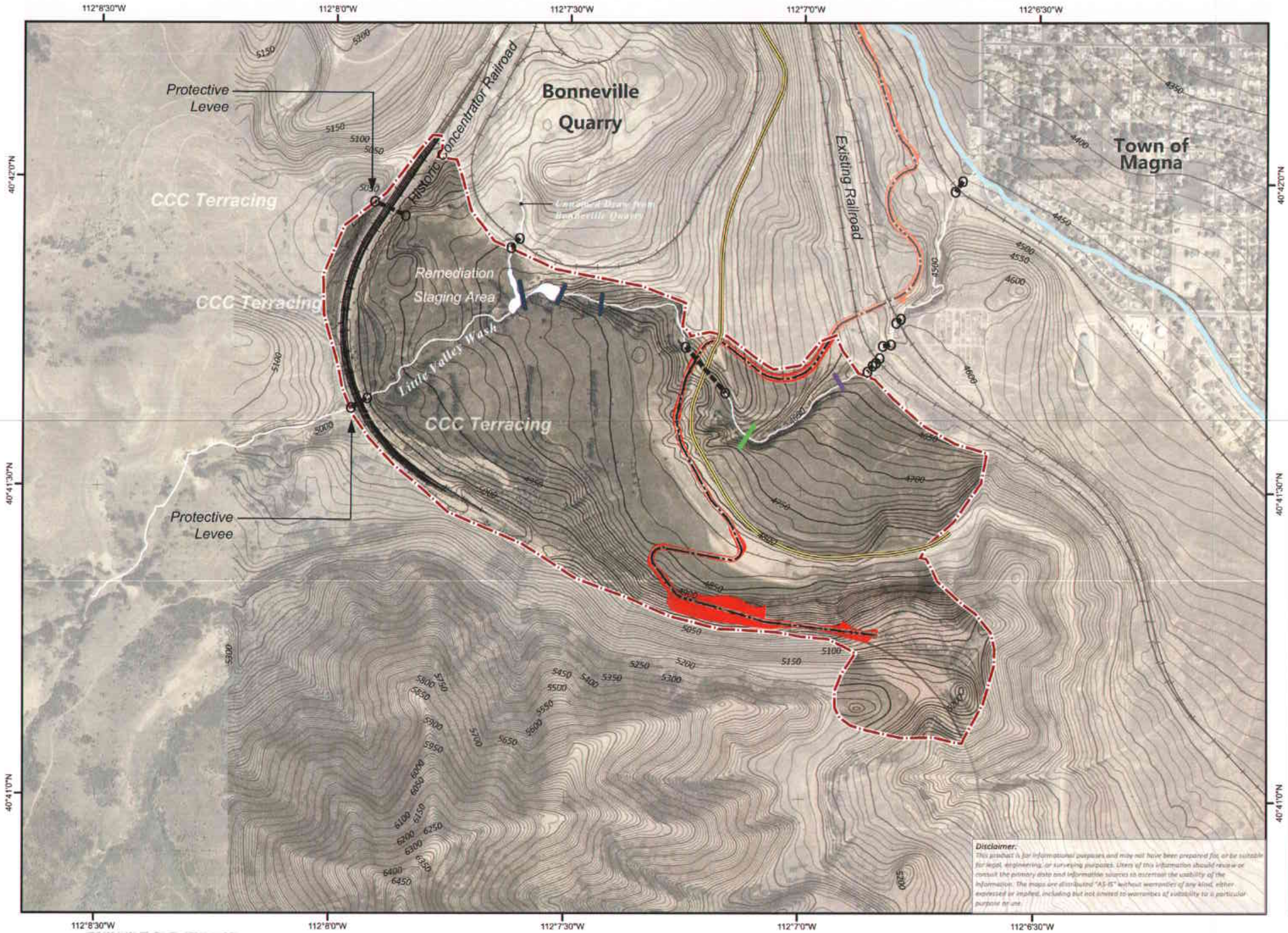

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Kennecott Utah Copper LLC

2011 Bonneville Borrow Area

FIGURE 3

Existing Hydrologic Features

- Investigation Area — 424.0 Acres
- Proposed Haul Road
- Railroad
- Settling Pond
- Utah-Salt Lake Canal
- Culvert
- Elevated Roadway
- Run-off Control Structure
- Concrete Spillway
- Flood Control Structure

0 500 1,000 2,000 Feet

Scale: 1" = 1,000'

Prepared By: WPNRC Inc.
Prepared For: Kennecott Utah Copper
Date: October 2011

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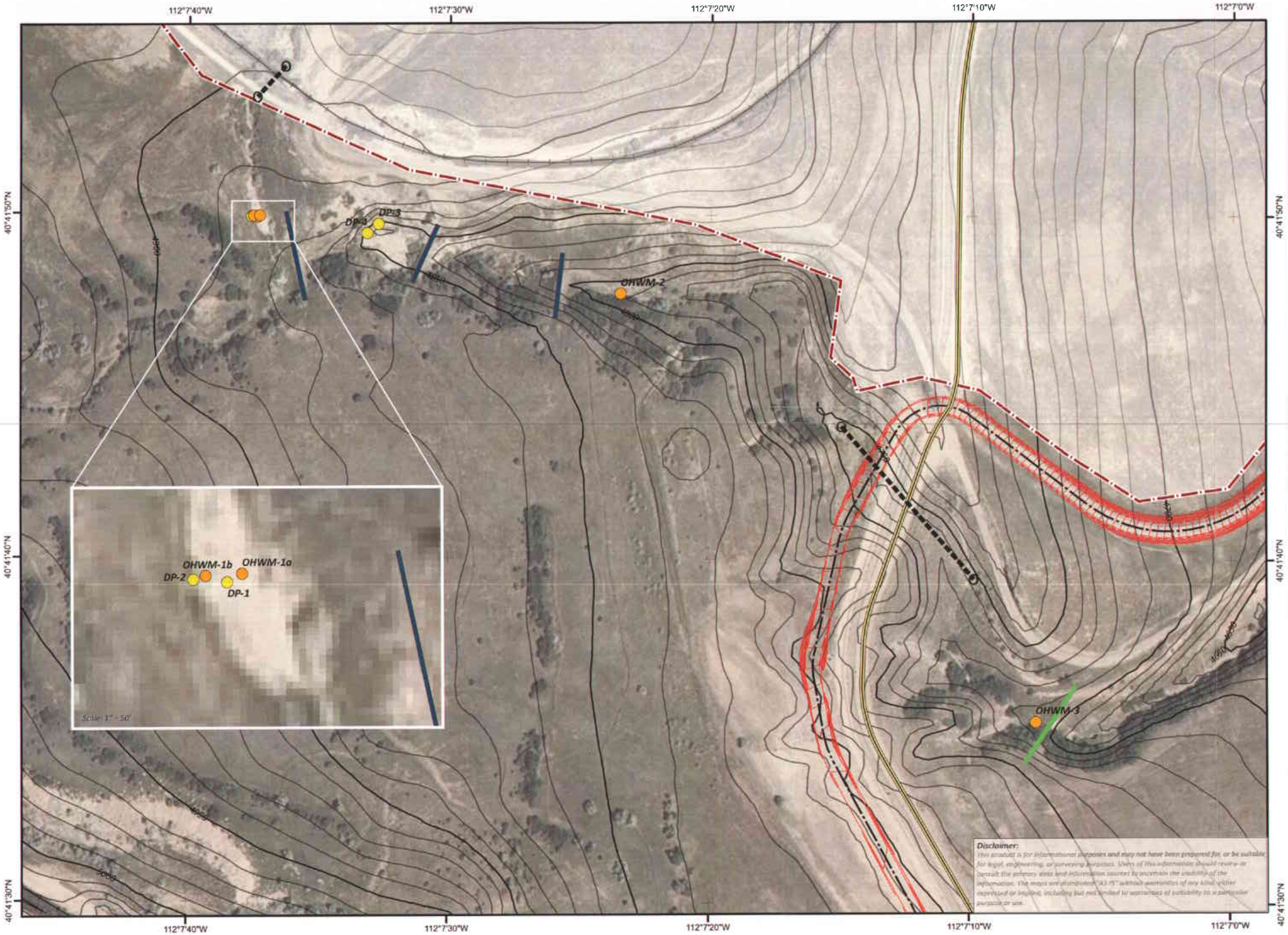

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2011 Bonneville Borrow Area

FIGURE 4

Data Points

- Investigation Area
- Proposed Haul Road
- Data Point
- OHWM Data Point
- Culvert
- Elevated Roadway
- Run-off Control Structure
- Concrete Spillway

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0 150 300 600 Feet

Scale: 1" = 300'

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Prepared For: Kennecott Utah Copper
Date: October 2011

4. Literature and References Cited

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5. Appendix A: Wetland Delineation Data Forms

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WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: KUCC Little Valley City/County: Salt Lake Sampling Date: 9/23/2011

Applicant/Owner: Kennecott Utah Copper State: UT Sampling Point: DP-1

Investigator(s): Wheeler/Petterson Section, Township, Range: S25, T1S, R3W

Landform (hillslope, terrace, etc.): Gulch Local relief (concave, convex, none): Concave Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 40*41'49.909"N Long: 112*07'37.414"W Datum: WGS 84

Soil Map Unit Name: Stony Terrace Escarpments NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ◯ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ◯

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◯	No ◉	
Hydric Soil Present?	Yes ◯	No ◉	**Is the Sampled Area within a Wetland?** Yes ◯ No ◉
Wetland Hydrology Present?	Yes ◯	No ◉	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Tamarix ramossisima*	5	Yes	FACW
2. *Eleagnus angustifoliumus*	3	Yes	FACW
3.			
4.			
5.			
Total Cover:	8 %		
Herb Stratum			
1. *Bromus tectorum*	5	Yes	UPL
2. *Poa bulbosa*	1	No	FACU
3. *Ambrosia psilostachya*	2	Yes	FACU
4. *Mentzelia spp.*	1	No	Not Listed
5.			
6.			
7.			
8.			
Total Cover:	9 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 90 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	8	x 2 =	16
FAC species		x 3 =	0
FACU species	3	x 4 =	12
UPL species	6	x 5 =	30
Column Totals:	17 (A)		58 (B)

Prevalence Index = B/A = 3.41

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◯ No ◉

Remarks:

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Sampling Point: DP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	2.5Y 5/3						Silty clay	
4-15	5Y 5/2						Silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils:[4]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ **Sediment Deposits (B2) (Nonriverine)**
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ **Oxidized Rhizospheres along Living Roots (C3)**
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches): _____

Water Table Present? Yes ○ No ◉ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches): _____

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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SAMPLING POINT PHOTOS

Sampling Point: DP-1

Image Field

Soil Test Pit Photo

Image Field

Soil Matrix Photo

Image Field

Sample Area Photo

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WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: KUCC/ Little Valley City/County: Salt Lake Sampling Date: 9/23/2011

Applicant/Owner: Kennecott Utah Copper State: UT Sampling Point: DP-2

Investigator(s): Wheeler/Petterson Section, Township, Range: S25, T1S, R3W

Landform (hillslope, terrace, etc.): Gulch Local relief (concave, convex, none): Concave Slope (%): 25

Subregion (LRR): D - Interior Deserts Lat: 40*41'49.902"N Long: 112*07'37.563"W Datum: WGS 84

Soil Map Unit Name: Stony Terrace Escarpments NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ◯ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ◯

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◯	No ◉	
Hydric Soil Present?	Yes ◯	No ◉	**Is the Sampled Area within a Wetland?** Yes ◯ No ◉
Wetland Hydrology Present?	Yes ◯	No ◉	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	15	Yes	FACW
2.			
3.			
4.			
5.			
Total Cover:	15 %		
Herb Stratum			
1. *Bromus tectorum*	5	Yes	UPL
2. *Ambrosia psilostachya*	10	No	FACU
3. *Epilobium brachycarpum*	25	Yes	FAC
4. *Melilotus officinalis*	5	No	FACU
5.			
6.			
7.			
8.			
Total Cover:	45 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 20 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	66.7 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	15	x 2 =	30
FAC species	25	x 3 =	75
FACU species	15	x 4 =	60
UPL species	5	x 5 =	25
Column Totals:	60 (A)		190 (B)

Prevalence Index = B/A = 3.17

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◯ No ◉

Remarks:

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SOIL

Sampling Point: DP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-14	7.5YR 4/3	99					Silty clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils:[4]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ○ No ●

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ●	Depth (inches):
Water Table Present?	Yes ○	No ●	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ●	Depth (inches):

Wetland Hydrology Present? Yes ○ No ●

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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SAMPLING POINT PHOTOS

Sampling Point: DP-2

Image Field

Soil Test Pit Photo

Image Field

Soil Matrix Photo

Image Field

Sample Area Photo

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WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: KUCC/ Little Valley | City/County: Salt Lake | Sampling Date: 9/23/2011

Applicant/Owner: Kennecott Utah Copper | State: UT | Sampling Point: DP-3

Investigator(s): Wheeler/Petterson | Section, Township, Range: S25, T1S, R3W

Landform (hillslope, terrace, etc.): Gulch | Local relief (concave, convex, none): Concave | Slope (%): 1

Subregion (LRR): D - Interior Deserts | Lat: 40*41'49.768"N | Long: 112*07'32.720"W | Datum: WGS 84

Soil Map Unit Name: Stoney Terrace Escarpments | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ◯ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ◯

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ◯	
Hydric Soil Present?	Yes ◉	No ◯	Is the Sampled Area within a Wetland? Yes ◯ No ◉
Wetland Hydrology Present?	Yes ◉	No ◯	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Celtis laevigata*	3	Yes	NI
2.			
3.			
4.			
Total Cover:	3 %		
Sapling/Shrub Stratum			
1. *Tamarix ramossisima*	20	Yes	FACW
2.			
3.			
4.			
5.			
Total Cover:	20 %		
Herb Stratum			
1. *Bromus tectorum*	5	Yes	UPL
2. *Poa bulbosa*	1	No	FACU
3. *Ambrosia psilostachya*	6	Yes	FACU
4.			
5.			
6.			
7.			
8.			
Total Cover:	12 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 75 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	25.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	20	x 2 =	40
FAC species		x 3 =	0
FACU species	7	x 4 =	28
UPL species	8	x 5 =	40
Column Totals:	35 (A)		108 (B)

Prevalence Index = B/A = 3.09

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◯ No ◉

Remarks:

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SOIL

Sampling Point: DP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-8	2.5Y 4/2		10R 5/8	4			Silty clay	Smells like hydrocarbons
8-8.5	10R 5/8						Silt	
8.5-9.5	10YR 4/3						Sandy silt	
9.5-10.5	10YR 4/3		10R 5/8	10			Silty clay	Mottles are in layers w/roots
10.5-12	10YR 5/2		2.5YR 5/8	5			Silty clay	see Remarks below
12-14	10YR 5/3		2.5YR 5/8	5			Sandy silt	
14-16	2.5Y 4/3						Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☒ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils:[4]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ No ◯

Remarks: In top layer inclusion of 2.5Y 3/1, but these dark patches had a volatile hydrocarbon-type odor. Soil pit had noticeable odor after a while sitting open.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◯	No ◉	Depth (inches):
Water Table Present?	Yes ◯	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ◯	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ◯

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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SAMPLING POINT PHOTOS

Sampling Point: DP-3

Image Field

Soil Test Pit Photo

Image Field

Soil Matrix Photo

Image Field

Sample Area Photo

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WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: KUCC Little Valley | City/County: Salt Lake | Sampling Date: 9/23/2011

Applicant/Owner: Kennecott Utah Copper | State: UT | Sampling Point: DP-4

Investigator(s): Wheeler/Petterson | Section, Township, Range: S25, T1S, R3W

Landform (hillslope, terrace, etc.): Gulch | Local relief (concave, convex, none): Concave | Slope (%): 1

Subregion (LRR): D - Interior Deserts | Lat: 40*41'49.49.502"N | Long: 112*07'33.142"W | Datum: WGS 84

Soil Map Unit Name: Stoney Terrace Escarpments | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ◯ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ◯

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◯	No ◉	
Hydric Soil Present?	Yes ◯	No ◉	**Is the Sampled Area within a Wetland?** Yes ◯ No ◉
Wetland Hydrology Present?	Yes ◉	No ◯	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Tamarix ramossisima*	15	Yes	FACW
2.			
3.			
4.			
5.			
Total Cover:	15 %		
Herb Stratum			
1. *Bromus tectorum*	40	Yes	UPL
2. *Poa bulbosa*	1	No	FACU
3. *Ambrosia psilostachya*	4	No	FACU
4. *Mentzelia spp.*	1	No	Not Listed
5.			
6.			
7.			
8.			
Total Cover:	46 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 50 % % Cover of Biotic Crust 30 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	15	x 2 =	30
FAC species		x 3 =	0
FACU species	5	x 4 =	20
UPL species	41	x 5 =	205
Column Totals:	61 (A)		255 (B)

Prevalence Index = B/A = 4.18

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◯ No ◉

Remarks:

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SOIL

Sampling Point: DP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-14	2.5Y 4/3						Gravelly sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils:[4]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ○ No ●

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☒ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ● Depth (inches): _____

Water Table Present? Yes ○ No ● Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ○ No ● Depth (inches): _____

Wetland Hydrology Present? Yes ● No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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SAMPLING POINT PHOTOS

Sampling Point: DP-4

Image Field

Soil Test Pit Photo

Image Field

Soil Matrix Photo

Image Field

Sample Area Photo

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6. Appendix B: OHWM Data Forms

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Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Little Valley haul road
Project Number:
Stream: Little Valley Wash
Investigator(s): Wheeler/Petterson

Date: 9/23/2011
Town:
Photo begin file#:

Time: 3:35
State: Utah
Photo end file#:

Y ■ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ■ Is the site significantly disturbed?

Location Details:
Draw tributary to Little Valley Wash

Projection: Lat/Long **Datum:** WGS 84
Coordinates: 40°41'47.783"N. 112° 07'19.840"W

Potential anthropogenic influences on the channel system:

Soil in channel originates from previous use as previous use as settling pond.

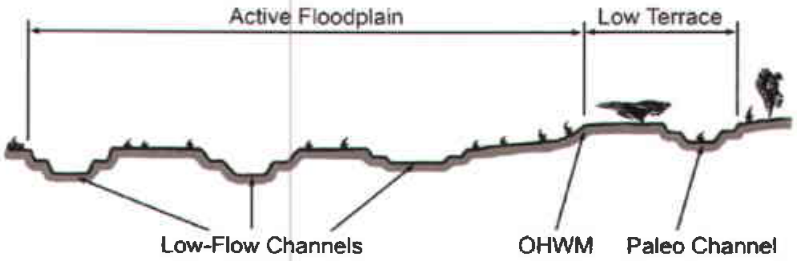
Brief site description:
Area where channel broadens and sediment is deposited

Checklist of resources (if available):

- ☐ Aerial photography
  Dates:
- ■ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ■ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ■ Global positioning system (GPS)
- ☐ Other studies

- ■ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☐ Digitized on computer
   - ■ GPS
   - ☐ Other:

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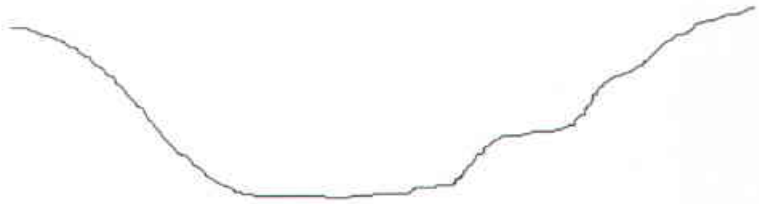
Project ID: **Cross section ID:** LV OHWM DP-1 **Date:** 8/31/2011 **Time:**

Cross section drawing:



OHWM

GPS point: 40*41'47.783"N. 112* 07'19.840"W

Indicators:

- ☐ Change in average sediment texture
- ☒ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

Floodplain unit:

☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 40*41'49.935"N. 112* 07'37.473"W

Characteristics of the floodplain unit:

Average sediment texture: Fine silty clay

Total veg cover: 22 % Tree: ____ % Shrub: 20 % Herb: 2 %

Community successional stage:

- ☒ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Tamarix and willows overhanging bank

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SAMPLING POINT PHOTOS

Sampling Point: _____

Image Field

Upgradient Photo

Image Field

Downgradient Photo

Image Field

Channel Substrate Photo

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Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Little Valley haul road
Project Number:
Stream: Little Valley Wash
Investigator(s): Wheeler/Petterson

Date: 9/23/2011
Town:
Photo begin file#:

Time: 3:35
State: Utah
Photo end file#:

Y ■ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ■ Is the site significantly disturbed?

Location Details:
Little Valley Wash OHWM-2

Projection: Lat/Long
Datum: WGS 84
Coordinates: See below

Potential anthropogenic influences on the channel system:

Dam upstream stops surface water connectivity toupstream reaches.

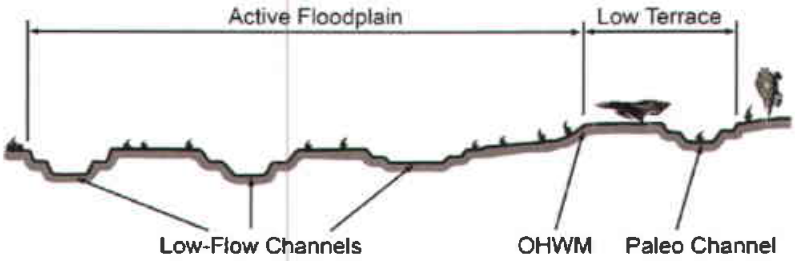
Brief site description:
Dry wash in oakbrush woodlands.

Checklist of resources (if available):

- ☐ Aerial photography
  Dates:
- ■ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ■ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ■ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☐ Digitized on computer
   - ■ GPS
   - ☐ Other:

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Project ID: **Cross section ID:** LV OHWM-2 **Date:** 8/31/2011 **Time:**

Cross section drawing:

OHWM

GPS point: 40*41'47.783"N. 112* 07'19.840"W

Indicators:

- ☐ Change in average sediment texture
- ☒ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

No low flow channel. See photos

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 40*41'47.783"N. 112* 07'19.840"W

Characteristics of the floodplain unit:

Average sediment texture: Large gravels

Total veg cover: 40 % Tree: 0 % Shrub: 10 % Herb: 30 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Gambels oak seedlings in floodplain, evidencing lack of surface flows. Oaks overhang floodplain as well.

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SAMPLING POINT PHOTOS

Sampling Point: OHWM-2

Image Field

Upgradient Photo

Image Field

Downgradient Photo

Image Field

Channel Substrate Photo

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Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Little Valley haul road
Project Number:
Stream: Little Valley Wash
Investigator(s): Wheeler/Petterson

Date: 9/23/2011
Town:
Photo begin file#:

Time: 3:35
State: Utah
Photo end file#:

Y ■ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ■ Is the site significantly disturbed?

Location Details:
Little Valley Wash OHWM-3

Projection: Lat/Long **Datum:** WGS 84
Coordinates: See below

Potential anthropogenic influences on the channel system:

Upstream there are many features- 2 dams, many terraces, roadways, railroad grades, levees, etc.

Brief site description:

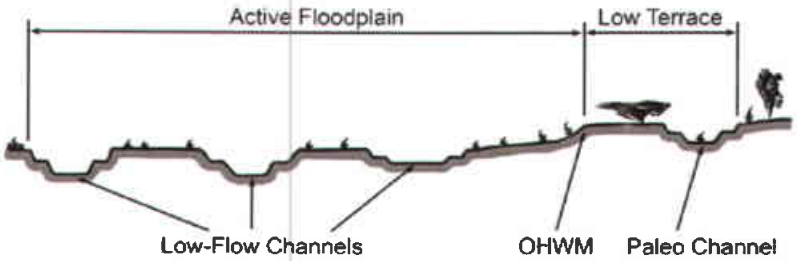
Area below large culverted road crossing. In scrub oak woodland.

Checklist of resources (if available):

- ■ Aerial photography
  Dates:
- ☐ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ■ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ■ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☐ Digitized on computer
   - ■ GPS
   - ☐ Other:

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Project ID: **Cross section ID:** LV OHWM-3 **Date:** 8/31/2011 **Time:**

Cross section drawing:

OHWM

GPS point: _____

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

No low flow channel. See photos

Floodplain unit:

☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 40*41'47.783"N. 112* 07'19.840"W

Characteristics of the floodplain unit:

Average sediment texture: Large gravels

Total veg cover: 90 % Tree: 0 % Shrub: ___ % Herb: 90 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Intermediate wheatgrass throughout gully- no evidence of flow

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SAMPLING POINT PHOTOS

Sampling Point: OHWM-3

Image Field

Upgradient Photo

Image Field

Downgradient Photo

Image Field

Channel Substrate Photo

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SALT LAKE COUNTY

- Kennecott has reviewed the development of the Bonneville Area against internal protocol governing to determine if a project on KUC property would requires a building, grading or other permit from a local government agency
- Kennecott does not believe the development of the Bonneville Borrow Area requires Salt Lake County land disturbance and/or extraction permits

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Stormwater Pollution Prevention Plan

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Site-Specific Stormwater Pollution Prevention Plan

for:

Bonneville Borrow Area
Rio Tinto Group – Kennecott Utah Copper
Sections 25 and 36, Township 1 South, Range 3 West
Salt Lake County, Utah

Operator:

Kennecott Utah Copper Corporation
P.O. Box 6001
Magna, Utah 84044-6001
(801)204-2113

SWPPP Contact:

Reed Bodell
Superintendent of Water Resources
(801) 569-7915

SWPPP Prepared by:

URS Corporation
8181 East Tufts Avenue
Denver, CO 80237
303-694-2770

SWPPP Preparation Date:

11/16/2011

Project Estimated Start Date: May, 2012
Project Estimated Completion Date: May, 2015

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Figures

Figure 1 is the Site Location Map
Figures 2-4 detail the required site erosion control BMPs
Erosion and Sediment Control Plan
Appendix A – Corrective Action Log
Appendix B – SWPPP Amendment Log
Appendix C – Grading and Stabilization Activities Log

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This Site-Specific SWPPP was developed for the Bonneville Borrow Area at Kennecott Utah Copper west of Magna, Utah. The Kennecott Copper Mine is planning improvements and an expansion of their facilities, particularly an enlargement of the tailings pond. The proposed Bonneville Borrow area will become a source of construction materials in support of these efforts. A site location map is shown on Figure 1 and site-specific erosion control measures are depicted on Figures 2 through 4. This SWPPP addresses the site specific conditions at this site and provides information on mitigating stormwater impacts from the proposed site.
This document was modeled after the U.S. Environmental Protection Agency's (EPA) SWPPP Template for construction site operators in Authorized States (found at: http://www.epa.gov/npdes/pubs/sw_swppp_template_authstates.doc).

SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

Table 1.1 Project/Site Information

Project/Site Name: Bonneville Borrow Area / Kennecott Copper
Project Location (narrative, relative to nearby roadways): The proposed borrow area is located approximately 2 miles west of Magna, Utah and 1.5 miles south of the Kennecott mine tailings pond. The site is identified as Little Valley on the USGS 7.5 Minute Series Farnsworth Peak, Utah Quadrangle.
City (if applicable): Magna, Utah
County: Salt Lake
Latitude/Longitude: Lat. 40.69 ° N, Long. 112.13° W(NAD 83)
Method for determining latitude/longitude
☒ USGS topographic map (specify scale: 1:24,000)
☐ Other (please specify): _____
☐ Lidar ☐ Survey (provided by _____).
Describe the adjacent roadways and access to the site: Access to the site is from State Road 201 (Alternate US 50) through the Kennecott mining facility.
Is the project located in Indian country? ☐ Yes ☒ No
If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable." N/A
Is this project considered a federal facility? ☐ Yes ☒ No

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Table 1.2 Responsible Parties

Operator:
Kennecott Utah Copper Corporation P.O. Box 6001 Magna, Utah 84044-6001 (801)204-2113
Operator Contacts:
Reed Bodell Superintendent of Water Resources (801) 569-7915
Subconsultants/Subcontractors:
URS Corporation 8181 East Tufts Avenue Denver, CO 80237

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Table 1.3 Nature and Sequence of Construction Activity

Describe the general scope of the work for the project, major phases of construction, etc:
The Bonneville Borrow Area is approximately 224 acres which contains alluvial soils needed for the Kennecott Tailing expansion efforts. It will be developed in phases and include the clearing of vegetation, the removal and storage of top soil, and the temporary stockpiling of mined alluvial material in the general borrow area (**see attached Figures 2-4**). The borrow area is divided into three sub-areas: quartzite borrow area, alluvial borrow area, and railroad embankment borrow area. A crushing and screening plant will be required to process the materials from the quartzite borrow area to generate the drain material, railroad ballast, railroad sub-ballast and road base The proposed borrow area will be regraded to minimize areas of soil erosion and impacts to water quality during storm events. The stormwater mitigation efforts will encompass the total projected disturbed area of approximately 224 acres for an estimated 3 year time frame. The proposed sequence for the construction activity of the borrow area is as follows: • Stake the project site (haul road and borrow areas). • Clear and grub the existing vegetation. • Remove topsoil and stockpile the material for use during final reclamation activities. • Install stormwater controls. • Grade haul road and borrow areas. • Excavate water quality ponds • Install stormwater controls for stockpiles. • Construct perimeter berms and stormwater diversion trenches (as needed). • Install culverts (as needed) with inlet and outlet protections. • Install secondary containment, concrete washouts, and portable toilets with needed stormwater controls. • Construct crushing and screening plant • Reclaim portions of the project that are no longer used for production (revegetate, install secondary containment, clean out any sediment basins that will be used as permanent stormwater controls, etc.).
What is the function of the construction activity?
Develop area as source of construction material.
Estimated Project Start Date: Q3 2012

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Table 1.4 Soils, Slopes, Vegetation, and Current Drainage Patterns

Soil type(s) and source of information:
The existing soils in the general location of the borrow area are identified below based on the NRCS Soil Survey. In general, the soils in the area consist primarily of loamy soils with Hydrologic Soil Groups (HSG) C and D. Depth to water table for all identified area soils is listed as greater than 80 feet. Investigations indicate that the area depth to water table actually exceeds 500 feet. Soil Map Units located within the borrow area are described below. • Stony Terrace Escarpments – areas comprised of large, rounded cobbles with light gray silty clays infilling the stones. • Bradshaw-Agassiz Association – steep sloped areas (40% to 70%) comprised of Bradshaw very cobbly silt loam and Agassiz very cobbly silt loam. • Kearns Silt Loam, 3 to 6% Slopes – very deep, well-drained soils, formed in alluvium and lacustrine deposits derived from sedimentary rocks. • Harker Soils, 6 to 40% Slopes – well-drained, medium to rapid runoff, and slow permeability soils typically associated with foothill areas.
Slopes (describe current slopes and note any changes due to grading or fill activities):
USGS and site-specific contour survey data indicate that slopes within the subject area range from 3% to 50%. Grading and excavation efforts will typically reduce the steeper slopes on the site. Slopes will be stabilized to the extent possible using terracing and regrading in stabilized lifts for increased stability.
Drainage Patterns (describe current drainage patterns and note any changes dues to grading or fill activities):
Drainage from the site is tributary to The Little Valley Wash (Wash). The Wash lies along the northern Bonneville Borrow permit boundary which flows northeast from the eastern boundary, approximately 0.65 miles, until its confluence with the Utah Salt Lake Canal. The Wash is an ephemeral waterway that is largely devoid of ordinary high water mark features. The Wash planform geometry is heavily influenced by existing conveyance features such as culverts, historic roadway and railroad grades. The historic use of the Wash as settling ponds for the decommissioned Bonneville Concentrator have resulted in a layer of concentrator materials being deposited within the Wash. Stream slopes range from 5% to 10% along the northern Boundary of the site. Flows from the site will either enter the Wash from the northeastern corner as shallow ditch flow or from culverts located on the eastern haul road after passing through water quality BMPs. See the attached Erosion and Sediment Control Plan.
Vegetation:
The area is primarily alluvial rock with areas of sparse, desert grassland.

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Other (note any historic site contamination evident from existing site features and known past usage of the site):
The Little Valley Wash has been affected by historical mining facilities and earthen flood control structures in the area.

Table 1.5 Construction Site Estimates

The following are estimates of the construction site areas of disturbance and pre- and post-construction runoff curve numbers.

Total borrow area:	224 acres
Total Construction site area to be disturbed:	224 acres
Percentage impervious area before construction:	10%
Weighted Curve Number before construction:	85
Percentage impervious area after construction:	15%
Weighted Curve Number after construction:	91

Table 1.6 Receiving Waters

Description of receiving waters (include on map, insert cross-reference). Note any stream crossings if applicable.
The Little Valley Wash drains from southwest to northeast across the northern edge of the proposed borrow area. This drainage crossed beneath the haul road and continues east approximately 0.65 miles before draining into the Utah and Salt Lake Canal. The Canal drains to a flume and settling pond just south of State Route 201 and is routed through canals and channels under I-80 to the Great Salt Lake. A Jurisdictional Assessment of the Little Valley Wash (see source below) determined that the Wash through the borrow site area does not support the frequency or hydrologic conditions (flow durations and volumes) needed for creating ordinary high water marks (OHWM's). The study concluded that the Wash does not exhibit characteristics needed for being considered Waters of the US. Additionally, the borrow site area includes numerous features inhibiting flows from reaching downstream areas. Therefore, it is very unlikely that routine discharges from the Bonneville Borrow Area site would reach downstream areas or receiving waters. Source: *Waters of the US Jurisdictional Assessment for the Bonneville Borrow Area*, Prepared by WP Natural Resource Consulting, Inc. for Kennecott Utah Copper LLC and the US Army Corps of Engineers, November 2011.

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UPDES permit:
UPDES Permit Number UT0000051 authorizes Kennecott Utah Copper LLC to discharge to a number of identified outfalls. The lower end of the Little Valley Wash is identified in the Permit as an outfall to KUC.
Description of impaired waters or waters subject to TMDLs and the list of pollutant(s) causing the impairment:
N/A
Receiving Water Segment Number and Applicable Water Quality Standards:
N/A

Table 1.7 Site Features and Sensitive Areas to be Protected

Construction BMPs will be implemented and maintained for controlling site runoff and preventing downstream areas and potential receiving waters from being adversely impacted by construction activities. BMPs presented on the attached sheets are intended to minimize sediments leaving the Bonneville Borrow Area site.

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Table 1.8 Potential Sources of Pollution

Potential sources of pollutants/sediment to stormwater runoff, which may reasonably be expected to affect the quality of stormwater discharges from the construction site and the BMPs which may be used to mitigate runoff of these from these sources:
• Sediment from clearing and grubbing operations – silt fence and straw wattles • Sediment from site grading and site excavation operations – silt fence, and erosion control terracing on slopes; surface roughening, sheepsfoot rolling, construction phasing, run-on control • Oil, soil cement, sediment from vehicle tracking – stabilized construction exits; concrete and vehicle wash out areas near construction entrance • Sediment from Borrow Area excavation – silt fence, straw wattles and sediment ponds (if necessary) • Sediment from topsoil stripping and stockpiling – covering and perimeter containment, erosion control blankets, and silt fence • Sediment from landscape operations – minimize disturbed areas, and use silt fence, and straw wattles where indicated on the Erosion and Sediment Control Plan.
Potential pollutants and sources, other than sediment, to stormwater runoff:
• Borrow Area – Fueling activities, minor equipment maintenance, sanitary facilities during excavation, hazardous waste storage, stockpiling and processing – good housekeeping measures will be employed to mitigate the transportation of these potential pollutants out of the area • Construction Activity and Crushing and Screening Plant – Good housekeeping measures, proper operation and maintenance, and secondary containment will be employed to mitigate the transportation of associated potential pollutants from site industrial areas. The concrete washout facility will be used as needed during construction of industrial facilities.

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List of potential pollutant sources

Trade Name Material	Stormwater Pollutants	Location/Activity on Site
Pesticides (insecticides, fungicides, herbicides)	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic	Herbicides used for noxious weed control (if necessary)
Fertilizer	Nitrogen, phosphorous	Newly seeded areas
Cement	Limestone, sand, pH, chromium	Industrial Areas
Wood preservatives	Stoddard solvent, petroleum distillates, arsenic, copper, chromium	Timber forms
Hydraulic oil/fluids	Mineral oil	Leaks or broken hoses from equipment
Processing materials	Toxic Polluants	Industrial Areas
Gasoline	Benzene, ethyl benzene, toluene, xylene, MTBE	Borrow and Industrial Areas
Diesel Fuel	Petroleum distillate, oil & grease, naphthalene, xylenes	Borrow and Industrial Areas
Paints	Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic	Industrial Areas
Antifreeze/coolant	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Leaks, broken hoses from equipment
Sanitary toilets	Bacteria, parasites, and viruses	Borrow and Industrial Areas

EROSION AND SEDIMENT CONTROL BMPs

The suggested BMPs for use during construction are identified on the Erosion and Sediment Control Plan along with installation details.

GOOD HOUSEKEEPING BMPs

Good housekeeping and pollution prevention BMPs that will be implemented to control pollutants in stormwater on this project include:

1. Material Handling and Waste Management
2. Establish Proper Material Storage Areas
3. Designated Washout Areas
4. Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
5. Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
6. Spill Prevention and Control Plan
7. Industrial Treatment Substance Disposal

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8. Conditions outlined in existing UPDES permit
9. Any Additional BMPs

POST-CONSTRUCTION BMPs

The suggested BMPs for use after the borrow material has been removed and stockpiled will allow for storm drainage to flow to the receiving waters with minimal impact. Secondary containment measures will be installed for all permanent operations equipment.

FINAL STABILIZATION

Once the borrow operations are completed, all disturbed areas will be revegetated in accordance with the guidance provided in the closeout plan for this area. Areas disturbed by the operation will be regarded and revegetated as appropriate. Final stabilization will be complete when areas have returned to 70 % of the pre-construction vegetation cover.

Noxious weed control will be implemented on an as-needed basis.

FINAL RECLAMATION

The site will be reclaimed in phases in accordance with the applicable regulatory agency requirements. An interim closure plan will be required as the area will be inactive for a period of years between active construction phases of the tailings impoundment. Once all construction ceases and borrow material is no longer required, the area will be closed. Reclamation activities for interim and final closure may include: removing temporary erosion control features and infrastructure, gravel from roads (unless determined to be retained); regrading the site to a suitable post-mining land use; revegetating with acceptable and appropriate seed mixes; and installing and maintaining any required stormwater controls until final stabilization is achieved.

CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

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Appendix A - Corrective Action Log

Project Name:
SWPPP Contact:

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

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Appendix B - SWPPP Amendment Log

Project Name:
SWPPP Contact:

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

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Appendix C - Grading and Stabilization Activities Log

Project Name:
SWPPP Contact:

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure and Location

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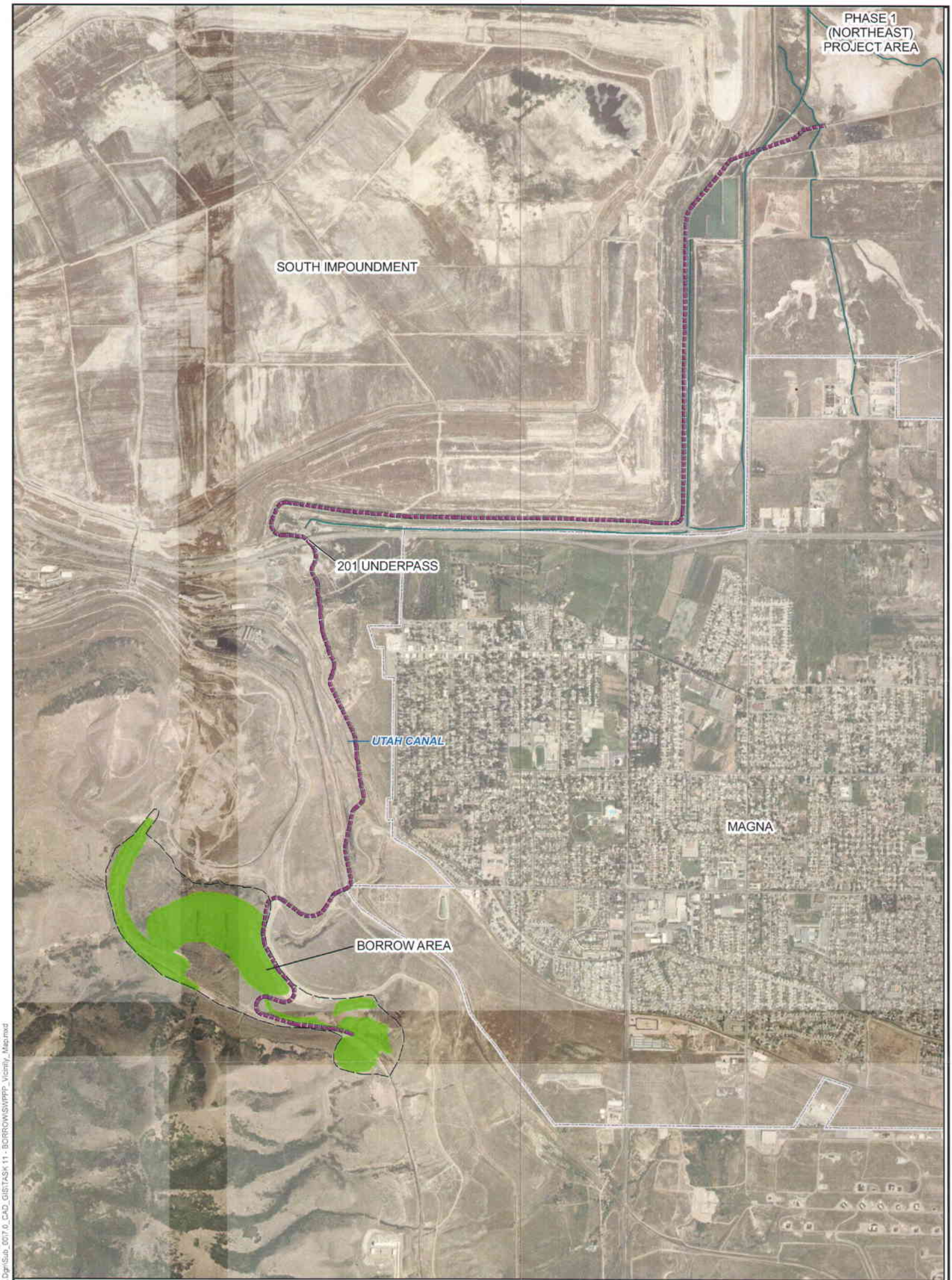

Legend

- Borrow Boundary
- Haul Road
- Borrow Area
- Magna Township Boundary

0 800 1,600 2,400 Feet

Project No. 22242184	KENNECOTT TAILINGS PREFEASIBILITY STUDY	BONNEVILLE BORROW AREA LOCATION MAP	FIGURE 1

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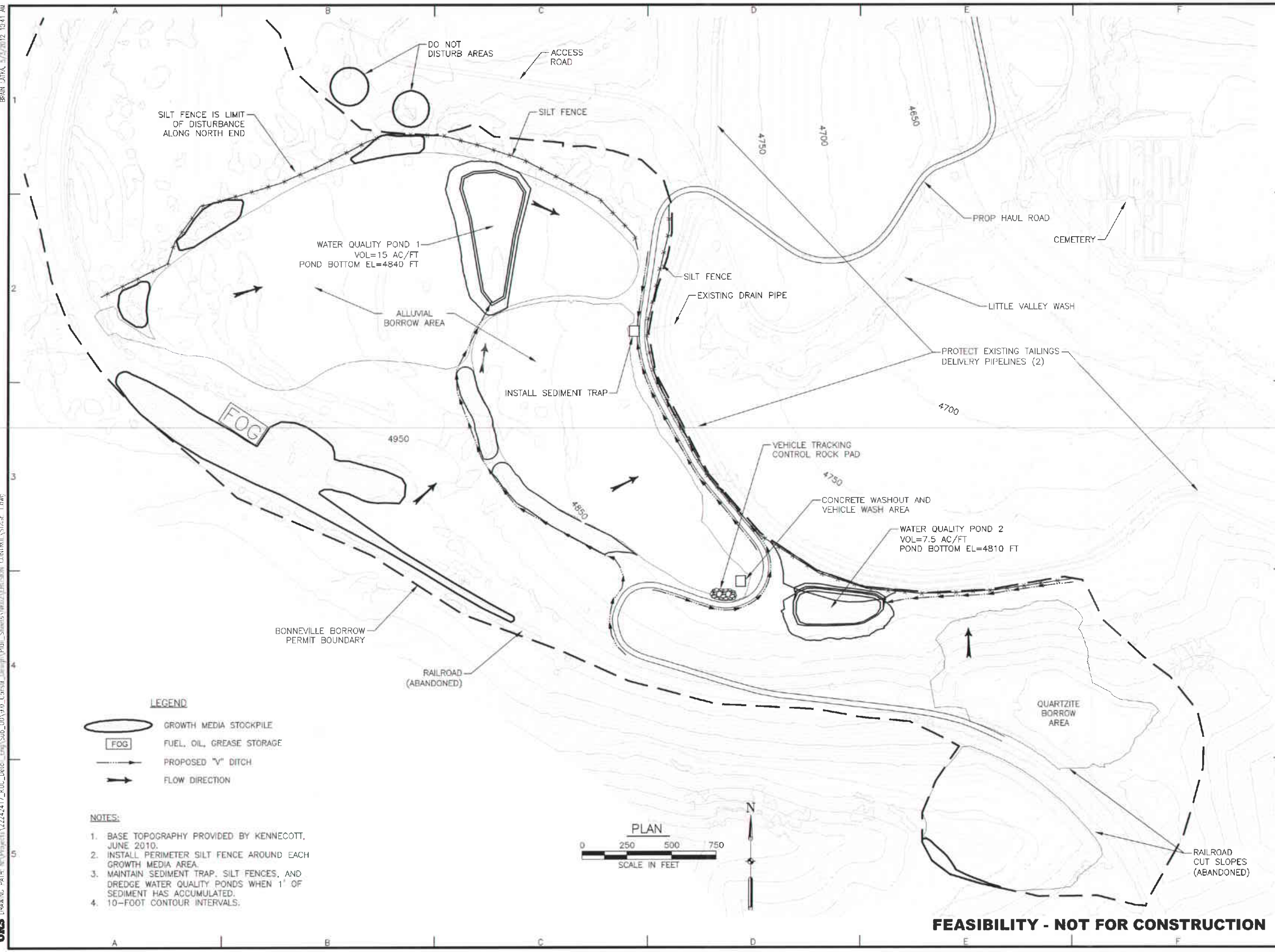

URS
URS Center
8181 East Tufts Avenue
Denver, Co. 80237-2537
303-694-2770 (phone)
303-694-3946 (fax)

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KENNECOTT TAILINGS EXPANSION FEASIBILITY STUDY MAGNA, UTAH

ISSUED FOR BIDDING — DATE — BY

ISSUED FOR CONSTRUCTION — DATE — BY

REVISIONS

NO.	DESCRIPTION	DATE
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URS PROJECT NO:	22242184
DRAWN BY:	DRAWN
DESIGNED BY:	DESIGNED
CHECKED BY:	CHECKED
DATE CREATED:	CREATED
PLOT DATE:	5/3/12
SCALE:	SCALE
ACAD VER:	AutoCAD 2011

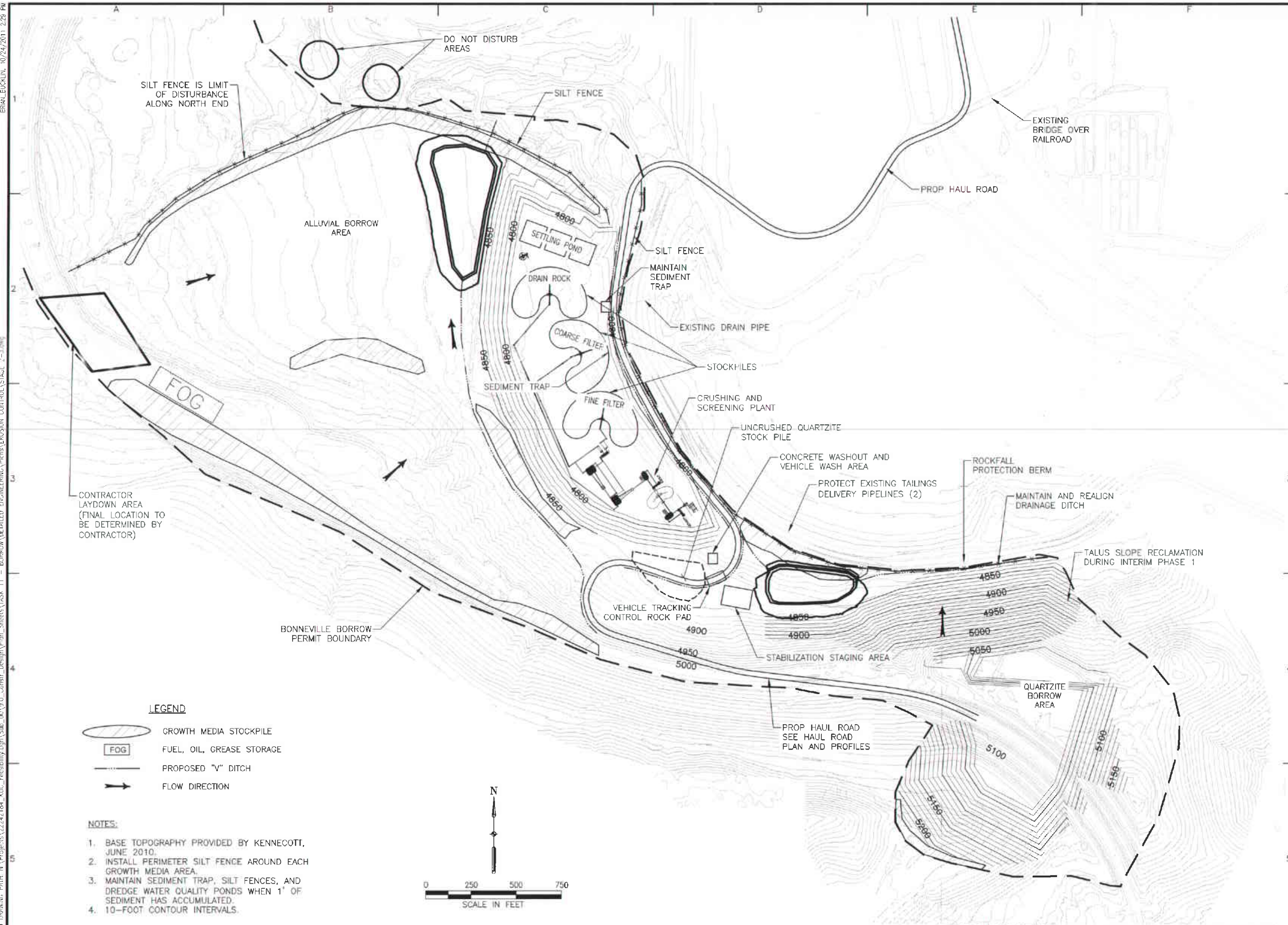
SHEET TITLE

BONNEVILLE BORROW AREA SWPPP BMP'S STAGE-1

FIGURE 2

DRAWING PATH: N:\Projects\22242417_KUC_Deltc_Eng\Sub_00\340_Consit_Design\Plan_Sheets\Wk02\EROSION CONTROL\STAGE 1.dwg

BRIAN JATKA, 5/3/2012 10:41 AM



LEGEND

- GROWTH MEDIA STOCKPILE
- FOG — FUEL, OIL, GREASE STORAGE
- PROPOSED "V" DITCH
- FLOW DIRECTION

NOTES:

1. BASE TOPOGRAPHY PROVIDED BY KENNECOTT, JUNE 2010.
2. INSTALL PERIMETER SILT FENCE AROUND EACH GROWTH MEDIA AREA.
3. MAINTAIN SEDIMENT TRAP, SILT FENCES, AND DREDGE WATER QUALITY PONDS WHEN 1' OF SEDIMENT HAS ACCUMULATED.
4. 10-FOOT CONTOUR INTERVALS.

FEASIBILITY - NOT FOR CONSTRUCTION

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ISSUED FOR CONSTRUCTION — DATE — BY

REVISIONS

NO.	DESCRIPTION	DATE
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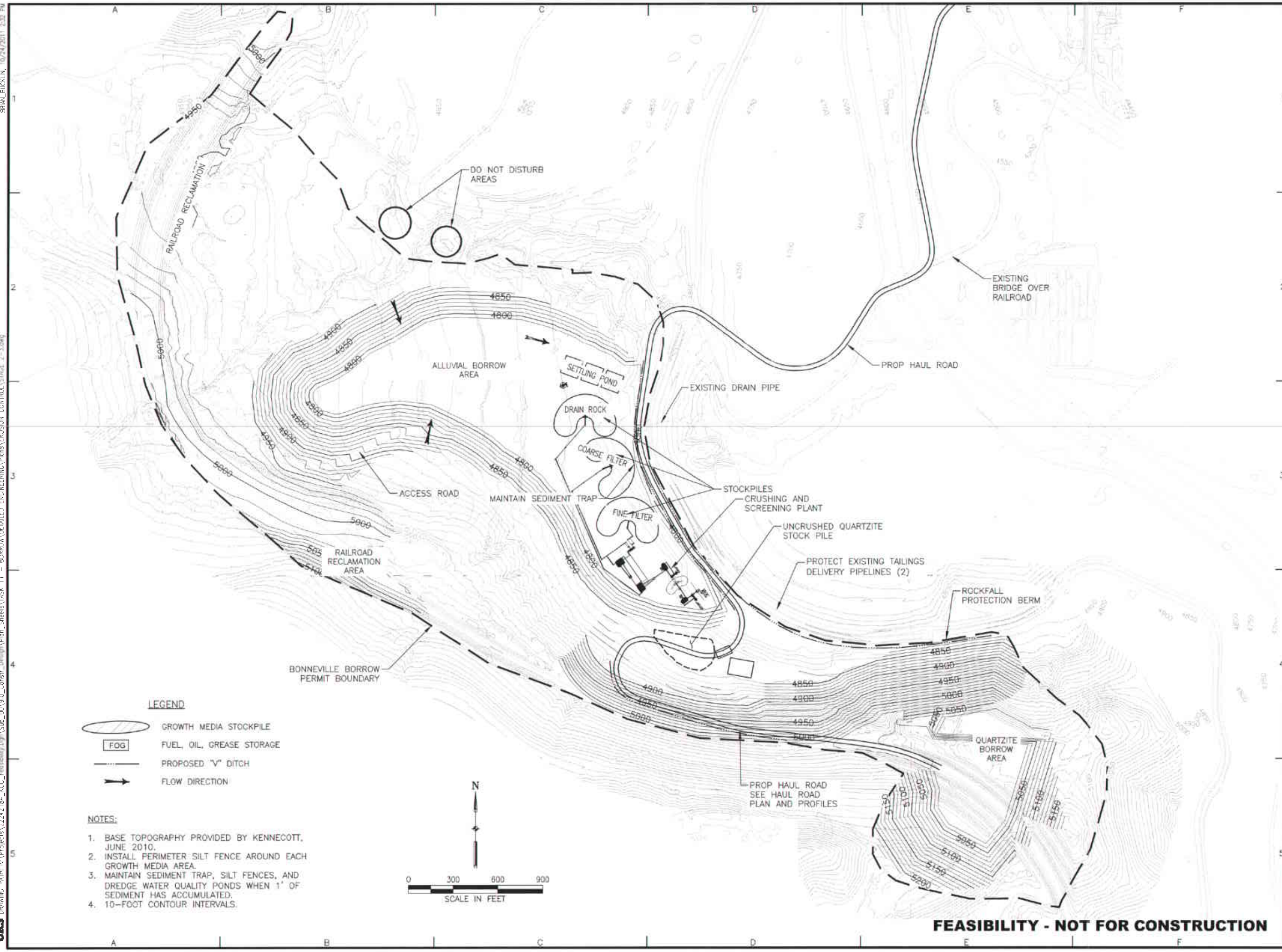
URS PROJECT NO:	22242184
DRAWN BY:	DRAWN
DESIGNED BY:	DESIGNED
CHECKED BY:	CHECKED
DATE CREATED:	CREATED
PLOT DATE:	10/24/11
SCALE:	SCALE
ACAD VER:	AutoCAD 2011

SHEET TITLE

BONNEVILLE BORROW AREA SWPPP BMP'S STAGE-2

BORROW AREA DESIGN
FIGURE 3

BRIAN_EUCKLIN, 10/24/2011 2:26 PM
URS DRAWING PATH: N:\Projects\22242184_KUC_Feasibility Dgn\Sub_DR\0 G_Constr_Design\Plan_Sheets\TASK 11 - BORROW\DETAILED ENGINEERING\Plans\EROSION CONTROL\STAGE 2-3.dwg



LEGEND

- GROWTH MEDIA STOCKPILE
- FOG — FUEL, OIL, GREASE STORAGE
- PROPOSED "V" DITCH
- FLOW DIRECTION

NOTES:

1. BASE TOPOGRAPHY PROVIDED BY KENNECOTT, JUNE 2010.
2. INSTALL PERIMETER SILT FENCE AROUND EACH GROWTH MEDIA AREA.
3. MAINTAIN SEDIMENT TRAP, SILT FENCES, AND DREDGE WATER QUALITY PONDS WHEN 1' OF SEDIMENT HAS ACCUMULATED.
4. 10-FOOT CONTOUR INTERVALS.

FEASIBILITY - NOT FOR CONSTRUCTION

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ISSUED FOR CONSTRUCTION — DATE — BY

REVISIONS

NO.	DESCRIPTION	DATE
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URS PROJECT NO:	22242184
DRAWN BY:	DRAW
DESIGNED BY:	DESI
CHECKED BY:	CHEC
DATE CREATED:	CREA
PLOT DATE:	10/24/11
SCALE:	SCAL
ACAD VER:	AutoCAD 2011

SHEET TITLE

BONNEVILLE BORROW AREA SWPPP BMP'S STAGE-3

BORROW AREA DESIGN
FIGURE 4

URS DRAWING PATH: N:\Projects\22242184_KUC_Feasibility Dgn\Sub_300\04_Constr. Design\Plan_Sheets\TASK 11 - BORROW\DETAILED ENGINEERING\Plans\EROSION CONTROL\STAGE 2-3.dwg
BRIAN_BUCKLIN, 10/24/2011 2:32 PM

Appendix F

Surety Calculations

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Surety Calculations

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Bonding Calculations

Direct Costs		
Subtotal Demolition and Removal	$120,076.00	
Subtotal Backfilling and Grading	$3,662,369.00	
Subtotal Revegetation	$148,000.00	
Direct Costs	$3,930,445.00	
Indirect Costs		
Mob/Demob	$393,045.00	10.0%
Contingency	$196,522.00	5.0%
Engineering Redesign	$98,261.00	2.5%
Main Office Expense	$267,270.00	6.8%
Project Management Fee	$98,261.00	2.5%
Subtotal Indirect Costs	$1,053,359.00	26.8%
Total Cost 2010	$4,983,804.00	
Number of years		5
Escalation factor		0.012
Escalation	$306,292.00	
Reclamation Cost Escalated	$5,290,096.00	
Bond Amount (rounded to nearest $1,000) 2013 Dollars	$5,290,000.00	
Posted Bond (for 118 acres disturbed)	$5,290,000.00	
Difference Between Cost Estimate and Bond	$0.00	
Percent Difference		

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Jaw Crusher 01																			$ 11,422.00
	Primary Screen 02	No Primary Screen																		$ -
	Grizzly Feeder 03	Included in the Jaw Crusher																		$ -
	Secondary Scalp Screen 04																			$ 7,329.00
	Secondary Crusher 05																			$ 9,137.00
	Tunnel with Feeder 06																			$ 2,000.00
	Tertiary Scalp Screen 07																			$ 7,329.00
	Tertiary Crusher 08																			$ 9,137.00
	Tertiary Screens 09																			$ 7,329.00
	Quaternary Crusher 10																			$ 9,137.00
	Quaternary Screens 11																			$ 7,329.00
	Radial Stack Conveyors 12																			$ 7,649.00
	Thickener and Conveyors 13																			$ 32,432.00
	Propane Tank 14																			$ 1,793.00
	Fuel Tanks 15																			$ 5,360.00
	Oil Drums 16																			$ 1,793.00
																				$ 120,076.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Jaw Crusher 01																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg, Large	02 41 16.13 0020	$ 0.31	/CF	50	25	20			25000					CF		25000	CF	$ 7,750.00
	Structure's Vol. Demolished																0.3	278	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													278	CY	$ 1,946.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 9,696.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	50	25	1			1250							46	CY	$ 523.00
	Concrete's Vol. Demolished																1.3	60	CY	
	Loading Cost	Front end loader, track mtd., 5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													60	CY	$ 109.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													60	CY	$ 486.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													60	CY	$ 608.00
	Subtotal																			$ 1,726.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 11,422.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No Primary Screen																			
	Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.																			
	Primary Screen 02																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

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Ref.	Description **Included in Jaw Crusher** **Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.**	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Grizzly Feeder 03																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Secondary Scalp Screen 04																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg. Large	02 41 16.13 0020	$ 0.31	/CF	20	40	20			16000					CF		16000	CF	$ 4,960.00
	Structure's Vol. Demolished																0.3	178	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													178	CY	$ 1,246.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 6,206.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	20	40	1			800							30	CY	$ 341.00
	Concrete's Vol. Demolished																1.3	39	CY	
	Loading Cost	Front end loader, track mtd.,5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													39	CY	$ 71.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													39	CY	$ 316.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													39	CY	$ 395.00
	Subtotal																			$ 1,123.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 7,329.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Secondary Crusher 05																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg, Large	02 41 16.13 0020	$ 0.31	/CF	20	50	20			20000					CF		20000	CF	$ 6,200.00
	Structure's Vol. Demolished																0.3	222	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													222	CY	$ 1,554.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 7,754.00
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	20	50	1			1000							37	CY	$ 421.00
	Concrete's Vol. Demolished																1.3	48	CY	
	Loading Cost	Front end loader, track mtd., 5 C.Y. cap=150 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													48	CY	$ 87.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													48	CY	$ 389.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													48	CY	$ 486.00
	Subtotal																			$ 1,383.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 8,137.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Tunnel with Feeder 06																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg. Large	02 41 16.13 0020	$ 0.31	/CF	12	40	12			5760					CF		5760	CF	$ 1,785.00
	Structure's Vol. Demolished																0.3	64	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													64	CY	$ 448.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 2,234.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	12	40	1			480							18	CY	$ 205.00
	Concrete's Vol. Demolished																1.3	23	CY	
	Loading Cost	Front end loader, track mtd.,5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													23	CY	$ 42.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													23	CY	$ 186.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													23	CY	$ 233.00
	Subtotal																			$ 666.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 2,900.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Tertiary Scalp Screen 07																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg. Large	02 41 16.13 0020	$ 0.31	/CF	20	40	20			16000					CF		16000	CF	$ 4,960.00
	Structure's Vol. Demolished																0.3	178	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													178	CY	$ 1,246.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 6,206.00
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demol	$ 11.36	/CY	20	40	1			800							30	CY	$ 341.00
	Concrete's Vol. Demolished																1.3	39	CY	
	Loading Cost	Front end loader, track mtd., 5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													39	CY	$ 71.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													39	CY	$ 316.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													39	CY	$ 395.00
	Subtotal																			$ 1,123.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 7,329.00

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RioTinto

Ref.	Description **Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.**	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Tertiary Crusher 08																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg. Large	02 41 16.13 0020	$ 0.31	/CF	20	50	20			20000					CF		20000	CF	$ 6,200.00
	Structure's Vol. Demolished																0.3	222	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													222	CY	$ 1,554.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 7,754.00
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demol	$ 11.38	/CY	20	50	1			1000							37	CY	$ 421.00
	Concrete's Vol. Demolished																1.3	48	CY	
	Loading Cost	Front end loader, track mtd.,5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													48	CY	$ 87.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													48	CY	$ 389.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													48	CY	$ 486.00
	Subtotal																			$ 1,383.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 9,137.00

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Ref.	Description **Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.**	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Tertiary Screens 09																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg. Large	02 41 16.13 0020	$ 0.31	/CF	20	40	20			16000					CF		16000	CF	$ 4,960.00
	Structure's Vol. Demolished																0.3	178	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													178	CY	$ 1,246.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 6,206.00
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demol	$ 11.38	/CY	20	40	1			800							30	CY	$ 341.00
	Concrete s Vol. Demolished																1.3	39	CY	
	Loading Cost	Front end loader, track mtd., 5 C.Y. cap=160 C.Y /hr.	31 23 16.42 1350	$ 1.82	/BCY													39	CY	$ 71.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													39	CY	$ 316.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													39	CY	$ 395.00
	Subtotal																			$ 1,123.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 7,329.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Quaternary Crusher 10																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg, Large	02 41 16.13 0020	$ 0.31	/CF	20	50	20			20000					CF		20000	CF	$ 6,200.00
	Structure's Vol. Demolished																0.3	222	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													222	CY	$ 1,554.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 7,754.00
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	20	50	1			1000							37	CY	$ 421.00
	Concrete's Vol. Demolished																1.3	48	CY	
	Loading Cost	Front end loader, track mtd.,5 C.Y., cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													48	CY	$ 87.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													48	CY	$ 389.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													48	CY	$ 486.00
	Subtotal																			$ 1,383.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 9,137.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Quaternary Screens 11																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg, Large	02 41 16.13 0020	$ 0.31	/CF	20	40	20			16000					CF		16000	CF	$ 4,960.00
	Structure's Vol. Demolished																0.3	178	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													178	CY	$ 1,246.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 6,206.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	20	40	1			800							30	CY	$ 341.00
	Concrete's Vol. Demolished																1.3	39	CY	
	Loading Cost	Front end loader, track mtd., 5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													39	CY	$ 71.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													39	CY	$ 316.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													39	CY	$ 395.00
	Subtotal																			$ 1,123.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 7,329.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Radial Stack Conveyors 12																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Mixed Materials Bldg. Large	02 41 16.13 0100	$ 0.33	/CF	20	40	20			16000					CF		16000	CF	$ 5,280.00
	Structure's Vol. Demolished																0.3	175	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													175	CY	$ 1,246.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 6,526.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	20	40	1			800							30	CY	$ 341.00
	Concrete's Vol. Demolished																1.3	39	CY	
	Loading Cost	Front end loader, track mtd.,5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													39	CY	$ 71.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													39	CY	$ 316.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													39	CY	$ 395.00
	Subtotal																			$ 1,123.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 7,649.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length ft	Width ft	Height ft	Diameter ft	Area	Volume ft^3	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Thickener and Conveyors 13																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	Steel Bldg. Large	02 41 16.13 0020	$ 0.31	/CF			26	60		73476					CF		73476	CF	$ 22,778.00
	Structure's Vol. Demolished																0.3	816	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													816	CY	$ 5,712.00
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 28,490.00
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY			1	60		2826							105	CY	$ 1,195.00
	Concrete's Vol. Demolished																1.3	137	CY	
	Loading Cost	Front end loader, track mtd., 5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													137	CY	$ 249.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													137	CY	$ 1,110.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													137	CY	$ 1,388.00
	Subtotal																			$ 3,942.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 32,432.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Propane Tank 14																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	5,000 thru 10,000 gallon	13 05 05.75 0530	$ 1,450.00	Ea						0					CF		1	Ea	$ 1,450.00
	Structure's Vol. **Demolished**																0.3	0	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capanity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													0	CY	$ -
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 1,450.00
	Equipment's Disposal Cost																			
	Dismanding Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demo1	$ 11.38	/CY	25	10	1			250							9	CY	$ 102.00
	Concrete's Vol. Demolished																1.3	12	CY	
	Loading Cost	Front end loader, track mtd. .5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													12	CY	$ 22.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													12	CY	$ 97.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													12	CY	$ 122.00
	Subtotal																			$ 341.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 1,793.00

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Ref.	Description Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Fuel Tanks 15																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	5,000 thru 10,000 gallon	13 05 05.75 0530	$ 1,450.00	Ea						0					CF		3	Ea	$ 4,350.00
	Structure's Vol. Demolished																0.3	0	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													0	CY	$ -
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 4,350.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demol	$ 11.38	/CY	25	10	1			250							27	CY	$ 307.00
	Concrete's Vol. Demolished																1.3	35	CY	
	Loading Cost	Front end loader, track mtd.,5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													35	CY	$ 64.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													35	CY	$ 284.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													35	CY	$ 355.00
	Subtotal																			$ 1,010.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 5,360.00

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Ref.	Description **Refer to NOI, Section 110.3 Surface Facilities to be left, Table 10 and Figure 4D.**	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Oil Drums 16																			
	Deduct 50% no interior walls																			
	Structure's Demolition Cost	5,000 thru 10,000 gallon	13 05 05.75 0530	$ 1,450.00	Ea						0					CF		1	Ea	$ 1,450.00
	Structure's Vol. Demolished																0.3	0	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	City Services	City Services SLV	$ 7.00	/CY													0	CY	$ -
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			$ 1,450.00
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost	Concrete Demolition	Concrete Demol	$ 11.38	/CY	25	10	1			250							9	CY	$ 102.00
	Concrete's Vol. Demolished																1.3	12	CY	
	Loading Cost	Front end loader, track mtd .5 C.Y. cap=160 C.Y./hr.	31 23 16.42 1350	$ 1.82	/BCY													12	CY	$ 22.00
	Transportation Cost	12 C.Y. dump truck, cycle 20 mile, 40 MPH ave.	31 23 23.20 1078	$ 8.10	/LCY													12	CY	$ 97.00
	Disposal Costs	City Services	City Services SLV	$ 10.13	/CY													12	CY	$ 122.00
	Subtotal																			$ 343.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			$ -
	Total																			$ 1,793.00

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	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Summary Earthwork															
Spread Stockpiles															$ 750,577.00
Replace Growth Media - Quarry Floors and Benches															$ 2,909,822.00
Scarifying - Roads, Crusher and Stockpiles															$ 1,970.00
Total															$ 3,662,369.00

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	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Maximum Volume, Stockpile Material, Table 6 (NOI) Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Refer to NOI 106.9 Material Stockpiles, Table 8 and Figure 5, 5A.															
Spreading Remaining Borrow Stockpiles															
Drain Rock									77000	LCY					
Coarse Filter									77000	LCY					
Fine Filter									77000	LCY					
Total CY									231000	LCY					
Cat 623 Scraper	$ 21,200.00	$ 113.95	0.1	$ 67.75	$ 325.60	2	$ 651.20		231000	LCY	319	LCY/HR	724	HR	$ 471,469.00
Cat D8 Dozer	$ 23,820.00	$ 117.20	0.1	$ 69.45	$ 345.55	1	$ 345.55						362	HR	$ 125,089.00
14 H Grader	$ 11,090.00	$ 54.25	0.1	$ 67.75	$ 196.74	1	$ 196.74						362	HR	$ 71,220.00
5,000 gal water truck	$ 5,415.00	$ 42.30	0.1	$ 67.75	$ 132.62	1	$ 132.62						362	HR	$ 48,008.00
Foreman, Average outside					$ 71.20	1	$ 71.20						362	HR	$ 25,774.00
Pickup Truck Crew	$ 1,090.00	$ 16.45	0.1		$ 24.91	1	$ 24.91						362	HR	$ 9,017.00
Subtotal															$ 750,577.00

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RioTinto

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Refer to NOI, Section 106.3 Estimated Acreage, Table 1 and Figure 5, 5A.															
Replace 2' growth media over quarry floors and benches															
Cat 623 Scraper	$ 21,200.00	$ 113.95	0.1	$ 67.75	$ 325.60	2	$ 651.00	$/HR	865200	LCY	319	LCY/HR	2806	HR	$ 1,826,706.00
Cat D9 Dozer	$ 23,820.00	$ 117.20	0.1	$ 69.45	$ 345.55	1	$ 346.00	$/HR					1403	HR	**$ 485,438.00**
14 H Grader	$ 11,090.00	$ 54.25	0.1	$ 67.75	$ 196.74	1	$ 197.00	$/HR					**1403**	HR	**$ 276,391.00**
5,000 gal water truck	$ 5,415.00	$ 42.30	0.1	$ 67.75	$ 132.62	1	$ 133.00	$/HR					1403	HR	$ 186,599.00
Foreman, Average outside					$ 71.20	1	$ 71.00	$/HR					1403	HR	$ 99,613.00
Pickup Truck Crew	$ 1,090.00	$ 16.45	0.1		$ 24.91	1	$ 25.00	$/HR					1403	HR	$ 35,075.00
															$ 2,909,822.00

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	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Refer to NOI, Section 106.3 Estimated Acreage, Table 1 and Figure 5, 5A.															
Scarifying roads, crusher and stockpile areas															
14 H Grader	$ 11,090.00	$ 54.25	0.1	$ 67.75	$ 196.74	1	$ 197.00	$/HR	29	ACRES	2.9	AC/HR	10	HR	$ 1,970.00
															$ 1,970.00

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Ref.	Description Refer to NOI, Section 106.3 Estimated Acreage, Table 1 and Figure 5, 5A.	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Seeding Cost	Standard Vegetation costs	Std Veg	$ 1,000.00	acre					118										$ 118,000.00
	Reseeding - assume 25%	Standard Vegetation costs	Std Veg	$ 1,000.00	acre					30										$ 30,000.00
	Subtotal																			$ 148,000.00
	Subtotal																			
	Subtotal																			
	Subtotal																			
	Subtotal																			
	Total																			$ 148,000.00

* Standard $1000/acre, DOGM quote

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Equipment Operating and Labor Rates

Hourly Rates	Equipment costs	Hourly Operating Costs	Equipment Hourly Rates Blue Book Rate	Labor Hourly Rates	Labor Type	Total Cost per unit	Unit
Cat D8R Dozer	$ 18,315.00	$ 86.45	$ 277.31	$ 69.45	Equip. Oper-Heavy	$ 346.76	hour
Cat D9R Dozer	$ 23,820.00	$ 117.20	$ 345.55	$ 69.45	Equip. Oper-Heavy	$ 415.00	hour
Cat D10R Dozer	$ 30,995.00	$ 150.10	$ 426.58	$ 69.45	Equip. Oper-Heavy	$ 496.03	hour
Cat 14 Grader	$ 11,090.00	$ 54.25	$ 196.74	$ 67.75	Equip. Oper-Medium	$ 264.49	hour
Water Truck 5000 gal	$ 5,415.00	$ 42.30	$ 132.62	$ 67.75	Equip. Oper-Medium	$ 200.37	hour
Water Truck 10,000 gal	$ 13,470.00	$ 127.55	$ 276.74	$ 67.75	Equip. Oper-Medium	$ 344.49	hour
Pickup Truck 4x4	$ 1,090.00	$ 16.45	$ 24.91	$ 71.20	Foreman Average Outside	$ 96.11	hour
Cat 623 Scraper	$ 21,200.00	$ 113.95	$ 325.60	$ 67.75	Equip. Oper-Medium	$ 393.35	hour
Laborers				$ 52.70	Common bldg. Laborers	$ 52.70	hour

* Equipment Hourly Rates include ownership and operating cost from Blue Book 2011

** Labor Hourly Rates include overhead and profit from back cover Means Heavy Construction Cost Data 2011

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Dozing Cat Handbook Edition 41

Ripping/Scarifying		
D-10		
Ripper width (ft) (3 shank)	9.58	1-69
Ripper Penetration (ft)	2.88	1-69
Speed (mi.hr)	1	1-22
Maximum Production (ac/hr)		
Correction Factors		
Operator	0.75	1-56
Efficiency (50 min/hr)	0.83	1-56
Corrected Production (ac/hr)		

Grading		
Grading		
Cat 14		
Grader Blade width (ft)	14	2-15
Speed (mi/hr)	3.7	2-16
Maximum Production (ac/hr)		
Correction factor		
Operator	0.75	2-21
Efficiency (50 min/hr)	0.83	2-21
Corrected Production (ac/hr)		

Scrapers		
Growth Media Replacement and Stockpile Spreading		
Alluvial, Quartzite, Railroad Embankment and Stockpile		
Cat 623 Scraper		
Capacity (cu yd)	23	8-6
Average Haul Distance (ft)	800	
Cycle Time (min)		
Loading time (min)	0.9	8-17
Spreading time (min)	0.7	8-17
Loaded haul time (min) 2%	0.5	8-25
Empty haul time (min) 0%	0.4	8-25
Cycle time (min)		
Cycles per hour		
Production rate (lcy/hr)		
Correction Factors		
Operator	0.75	1-56
Job efficiency (50 min/hr)	0.83	1-56
Material	0.9	
Load Factor		
Total Correction Factor	0.6	
Corrected Production Rate (lcy/hr)		

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Project: Bonneville Borrow
Date: 01/03/12
Prepared by: A. Fortner

WORKSHEET 11A
PRODUCTIVITY OF PUSH-PULL OR SELF-LOADING SCRAPER USE

Earthmoving Activity:

Spreading Stockpiles

Characterization of Scraper Used (type, capacity, etc.):

Origin - stockpiles.
Destination - quarry floors.

Description of Scraper Use (origin, destination, grade, haul distance, capacity, etc.):

Approximately 4,948,930 CY.
Approximate haul distance 400 ft.

Productivity Calculations:

Cycle Time = 0.9 (load time (push-pull is per) min + 0.5 (loaded) min + 0.7 (maneuver and) min + 0.5 (return) min

= 2.6 (push-pull is per pair) min

Hourly Production = 23.0 (capacity*) LCY x 60 min/hr ÷ 2.6 (cycle time**) min x 0.60 (efficie

= 318.5 (push-pull is per pair) LCY/hr

Hours to move 4948930.0 (volume to be handled) LCY ÷ 318.5 (net hourly) LCY/hr = 15540.1 hr

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Project:	Bonneville Borrow
Date:	01/03/12
Prepared by:	A. Fortner

WORKSHEET 11A
PRODUCTIVITY OF PUSH-PULL OR SELF-LOADING SCRAPER USE

Earthmoving Activity:

Redistribution of Topsoil on quarry floor and quartzite benches.

Characterization of Scraper Used (type, capacity, etc.):

Origin - topsoil stockpiles.
Destination - quarry floors.

Description of Scraper Use (origin, destination, grade, haul distance, capacity, etc.):

Approximately 746,000 BCY or 895,200 LCY (20% of BCY).
Approximate haul distance 800 ft.

Productivity Calculations:

Cycle Time = 0.9 min (load time (push-pull is per pair)) + 0.5 min (loaded trip time) + 0.7 min (maneuver and spread time) + 0.5 min (return trip time)

= 2.6 min (push-pull is per pair)

Hourly Production = 23.0 LCY (capacity*) x 60 min/hr ÷ 2.6 min (cycle time**) x 0.60 (efficiency factor)

= 318.5 LCY/hr (push-pull is per pair)

Hours Required = 895200.0 LCY (volume to be handled) ÷ 318.5 LCY/hr (net hourly production) = 2811.0 hr

* The average of the struck and heaped capacities; use total for two scrapers for push-pull.

Data Source(s):
Cat Edition 41

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Project: Bonneville Borrow
Date: 01/03/12
Prepared by: A. Fortner

WORKSHEET 12
PRODUCTIVITY AND HOURS REQUIRED FOR MOTORGRADER USE

Earthmoving Activity:

Scarifying roads, crusher and stockpile areas.

Characterization of Grader Used (type, size capacity, etc.):

Cat 14, 14' wide blade, Ripper width 8'6" wide.

Description of Grader Route (push distance, grade, effective blade width, operating speed, etc.):

Approximately 29 acres to scarify.

Productivity Calculations:

Grading

Hourly Production = 3.7 (average speed) mi/hr x 8.5 (effective blade width) ft x 5280 ft/mi x 1 ac

÷ 43560 ft^2 x 0.75 (efficiency factor) = 2.9 ac/hr

Hours Required = 29 (area to be graded) ac ÷ 2.9 (hourly production) ac/hr = 10.1 hr

Scarification

Hourly Production = 3.7 (average speed) mi/hr x 8.5 (scarifier width) ft x 5280 ft/mi x 1 ac

÷ 43560 ft^2 x 0.75 (efficiency factor) = 2.9 ac/hr

Hours Required = 29 (area to be scarified) ac ÷ 2.9 (hourly production) ac/hr = 10.1 hr

Total Hours Required

Total Hours = 10.1 (grading hours required) + 10.1 (scarification hours required) = 20.3 hr

Data Source(s):

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