FREEPORT-McMoRan COPPER & GOLD

Sierrita Operations
Environment, Land & Water Department
6200 West Duval Mine Road
PO Box 527
Green Valley, Arizona 85622-0527

April 5, 2011

Via Certified Mail # 7009 3410 0002 3634 3340
Return Receipt Requested

Ms. Tina LePage
Arizona Department of Environmental Quality
Voluntary Remediation Program - Waste Programs Division
1110 West Washington Street
Phoenix, Arizona 85007-2935

Re: Soil and Sediment Characterization Report
Freeport-McMoRan Sierrita Inc. (Sierrita) Voluntary Remediation Program

Dear Ms. LePage:

As per Sierrita's Investigation Work Plan submitted on April 2008, enclosed are two copies of the Soil and Sediment Characterization Report prepared by URS Corporation for Sierrita. This report documents the work conducted by Sierrita to assess potential impacts to soil and sediment for constituents of interest associated with historical Sierrita operations

A second report documenting the results of the groundwater investigation, including development of a refined conceptual site model and background conditions for uranium, is being prepared and will be submitted when it is completed.

If you have any questions, please do not hesitate to contact Stuart Brown at (602) 448-09720972 or myself at (520) 393-2696.

Sincerely,

Martha G. Mottley
Chief Environmental Engineer

MGM:ms
20110405_002
Attachment

xc: Henry Darwin, Arizona Department of Environmental Quality
Tom DiDomizio, Arizona Department of Environmental Quality
John Broderick, Sierrita
Ned Hall, FCX
Stuart Brown, FCX

F I N A L

VOLUNTARY REMEDIATION PROGRAM (VRP) SOIL AND SEDIMENT CHARACTERIZATION REPORT

Freeport-McMoRan Sierrita Inc.

Green Valley, Arizona

March 2011

Prepared for:
Freeport-McMoRan Sierrita Inc.
6200 West Duval Mine Road
Green Valley, AZ 85622-0527

Prepared by:
URS
URS Corporation
333 East Wetmore Road
Tucson, AZ 85705
And
URS Corporation
8181 East Tufts Avenue
Denver, CO 80237

FINAL
VOLUNTARY REMEDIATION PROGRAM (VRP)
SOIL AND SEDIMENT CHARACTERIZATION REPORT
FREEPORT-MCMORAN SIERRITA INC.
GREEN VALLEY, ARIZONA

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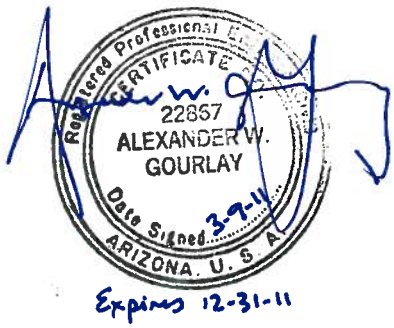


Table of Contents

List of Tables

List of Figures

List of Appendices

(Appendices on Compact Disk [CD])

TABLE OF ACRONYMS

Acronym	Definition
95UCL	95 Percent Upper Confidence Limit
ADEQ	Arizona Department of Environmental Quality
APP	Aquifer Protection Permit
ARCH	air rotary casing hammer
ARS	Arizona Revised Statutes
amsl	above mean sea level
ASTM	American Society for Testing and Materials
AWQS	Aquifer Water Quality Standards
ft bgs	feet below ground surface
CLEAR	Copper Leach Electrowinning and Regeneration
COI	Constituent of Interest
COPC	Constituent of Potential Concern
DO	dissolved oxygen
DQO	data quality objective
ELMA	Errol L. Montgomery & Associates
EPA	U.S. Environmental Protection Agency
GPL	Groundwater Protection Level
gpm	gallons per minute
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MD	Matrix Spike/Matrix Duplicate
nr-SRL	non-residential Soil Remediation Level
OD	outside diameter
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
r-SRL	residential Soil Remediation Level
UTL	Upper Tolerance Limit
VRP	Voluntary Remediation Program
HGC	Hydro Geo Chem Inc.

1.0 INTRODUCTION

This report presents the site characterization results for soil and sediment at the Sierrita Mine located near Green Valley, Arizona (Figure 1-1). The investigation was conducted under the Arizona Voluntary Remediation Program (VRP) administered by the Arizona Department of Environmental Quality (ADEQ). Freeport-McMoRan Sierrita Inc. (Sierrita) submitted an application to enter into the VRP on June 16, 2007. The site was accepted into the VRP under Site Code 100073-03 on August 15, 2007.

Sierrita retained URS Corporation (URS) to prepare and implement a site characterization work plan for the Sierrita Mine. The Voluntary Remediation Program (VRP) Investigation Work Plan (Work Plan) was submitted to ADEQ in April 2008 and an Addendum – Quality Assurance Project Plan was submitted to ADEQ in September 2008. The Work Plan and Addendum were approved by ADEQ on November 26, 2008. Implementation of soil and sediment characterization commenced in June 2008 and was completed in November 2008. Groundwater characterization was also performed between July 2008 and July 2009. The groundwater characterization results will be submitted to the ADEQ in a subsequent sitewide groundwater characterization report.

1.1 Characterization Objectives and Scope

As described in the Work Plan, the goal of the VRP characterization was to evaluate:

- Facilities that ceased operation and/or were closed prior to implementation of Sierrita's Aquifer Protection Permit (No. P-101679).
- Selected operations exempt from regulation under the APP.
- Operations identified as "to be closed" under the APP.
- Active operations with the potential to release mining-related constituents to groundwater.
- Potential uranium impacts to groundwater.

The focus of site characterization was to sample soil, sediment, and groundwater to assess potential releases of constituents of interest (COIs) from specified subareas. Initially, nine subareas were identified in the Work Plan for characterization (Figure 1-2). During performance of the site characterization outlined in the Work Plan, one additional historical operation, the Former Laydown Yard, was identified and characterized. Ten subareas were characterized:

- Former CLEAR Plant
- Former Evaporation Pond
- Old D Pond
- Former Esperanza Mill
- Former C Pond and C Pond Spoils
- Former Raffinate Pond
- Former Laydown Yard
- Former E Pond
- Former Rhenium Ponds
- Sierrita and Esperanza Tailing Impoundments

The results of tailing and tailing porewater sampling at the Sierrita and Esperanza Tailing Impoundments are not discussed in this report but will be submitted to the ADEQ in a subsequent sitewide groundwater characterization report. Tailing and tailing porewater were sampled during the 2008 field investigation to support sitewide groundwater characterization and will be used in the interpretation of the groundwater sampling results.

The constituents of interest (COI) analyzed during the VRP characterization were selected based on a review of groundwater constituents currently monitored or regulated at Sierrita under its APP permit, historical groundwater quality data for the Sierrita Mine, and current and historical mining processes and operations. The soil and sediment COIs selected for analysis include mining-related total metals (antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, selenium, thallium, and zinc), total uranium, uranium isotopes (uranium-234, uranium-235, and uranium-238), and radium isotopes (radium-226 and radium-228). Many of these constituents also naturally occur in soils, rock, and groundwater at non-mineralized and mineralized mine sites.

1.2 Groundwater Characterization

Groundwater was also characterized during the VRP investigation. Groundwater characterization included the installation of 15 bedrock monitor wells and 14 temporary alluvium monitor wells. Groundwater at the existing and new monitor wells was sampled and analyzed for 4 quarters from July 2008 to July 2009. A separate sitewide groundwater characterization report will be

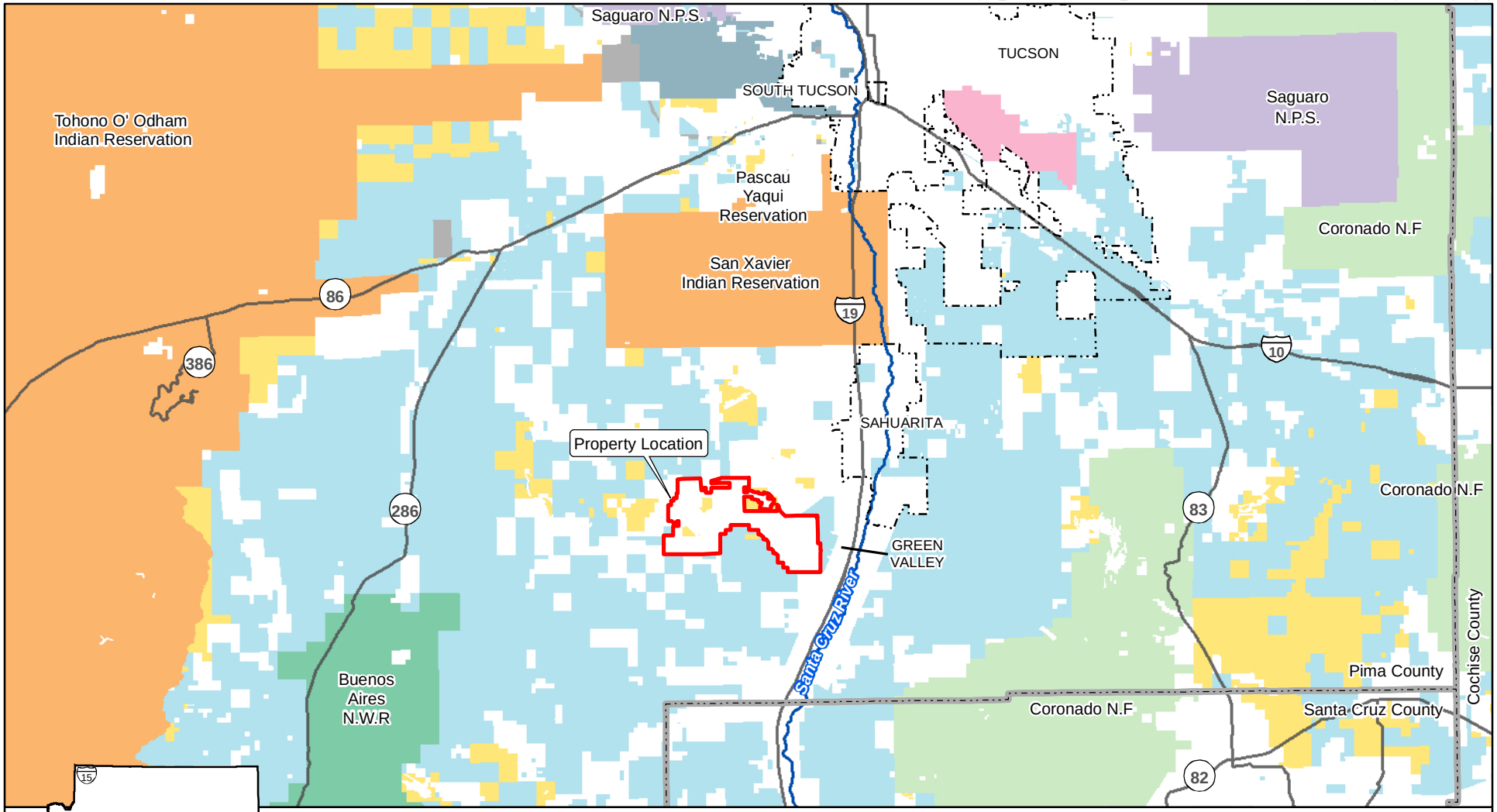
subsequently submitted to the ADEQ. The sitewide groundwater characterization report will include characterization of the potential impacts to groundwater from active and historical operations, an evaluation of background conditions for uranium in groundwater, a refined conceptual site model, and tailing and tailing porewater data from the Esperanza and Sierrita Tailing Impoundment investigations.

1.3 Organization of the Report

This report is comprised of five sections, including this Introduction (Section 1). Section 2 discusses subarea history, describes field activities, presents analytical results for each subarea, and includes sample location maps and analytical data tables. Section 3 discusses and evaluates analytical quality assurance and quality control including data verification and data validation. Section 4 evaluates the soil and sediment characterization results for each subarea. Section 5 provides a list of references used to prepare this report. Soil boring logs, soil and sediment analytical data packages, and data verification and validation reports are provided in the following appendices:

- Appendix A Soil Boring Logs
- Appendix B Soil and Sediment Analytical Data Packages
- Appendix C Data Verification Reports
- Appendix D Level IV Data Validation Reports

P:\WRES\Freeport_McMoRan\24096838_Sierrita\GIS\mxds\Phase1Soil\Figure 1-1 PropertyLocation.pdf (jw)



LEGEND

- Sierrita Property Boundary
- County Boundary
- City Boundary
- Major Road
- River/Stream

Surface Management

- Bureau of Land Management
- U.S. Forest Service (N.F.)
- National Park Service (N.P.S.)
- U.S. Fish and Wildlife Service (N.W.R.)
- Indian Reservation
- Military
- Local or State Parks
- State Trust Land
- Private
- Other

Source:
Base Map - Arizona State Land Department 1997 - 2010

URS

Figure 1-1
Property Location

Freeport-McMoRan Sierrita Inc.

N

0 5 10
Miles

P:\WRES\Freeport_McMoRan\24096838_Sierrita\GIS\mxds\Phase1SoilFigure 1-2 Site Features.pdf (jw)

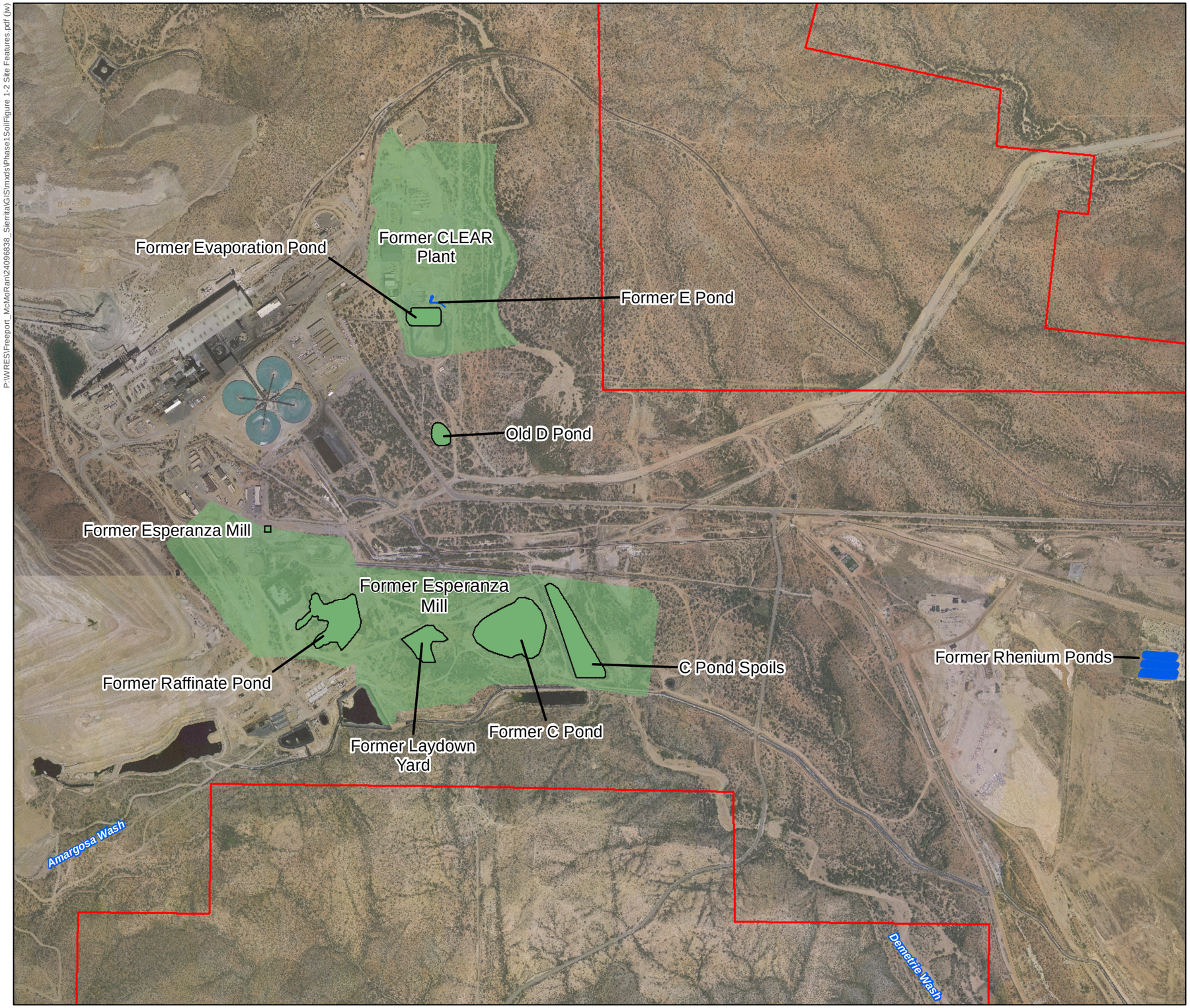


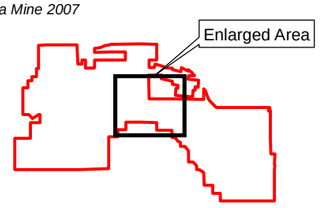
Figure 1-2
Investigation Subareas

Freeport-McMoRan Sierrita Inc.

Legend

- Sierrita Property Boundary
- Former E Pond and Former Rhenium Ponds Subareas
- Former CLEAR Plant and Former Esperanza Mill Subareas
- Former Evaporation Pond, Old D Pond, Former Esperanza Mill, Former C Pond and C Pond Spoils, Former Raffinate Pond, and Former Laydown Yard Subareas

Source:
Imagery - Sierrita Mine 2007



N

0 1,000 2,000

Feet

1 inch = 1,000 feet

URS

2.0 SUBAREA CHARACTERIZATION

The following subsections present descriptions of the activities undertaken to characterize the nine subareas and presents their characterization results. The subareas are grouped geographically in three general Sierrita site areas as illustrated on Figure 1-2 and consist of:

Former CLEAR Plant Area (Details are presented on (Figure 2-1)

- Former CLEAR Plant
- Former E Pond
- Former Evaporation Pond
- Old D Pond

Former Esperanza Mill Area (Details are presented on (Figure 2-7)

- Former Esperanza Mill
- Former C Pond and C Pond Spoils
- Former Laydown Yard
- Former Raffinate Pond

Tailing Impoundment Area

- Former Rhenium Ponds

Field work at these subareas was performed between June and November 2008 and consisted of:

- Collection and analysis of 171 soil samples from 54 soil boring locations advanced to the bedrock surface
- Collection and analysis of 36 sediment samples from 18 locations
- Installation of 15 bedrock monitor wells designated as MW-2008-01, etc.
- Installation of 14 temporary alluvial monitor wells designated as TW-2008-01, etc.

2.1 Previous Investigation

In 2004, Hydro Geo Chem Inc. (HGC 2008) conducted an investigation that included collecting surface samples from 0 to 0.25 feet below ground surface (ft bgs; 0 to 3 inches) and trench

samples from depths ranging between 0 and 14 ft bgs. The HGC samples were collected in some of the same subareas that are the focus of this VRP investigation. Sampling data from the HGC investigation was used to supplement the VRP investigation where appropriate, with applicable total metals data presented in this VRP report. Soil samples collected by HGC in 2004 were initially screened in the field for paste pH, which was used to determine if the sample should be submitted for total metals analysis. Soil samples for laboratory analysis were selected based on their potential to accumulate metals or to potentially generate acid.

2.2 HGC Sample Designation

HGC's soil sample locations were identified by subarea (CLEAR Plant [CP] and Esperanza Mill [EM]) followed by sequential numbering. HGC's trench soil sample locations were also identified by subarea, followed by (Trench [T]) and then the sample depth interval. Examples of HGC's sample designations are described below:

- **HGC Surface Sample Designation** – The sample designation included two fields separated by dashes; consider the following example: CP-1.

  The first field (CP) identifies the CLEAR Plant and the subsequent numeric character (1) represents the first sequential sample.

- **HGC Surface Trench Sample Designation** – The sample designation included four fields separated by dashes; consider the following example: CP-T-1-1.5.

  The first field (CP) identifies the CLEAR Plant, the second field (T) identifies a trench sample, the third field (1) represents the top of the sample interval measured in ft bgs, and the fourth field (1.5) represents the bottom of the sample interval measured in ft bgs.

2.3 VRP Sample Collection

Soil and sediment sample borings were advanced using direct push techniques and Geoprobe® tooling. The Geoprobe® sampling method consisted of advancing the sample rods by hydraulically pushing or driving the rods to the desired sample collection depth. Soil samples were collected using disposable, non-reactive acetate liners placed within a Macro-core® sampling device. A limited number of samples were collected using a stainless steel hand auger in subareas that were inaccessible to the direct push rig.

Soil samples were generally composited as 1- or 2-foot sample intervals from ground surface to total boring depth. Soil samples were collected and composited as specified in the Work Plan

(URS 2008). The composited soil depth intervals ranged from 0 to 1, 1 to 3, 5 to 7, 10 to 12, 15 to 17, and 20 to 22 ft bgs. All soil borings were advanced to refusal or the top of bedrock whichever was encountered first. The depth to the top of bedrock was variable but was generally less than 10 ft bgs.

2.4 VRP Sample Designation

Each soil and sediment sample collected during the 2008 VRP investigation was first identified by subarea. The following subarea designations were used:

- Former CLEAR Plant (CP)
- Former E Pond (E)
- Former Evaporation Pond (EV)
- Old D Pond (OD)
- Former Esperanza Mill (EM)
- Former C Pond (C)
- Former C-Pond Spoils (CS)
- Former Laydown Yard (EM[1])
- Former Raffinate Pond (RA)
- Former Rhenium Ponds (RP)

Each soil and sediment sample was further identified using an alphanumeric designation based on the type of sample collected. The following sample designations were used:

- **Grid Sample Designation** – Grid samples included soil samples collected at random grid nodes from a system of 200-foot-square grid units. The grid sample designation included five fields separated by dashes; consider the following example: CP-M04-00-01.

  The first field (CP) identifies the CLEAR Plant, the second field (M) is a single-digit alpha character representing a vertical grid line, and the third field (04) is a

[1] Samples in the Former Laydown Yard subarea were initially collected during the investigation of the Esperanza Mill subarea. Thus, the Former Laydown Yard subarea samples have the same sample designation (EM) as the Esperanza Mill.

double-digit numeric character representing a horizontal grid line. The grid node is the point where the grid lines intersect. The fourth field (00) represents the top of the sample interval measured in ft bgs and the fifth field (01) represents the bottom of the sample interval measured in ft bgs.

- **Judgmental Sample Designation** – Judgmental samples included soil samples that were not located on grid nodes. The judgmental sample designation includes five fields separated by dashes; consider the following example: CP-JS-01-00-01.

  The first field (CP) identifies the CLEAR Plant, the second field (JS) identifies a judgmental sample, the third field (01) is a double-digit numeric character representing the sequential JS sample, the fourth field (00) represents the top of the sample interval measured in ft bgs, and the fifth field (01) represents the bottom of the sample interval measured in ft bgs.

- **Sediment Sample Designation** – Sediment samples included samples located in areas of probable sediment accumulation. The sediment sample designation includes five fields separated by dashes; consider the following example: CP-SD-01-00-01.5.

  The first field (CP) identifies the CLEAR Plant, the second field (SD) identifies a sediment sample, the third field (01) is a double-digit numeric character representing the sequential SD sample, the fourth field (00) represents the top of the sample interval measured in ft bgs, and the fifth field (01.5) represents the bottom of the sample interval measured in ft bgs.

2.5 Sample Analyses

Soil and sediment samples were submitted to ACZ Laboratories in Steamboat Springs, Colorado for total metals analysis including antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, selenium, thallium, uranium and zinc. Soil samples with total lead results greater than the groundwater protection level (GPL) of 290 mg/kg were also analyzed for lead using the synthetic precipitation leaching procedure (SPLP).

During the 2008 VRP investigation, selected soil samples that exceeded the r-SRL for total chromium were analyzed for hexavalent chromium. Hexavalent chromium was not detected above its reporting limit in any of the soil samples analyzed during the 2008 VRP investigation. Therefore, considering that hexavalent chromium has not been used at the Sierrita site and is not likely to be stable in the geochemical environment of the surface and shallow subsurface soils, it is assumed that trivalent chromium is the most likely form of chromium present at the site. Given

these considerations, the soil chromium results will be compared to the trivalent chromium nr-SRL (1,000,000 mg/kg) in this report.

Soil samples were also submitted to Paragon Labs in Fort Collins, Colorado for analysis of isotopic uranium (uranium-234, uranium-235, and uranium-238) and isotopic radium (radium-226 and radium-228). Soil sample results for isotopic uranium and radium will be submitted to the ADEQ in a subsequent sitewide groundwater characterization report. Isotopic uranium and isotopic radium activities in soil samples were analyzed to support sitewide groundwater characterization and will be used in the interpretation of the groundwater sampling results.

2.6 Work Plan Deviations

Three deviations from the Work Plan were made in response to actual conditions encountered in the field. The Work Plan deviations included:

- During the 2008 VRP investigation, all borings were advanced to refusal or bedrock, whichever came first. A target maximum boring depth of 22 ft bgs was proposed in the Work Plan (URS 2008). Most soil borings were advanced to less than 10 ft bgs. The deepest soil boring was advanced to a depth of 20 ft bgs.
- Because bedrock was frequently encountered at depths less than the target maximum boring depth of 22 ft bgs, the total number of samples collected was less than the total number proposed in the Work Plan. Considering the maximum boring depth of 22 ft bgs proposed in the Work Plan (URS 2008), six sampling intervals per boring were specified. Typically, three or less soil samples were collected at each boring location because the depth to bedrock was less than anticipated in the Work Plan. Six soil samples (excluding duplicates) were only collected at one soil boring (CP-JS-04) during the investigation.
- At each location a minimum of three attempts were made to reach the target maximum depth. The range in total depths for the boreholes reflects the considerable variation of depth to bedrock depth across the property. The total depth to bedrock was generally less than 10 ft bgs. .

2.7 Former CLEAR Plant Subarea

The CLEAR Plant was historically located in the north-central portion of the Sierrita property (Figures 1-2 and 2-1). The Former CLEAR Plant subarea comprises approximately 59 acres. The Former Evaporation Pond and Former E Pond subareas are located within the Former CLEAR

Plant subarea as illustrated in Figure 2-1. The Former CLEAR Plant is not an APP-regulated facility.

2.7.1 Subarea Description

From 1977 to 1983, the Former CLEAR Plant produced metallic copper. Copper was initially leached from copper concentrate slurry which was produced from sodium and potassium chloride brines and sodium hydroxide and ferric chloride reagents. This leach solution was processed through two mixing reactors and a thickener before a slurry of cement copper was added to the leach solution to produce a pregnant solution. The pregnant solution was then circulated in electrolytic tanks containing anode and cathode arrays. The resulting precipitated copper was filtered, washed, dried, and stored until sold. The Former CLEAR Plant was demolished in 1995. The process equipment and a majority of the interior contents of the building were dismantled and salvaged.

Information regarding the Former CLEAR Plant was obtained though interviews with current and former employees. Information obtained during the interviews indicates that the plant was commissioned in 1975. A number of impoundments were associated with the plant, including the Former Evaporation Pond, the Old D Pond, and the Former E Pond (formerly misidentified in the Aquifer Protection Permit [APP] as the Old D Pond). A number of aboveground process tanks and ponds that were associated with the former operations were identified from historical aerial photographs. No traces of the aboveground process tanks are currently evident. Figure 2-1 illustrates historical features including former impoundments and tanks that were identified on the historical aerial photographs.

The topography of the Former CLEAR Plant area generally slopes eastward and is incised by east-west trending drainages. The western portion of the area is cut into bedrock. Fill ranging from a few inches to approximately 25 feet in thickness is present in the remaining area. In the western portion of the property where fill is thin or non-existent, bedrock is at or near the surface, and outcrops of granodiorite are visible. The easternmost portion of the area, located along Demetrie Wash, is undisturbed and is sparsely covered with native vegetation. A large part of the Former CLEAR Plant subarea is covered with gravel or crushed rock. Buried concrete slabs are known, through interviews with current and former employees, to exist under the current layer of gravel.

Currently, the Former CLEAR Plant subarea is used as 1) an asset recovery yard to store used equipment, machinery, and vehicles, 2) contractor offices and materials storage, 3) a metal fabrication shop, and 4) Sierrita's "Central Accumulation" building, currently used to store

environmental sampling supplies and manage hazardous waste. The Former CLEAR Plant building is currently used for storage of miscellaneous materials such as used computers and office equipment and as a training center. The Crystal Plant is located in the southernmost building, which manufactures copper sulfate pentahydrate, a product that may be sold as fertilizer, pesticide, foot bath, and animal feed.

2.7.2 2004 HGC Investigation

The following samples were collected during HGC's 2004 investigation at the Former CLEAR Plant:

- 12 surface soil samples at 12 locations
- 24 subsurface soil samples at 8 trench locations
- 2 groundwater grab samples from 2 excavated trenches

2.7.3 2008 VRP Investigation

URS collected the following samples to further characterize the Former CLEAR Plant subarea:

- 27 soil samples from soil borings at 10 grid sample locations
- 15 soil samples from soil borings at 4 judgmental (JS) sample locations
- 20 sediment samples from borings at 10 sediment (SD) sample locations
- 4 quarters of groundwater samples from 2 newly installed monitor wells

Refer to Figure 2-1 for the locations of the soil samples and monitor wells. Refer to Table 2-1 for sample designations, sampling depth intervals, and analytical results.

Grid soil samples were collected from randomly selected nodes on a 200-foot grid applied to the roughly 59 acres that comprise the Former CLEAR Plant subarea. Twenty-seven soil samples were collected from the 10 randomly selected grid nodes (CP-M06, CP-O03, CP-P04, CP-P05, CP-P12, CP-Q09, CP-M04, CP-P07, CP-N08, and CP-O09). The sample depth intervals ranged from 0 to 1 to 15 to 17 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-1.

Judgmental samples were collected from soil borings at four locations. Three judgmental sample locations were identified in the Work Plan (URS 2008) based on previous sampling results (HGC 2008), and are locations where concentrations of arsenic and/or lead were detected above their respective nr-SRL. One additional judgmental sample location (CP-JS-04) was identified based

on field observations. Sample location CP-JS-04 was drilled in a fill area that had not been previously sampled to the total depth of the fill. A total of 15 soil samples were collected from the four judgmental sample locations (CP-JS-01, CP-JS-02, CP-JS-03, and CP-JS-04). The sample depth intervals ranged from 0 to 1 to 20 to 20.3 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-1.

Twenty sediment samples were collected from 10 borings to evaluate the five shallow surface drainages that originate at the Former CLEAR Plant subarea. Four drainages flow eastward to Demetrie Wash and one drainage flows south toward the Old D Pond. Two sediment sample locations were established for each of the 5 drainages to evaluate potential sediment impacts, as described in the Work Plan. Ten borings (CP-SD-01, CP-SD-02, CP-SD-03, CP-SD-04, CP-SD-05, CP-SD-06, CP-SD-07, CP-SD-08, CP-SD-09, and CP-SD-10) were advanced to 3 ft bgs. The sample depth intervals ranged from 0 to 1 and 1 to 3 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-1.

Two monitor wells were installed to monitor bedrock groundwater upgradient and downgradient (MW-2008-01 and MW-2008-02, respectively) of the Former CLEAR Plant subarea. Analytical results for water samples collected from these wells will be described in a separate sitewide groundwater characterization report.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field as follows:

1. The Work Plan proposed collecting 60 soil samples from 10 grid sample locations; however only 27 samples were collected from 10 grid sample locations because the depth to bedrock was less than anticipated in the Work Plan.
2. The Work Plan proposed collecting 18 soil samples from three judgmental sample locations; however 15 only soil samples were collected from four judgmental sample locations (CP-JS-01, CP-JS-02, CP-JS-03, and CP-JS-04) because the depth to bedrock was less than anticipated in the Work Plan.
3. One judgmental sample location (CP-JS-04) was added based on field observations. The additional sample location was added to delineate an area where fill had been placed and samples had not previously been collected at depth.

2.7.4 Characterization Results

The following discussion is based on results of the 2004 HGC investigation (HGC 2008) and the 2008 VRP investigation. Analytical results are presented on Table 2-1 and summarized on Figure

2-2. Figure 2-2 only shows sample results for borings with COI concentrations greater than the non-residential soil remediation levels (nr-SRLs) or groundwater protection levels (GPLs). Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.7.4.1 Physical Characteristics

Twenty-four soil borings in the Former CLEAR Plant subarea were advanced to the underlying granodiorite bedrock. Bedrock was encountered between 3 and 20 ft bgs with deepest bedrock occurrence to the northeast. The soils overlying bedrock generally consisted of loose silty sands with layers of cobble sized fill material.

In October 2008, the depth to groundwater in bedrock ranged from 67 ft bgs in upgradient well MW-2008-01 to 30 ft bgs in downgradient well MW-2008-02. The general direction of bedrock groundwater flow is to the east.

2.7.4.2 Soil Samples

Seventy-eight soil samples were collected from 34 locations within the Former CLEAR Plant subarea during the 2004 and 2008 investigations. The most commonly detected COIs exceeding their respective nr-SRLs are arsenic and copper. A summary of the results that exceed the nr-SRLs or GPLs are shown on Figure 2-2.

Arsenic was detected in all soil samples collected. Arsenic concentrations range from 1.0 to 166 mg/kg. Arsenic was detected at concentrations above the nr-SRL (10 mg/kg) in 22 soil samples collected from 17 sample locations. Ten of the samples exceeding the nr-SRL were collected from 0 to 1.5 ft bgs. The deepest sample collected containing arsenic at concentrations exceeding the nr-SRL was from 14 ft bgs. Arsenic concentrations did not exceed the GPL (290 mg/kg) in any of the samples analyzed.

Copper was detected in all soil samples collected at concentrations ranging from 174 to 109,000 mg/kg. Four samples exceeded the nr-SRL (41,000 mg/kg). These four samples were collected during the 2004 HGC investigation. None of the copper concentrations in soils collected during the 2008 VRP investigation exceeded the nr-SRL. Three of the samples were collected at a depth interval of 0 to 0.25 ft bgs (0 to 3 inches bgs); the other soil sample was collected from a depth of 1.5 ft bgs. A GPL for copper has not been established.

Lead was detected in all soil samples at concentrations ranging from 1.2 to 1,820 mg/kg. Five samples contained lead at concentrations exceeding the GPL (290 mg/kg). Two of the five samples had concentrations above the nr-SRL (800 mg/kg). These five samples were collected

during the 2004 HGC investigation. None of the lead concentrations in soils collected during the 2008 VRP investigation exceeded the nr-SRL or GPL.

Antimony was detected in two soil samples from 0 to 0.25 ft bgs at concentrations above the GPL (35 mg/kg). Neither of these concentrations exceeded the nr-SRL for antimony (410 mg/kg). These two samples were collected during the 2004 HGC investigation. None of the antimony concentrations in soils collected during the 2008 VRP investigation exceeded the nr-SRL.

Barium, beryllium, chromium, cobalt, manganese, molybdenum, nickel, selenium, thallium, uranium, and zinc were detected in most of the soil samples but the detected concentrations were less than their respective nr-SRL or GPL. Cadmium and mercury were generally not detected above their reporting limits in most of the soil samples.

2.7.4.3 Sediment Samples

Twenty sediment samples were collected from 10 borings along the five shallow surface drainages that originate from the Former CLEAR Plant subarea (Figure 2-1). COIs were not detected at concentrations at or above the nr-SRLs or GPLs in the sediment samples.

2.7.5 Former CLEAR Plant Subarea Summary

Arsenic, lead, copper, and antimony in some of the soil samples collected in the Former Clear Plant subarea were detected at concentrations above nr-SRLs and/or GPLs. The analytical results from the 2004 HGC investigation and the additional samples collected during the 2008 VRP investigation indicate that metals present at concentrations exceeding the nr-SRLs occur primarily in the following four locations within the footprint of the Former CLEAR Plant subarea (Figure 2-2):

1. An area in the northwestern corner of the Former CLEAR Plant, characterized by soil sample locations designated CP-5 and CP-T-1. Sample CP-5 was collected from the top 3 inches of soil and contained arsenic at a concentration exceeding the nr-SRL. Deeper soil samples collected from nearby trench CP-T-1 contained arsenic at concentrations exceeding the nr-SRL, to a depth of 4 ft bgs. The deepest sample, collected from 8 ft bgs, did not contain metals at concentrations exceeding their nr-SRLs. Arsenic is the only metal present in this area at a concentration exceeding the nr-SRL.
2. An area located north of the main access road into the Former CLEAR Plant, and extending eastward to the edge of the extensively graded and leveled area. This area is characterized by sample locations designated CP-9, CP-7, CP-M04, CP-T-2, CP-T-2B,

CP-T-2C, CP-1, and CP-JS-01. Analysis of samples collected from these locations detected arsenic and copper at concentrations exceeding the nr-SRLs in the upper 1 foot of soil. Deeper soil samples collected from locations CP-T-2 and CP-JS-01 (on the east side of the area) contained arsenic exceeding the nr-SRL to a depth of 7 and 12 ft bgs, respectively. Arsenic concentrations ranged from 1.5 to 105 mg/kg with concentrations in 10 samples exceeding the nr-SRL. Copper concentrations ranged from 506 to 59,300 mg/kg with concentrations in two samples exceeding the nr-SRL. No other metals were present at concentrations exceeding the nr-SRL. Lead and antimony were detected at concentrations exceeding the GPL at sample location CP-1, where arsenic and copper were also detected above the nr-SRL.

3. The center of the Former CLEAR Plant which is now designated as the Asset Recovery yard. This area is characterized by sample locations designated CP-16, CP-15, CP-T-3, and CP-T-4. Lead was detected in two samples at concentrations above the GPL (290 mg/Kg) (one from the upper 0.25 feet (3 inches) and one from 8 ft bgs). Arsenic concentrations in the area ranged from 1.1 to 34.9 mg/kg, with concentrations in six samples exceeding the nr-SRL. Copper concentrations in this area ranged from 998 to 109,000 mg/kg, with concentrations in two surface soil samples exceeding the nr-SRL. No other COIs were present at concentrations exceeding their respective nr-SRL.
4. The area located near the southern end of the Former CLEAR Plant immediately north of the Former E Pond. This area is characterized by sample locations designated CP-2 and CP-3. Arsenic and lead were detected at concentrations exceeding the nr-SRL in samples taken from the upper 0.25 feet (3 inches) of soil. No other metals were present at concentrations exceeding the nr-SRL. Lead and antimony were detected at concentrations exceeding the GPLs at sample location CP-2. Deeper samples collected immediately adjacent to this area (CP-O09 and CP-JS-03) did not contain COIs at concentrations greater than the nr-SRLs or GPLs.

In addition to these four specific areas, one anomalous soil sample was identified at sample location CP-N08 where arsenic was detected at a concentration of 41.9 mg/kg at the depth interval from 10 to 11 ft bgs. The three samples collected from soils overlying this sample contained arsenic at concentrations (4.1 to 7.7 mg/kg) less than the nr-SRL.

2.8 Former E Pond Subarea

The Former E Pond subarea is located in the north-central portion of the Sierrita property within the southern portion of the Former CLEAR Plant subarea (Figures 1-2 and 2-3). The Former E Pond was associated with the CLEAR Plant process. The Former E Pond is an APP-regulated subarea that is misidentified in the APP as the Old D Pond.

2.8.1 Subarea Description

The Former E Pond is an inactive, backfilled pond. This pond was historically used to contain surface water runoff and possibly process solutions from upset conditions at the Former CLEAR Plant.

The topography of the Former E Pond slopes to the south and east. Most of the area has been disturbed by grading, and slopes to the south with little of the natural topography remaining. Outcrops of granodiorite are visible across the area. The area is sparsely covered with native vegetation.

2.8.2 2008 VRP Investigation

In July and August 2008, URS collected the following samples to characterize the Former E Pond:

- 5 soil samples from soil borings at 2 judgmental (JS) sample locations
- 4 quarters of groundwater samples from 1 newly installed bedrock monitor well

Refer to Figure 2-3 for the locations of the soil samples and monitor well. Refer to Table 2-2 for sample designations, sampling depth intervals, and analytical results.

Five judgmental samples were collected from two soil borings (E-JS-01 and E-JS-02) advanced through the footprint of the former impoundment. The sample depth intervals ranged from 0 to 1 to 5 to 7 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-2. The deepest sample collected was from 7 ft bgs at sample location E-JS-01.

One monitor well (MW-2008-03) was installed to monitor bedrock groundwater downgradient of the Former E Pond.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field:

1. The Work Plan proposed collecting 12 soil samples from two judgmental sample locations; however, only five soil samples were collected from two judgmental sample locations because the depth to bedrock was less than anticipated in the Work Plan.

2.8.3 Characterization Results

The following discussion is based on results from the 2008 VRP investigation. Analytical results are presented on Table 2-2. Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.8.3.1 Physical Characteristics

Two soil borings within the footprint of the Former E Pond were advanced to granodiorite bedrock. Bedrock was encountered between 3 and 7 ft bgs. The bedrock was shallower to the east of the Former E Pond. The overlying soils generally consisted of loose silty sands with layers of cobble-sized fill material.

In October 2008, the depth to bedrock groundwater in MW-2008-03 was approximately 33 ft bgs. The general direction of bedrock groundwater flow in the vicinity of the Former E Pond is to the southeast.

2.8.3.2 Soil Samples

Five soil samples were collected from two judgmental locations within the footprint of the Former E Pond. No COIs were detected at concentrations that exceeded their nr-SRLs or GPLs.

2.8.4 Former E Pond Subarea Summary

No COIs were detected above the nr-SRLs or GPLs in the soil samples collected from boring locations (E-JS-01 and E-JS-02) in the Former E Pond subarea.

2.9 Former Evaporation Pond Subarea

The Former Evaporation Pond subarea is located in the north-central portion of the Sierrita property south of the Former CLEAR Plant (Figures 1-2 and 2-4). The Former Evaporation Pond was a lined impoundment that received spent copper solution containing elevated chloride concentrations. The Former Evaporation Pond is not an APP-regulated facility.

2.9.1 Subarea Description

The Former Evaporation Pond subarea is an inactive pond. The Former Evaporation Pond is located immediately north of the New D Pond, which is a currently operating facility regulated under the APP.

The current topography of the Former E Pond area slopes to the south and east. Most of the area has been disturbed by grading to create the New D Pond and to direct surface runoff into the New D Pond. Outcrops of granodiorite are visible across the area. The area is sparsely covered with native vegetation.

2.9.2 2008 VRP Investigation

URS collected the following samples to characterize the Former Evaporation Pond:

- 6 soil samples from soil borings at 2 judgmental (JS) sample locations
- 4 quarters of groundwater samples from 1 newly installed bedrock monitor well (MW-2008-04)

Refer to Figure 2-4 for the locations of the soil samples and monitor well. Refer to Table 2-3 for sample designations, sampling depth intervals, and analytical results.

Six judgmental samples were collected from borings EV-JS-01 and EV-JS-02 within the footprint of the former impoundment. A total of six soil samples were collected from the two borings. The sample depth intervals ranged from 0 to 1 to 5 to 7 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-3. Both soil borings were drilled to 7 ft bgs.

One monitor well (MW-2008-04) was installed to monitor groundwater in bedrock immediately downgradient of the Former Evaporation Pond.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field:

1. The Work Plan proposed collecting 12 soil samples from two judgmental sample locations; however, only six soil samples were collected from two judgmental sample locations because the depth to bedrock was less than anticipated in the Work Plan.

2.9.3 Characterization Results

The following discussion is based on results of the 2008 VRP investigation. Analytical results are presented on Table 2-3. Laboratory data packages are contained in Appendix B. Data

verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.9.3.1 Physical Characteristics

Two soil borings within the footprint of the Former Evaporation Pond were advanced into the underlying granodiorite bedrock. Bedrock was encountered at 7 ft bgs in both borings. The overlying soils generally consisted of loose silty sands with layers of cobble-size fill material.

In October 2008, the depth to bedrock groundwater in MW-2008-04 was approximately 33 ft bgs. The general direction of bedrock groundwater flow in the vicinity of the Former Evaporation Pond is to the southeast.

2.9.3.2 Soil Samples

Six soil samples were collected from two locations within the Former Evaporation Pond area. No COIs were detected at concentrations exceeding the nr-SRLs or GPLs.

2.9.4 Former Evaporation Pond Subarea Summary

No COIs were detected above the nr-SRLs or GPLs in the soil samples collected from boring locations (EV-JS-01 and EV-JS-02) in the Former Evaporation Pond area.

2.10 Old D Pond Subarea

The Old D Pond subarea is located in the central portion of the Sierrita property between the Former CLEAR Plant and Former Esperanza Mill subareas (Figures 1-2 and 2-5). The APP application shows the Old D Pond located in the southern portion of the Former CLEAR Plant area. However, a recent interview and review of an aerial photograph dated 1979 as well as a visual site inspection, indicate that the Old D Pond was actually located approximately 1,000 feet south of the Former CLEAR Plant. During the site reconnaissance URS noted an impoundment south of the Former CLEAR Plant and a concrete sump was noted in the footprint of the former impoundment. Former employees reported that this pond was used into the 1990s, and is assumed to be the actual Old D Pond. The Old D Pond is not an APP-regulated facility.

2.10.1 Subarea Description

The Old D Pond was constructed in 1974 and reportedly received process solutions from the Former CLEAR Plant operation. As described in the 2008 VRP Investigation Work Plan, solutions were recycled and may have contained various constituents including metals and radionuclides. The Old D Pond listed in the APP as a facility “to be closed” at final mine closure has been determined to be the Former E Pond. It is Sierrita’s intent to maintain the terminology

of “Old D Pond” and adjust its location to what is now believed to be the actual location of Old D Pond.

The Old D Pond is located south of the Former CLEAR Plant in a topographically low area. The Old D Pond receives surface runoff from natural drainage features trending southeast along the north side of Duval Mine Road. A small earthen dam forms the east side of the pond, and provides a (wash) crossing for the dirt road that runs north from Duval Mine Road. Bedrock is present at roughly 7 ft bgs, overlain by alluvial sediments. The area surrounding the Old D Pond supports a healthy cover of native vegetation.

2.10.2 2008 VRP Investigation

URS collected the following samples to characterize the Old D Pond:

- 8 soil samples (including 1 duplicate) from soil borings at 3 judgmental (JS) sample locations
- 12 sediment (SD) samples from borings at 6 sediment sample locations
- 4 quarters of groundwater samples from 2 newly installed bedrock monitor wells

Refer to Figure 2-5 for the locations of the soil samples and monitor wells. Refer to Table 2-4 for sample designations, sampling depth intervals, and analytical results.

The three judgmental soil borings (OD-JS-01, OD-JS-02, and OD-JS-03) were advanced to the top of bedrock within the footprint of the Old D Pond. A total of eight (including one duplicate) soil samples were collected from the three borings. The sample depth intervals ranged from 0 to 1 to 5 to 7 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-4. The deepest soil sample collected was from 7 ft bgs at sample location OD-JS-02.

Sediment samples were collected to evaluate an unnamed wash originating at the Former CLEAR Plant area. Six sediment sample locations (OD-SD-01 through OD-SD-06) were established in the drainage in the vicinity of the Old D Pond. Two soil samples were collected from each boring at depth intervals from 0 to 1.5 and 1.5 to 3 ft bgs.

Two monitor wells were installed to monitor bedrock groundwater immediately upgradient and downgradient (MW-2008-06 and MW-2008-05, respectively) of the Old D Pond.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field:

1. The Work Plan proposed collecting 12 soil samples from two judgmental sample locations; however eight soil samples (including one duplicate) were collected from three judgmental sample locations because the depth to bedrock was less than anticipated in the Work Plan.
2. One judgmental sample location (OD-JS-03) was added to characterize the centermost portion of Old D Pond.

2.10.3 Characterization Results

The following discussion is based on results of the 2008 VRP investigation. Analytical results are presented on Table 2-4 and summarized on Figure 2-6. Figure 2-6 only shows sample results for borings with concentrations greater than the nr-SRL or GPL. Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.10.3.1 Physical Characteristics

Three soil borings within the footprint of the Old D Pond were advanced to the top of the underlying granodiorite bedrock. Bedrock was encountered between 3 and 9 ft bgs with the deeper bedrock depth occurring along the south edge of the pond. The soils overlying bedrock generally consisted of loose silty sands with layers of cobble-sized fill material.

In October 2008, the depth to bedrock groundwater ranged from approximately 15 ft bgs in upgradient well MW-2008-06 to 27 ft bgs in downgradient well MW-2008-05. The general direction of bedrock groundwater flow in the vicinity of the Old D Pond is to the southeast.

2.10.3.2 Soil Samples

Eight soil samples (including one duplicate) were collected from three locations within the footprint of the Old D Pond. The surface soil sample collected from a depth of 0 to 1 ft bgs at boring OD-JS-03 had an arsenic concentration (10.6 mg/kg) that slightly exceeded the nr-SRL (10 mg/kg). Arsenic concentrations in the other soil samples collected within the Old D Pond were significantly less than the arsenic nr-SRL.

2.10.3.3 Sediment Samples

Twelve sediment samples were collected from six borings along the unnamed drainage and adjacent to the Old D Pond. Four locations were sampled upstream and two locations were sampled downstream of the Old D Pond. No COIs were detected at concentrations greater than their respective nr-SRLs or the GPLs.

2.10.4 Old D Pond Subarea Summary

Arsenic was detected at a concentration that slightly exceeded the nr-SRL in the soil sample collected from 0 to 1 foot bgs at location OD-JS-03. At the same location, a primary and duplicate sample were collected at 1 to 3 ft bgs. The detected concentrations of arsenic in both the primary and duplicate samples were less than the nr-SRL. None of the other judgmental samples collected within the footprint of the Old D Pond had COIs concentrations greater than their respective nr-SRLs or GPLs.

2.11 Former Esperanza Mill Subarea

The Former Esperanza Mill subarea is located in the central portion of the Sierrita property (Figures 1-2 and 2-7). The Former Esperanza Mill subarea comprises an area of roughly 80 acres. The Former C Pond and C Pond Spoils, Former Raffinate Pond, and Former Laydown Yard subareas are located within the Former Esperanza Mill subarea as illustrated on Figure 2-7. The Former Esperanza Mill is an inactive area of historical operations that is not an APP-regulated facility. The Former C Pond and C Pond Spoils, Former Raffinate Pond, and Former Laydown Yard are discussed in Sections 2.12, 2.13, and 2.14, respectively.

2.11.1 Subarea Description

Information regarding the Former Esperanza Mill was obtained though interviews with current and former employees and a review of historical aerial photographs. An aerial photograph from 1959 shows the location of the former mill, thickeners, and ponds that were associated with the former mill operations. The Former Esperanza Mill processed sulfide ore from 1959 through 1981 (HGC 2008). No information has been found regarding specific processing methods. The former operations included a mill, two thickeners, and a raw water pond. Tailing from the Former Esperanza Mill was conveyed via pipeline to the Esperanza Tailing Impoundment located 1/2-mile southeast of the Former Esperanza Mill. Figure 2-7 illustrates the locations of features and former impoundments that were identified on historical aerial photographs.

The topography of the Former Esperanza Mill subarea slopes gently to the east-southeast. Much of the area has been disturbed by grading to facilitate historical and current mine-related activities and easements. The Former Esperanza Mill subarea is bordered by Amargosa Wash on the south and Demetrie Wash on the east. Duval Canal Extension trends west to east along the north side of the former mill area. The northwestern portion of the area is cut into bedrock with fill extending eastward. A drainage channel (topographic low) extends from near the base of the former thickeners and trends southeast across the former mill area.

Numerous work/storage shops and office buildings along with equipment storage areas are located in the northwest portion of the Former Esperanza Mill subarea. The remaining, and largest portion of the Former Esperanza Mill subarea consists of disturbed areas (cut and fill) within rock outcrops and washes. A sparse cover of native vegetation is present in the undisturbed area.

2.11.2 2004 HGC Investigation

The following soil samples were collected during a 2004 investigation at the Former Esperanza Mill area:

- 9 surface soil samples from 9 locations
- 6 subsurface soil samples from 2 trenches

2.11.3 2008 VRP Investigation

URS collected the following samples to further characterize the Former Esperanza Mill subarea:

- 26 random grid soil samples from soil borings at 9 locations
- 2 soil samples from 1 judgmental (JS) sample location

Refer to Figure 2-7 for the locations of the soil samples. Refer to Table 2-5 for sample designations, sampling depth intervals, and analytical results.

Grid soil samples (EM-C22, EM-E24, EM-G27, EM-H22, EM-K24, EM-M26, EM-N29, EM-P24, and EM-X26) were collected from nine randomly selected nodes on a 200-foot grid applied to the roughly 80 acres that constitute the Former Esperanza Mill subarea. The sample depth intervals ranged from 0 to 1 to 10 to 11 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-5.

Judgmental samples were also collected from boring EM-JS-01 at depth intervals of 0 to 1 and 1 to 3 ft bgs. This location was sampled based on previous soil sampling results (HGC 2008) where concentrations of arsenic, molybdenum, and antimony were detected above their respective nr-SRLs.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field:

1. The Work Plan initially proposed collecting 60 soil samples from 10 grid sample locations; however, only 26 samples were collected from nine grid sample locations

because the depth to bedrock was less than anticipated. The tenth grid boring was drilled in the Former C Pond and C Pond Spoils subarea. One judgmental soil boring (EM-JS-01) was added in the Former Esperanza Mill subarea based on field observation of surface soil staining. Two soil samples were collected at depth intervals of 0 to 1 and 1 to 3 ft bgs in judgmental boring EM-JS-01.

2.11.4 Characterization Results

The following discussion includes results from the 2004 investigation and the 2008 VRP investigation. Analytical results are presented on Table 2-5 and summarized on Figure 2-8. Figure 2-8 only shows sample results for borings with concentrations greater than the nr-SRL or GPL. Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.11.4.1 Physical Characteristics

Ten random soil borings in the Former Esperanza Mill subarea were advanced to the underlying granodiorite bedrock. Bedrock was encountered at a depth of 4 to 12 ft bgs. Surface elevations in the area are variable with most areas having been disturbed by excavation or filling activities. Materials overlying bedrock generally consist of fill or silty sands.

In October 2008, the depth to bedrock groundwater ranged from approximately 14 ft bgs in upgradient well MW-2008-11 to approximately 22 ft bgs in downgradient well MW-2008-08. The general direction of bedrock groundwater flow is to the east-southeast.

2.11.4.2 Soil Samples

A total of 43 soil samples were collected from 21 locations across the Former Esperanza Mill subarea. The most commonly detected metal exceeding the nr-SRL is arsenic. Arsenic concentrations ranged from 1.1 to 101 mg/kg. Antimony exceeded its GPL in one sample. A summary of the results that exceeded the nr-SRLs or GPLs are shown on Figure 2-8.

Arsenic was detected at concentrations greater than the nr-SRL (10 mg/kg) in eight soil samples collected from eight sample locations. Seven of the samples that exceeded the nr-SRL were collected from a depth interval of 0 to 1 ft bgs. Five of these samples, including sample EM-17 which had the highest arsenic concentration (101 mg/kg) were collected during the 2004 HGC investigation from a depth interval of 0 to 0.25 ft bgs. Only one sample from below 1 ft bgs exceeded the nr-SRL; it was collected from trench EM-T-3 at a depth 4 ft bgs. The GPL (290 mg/kg) for arsenic was not exceeded in any of the samples.

Antimony was detected in one soil sample (EM-17) from a depth interval of 0 to 0.25 ft bgs at a concentration (69 mg/kg) greater than the GPL (35 mg/kg). None of the other antimony results exceeded the GPL. The nr-SRL (410 mg/kg) for antimony was not exceeded in any of the samples.

Barium, beryllium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, thallium, uranium, and zinc were detected in most of the soil samples but at concentrations less than their respective nr-SRL or GPL. Cadmium and mercury were generally not detected above their reporting limits in most of the soil samples.

2.11.5 Former Esperanza Mill Subarea Summary

Arsenic and antimony were the only COIs detected in soil at concentrations that exceeded their nr-SRL and GPL, respectively. The analytical results from the 2004 HGC investigation and the 2008 VRP investigation indicate that arsenic is present in the near surface (0 to 1 ft bgs) soils across the Former Esperanza Mill subarea. Concentrations of arsenic were detected in all 43 samples submitted for analysis, with 8 samples exceeding the nr-SRL. Antimony was only detected in one near surface soil sample at a concentration greater than its GPL. None of the antimony soil results exceeded the nr-SRL.

Arsenic concentrations greater than the nr-SRL appear to be found in near surface soils (0 to 1 ft bgs) or fill debris in an area just south of the Duval Canal Extension. Arsenic concentrations greater than the nr-SRL were not detected in subsurface soils (i.e., below 1 ft bgs) except for one sample collected at a depth of 4 ft bgs at trench location EM-T-3. The other soil samples collected at depth intervals ranging up to 10 to 11 ft bgs had arsenic concentrations less than the nr-SRL and GPL.

2.12 Former C Pond and C Pond Spoils Subarea

The Former C Pond and C Pond Spoils subarea consists of the Former C Pond and C Pond Spoils. The Former C Pond is an inactive, backfilled pond located within the easternmost portion of the Former Esperanza Mill subarea, near the northwest corner of the confluence of Demetrie and Amargosa Washes (Figure 2-8). The Former C Pond measured roughly 600 feet by 600 feet and was approximately 8.3 acres in area. During operations, sediments that accumulated in the Former C Pond were periodically removed using a dredge line and the dredged spoils were placed on the east and west sides of the current Duval Canal Extension. These spoils were placed in an area referred to as the C Pond Spoils. The Former C Pond and C Pond Spoils subarea is not an APP-regulated facility.

2.12.1 Subarea Description

Information regarding the Former C Pond and C Pond Spoils was obtained though interviews with current and former employees. The Former C Pond was previously reported to be associated with the Former Esperanza Mill; however, recent interviews indicated that the Former C Pond was not associated with the Former Esperanza Mill but was instead used to collect surface runoff from the Sierrita Mill. According to the 1994 APP application (ELMA 1994), the Former C Pond was never used as an operations pond nor used to contain fluids from leaching operations. Water retained in the Former C Pond was overflow from the old Duval Canal during storm events and surface runoff from parts of the Former Esperanza Mill subarea. Mill staff reported that the Former C Pond also received surface water runoff from the Sierrita crusher dust collector area. The runoff from the dust collector area contained very fine grained sediment and had a relatively high concentration of copper. Sumps located in the Former C Pond filled with the fine-grained sediment that clogged the pumps. The sumps were periodically excavated to remove sediment buildup and unclog the pumps. The excavated sediment was placed on the ground surface immediately east of the Former C Pond, in an area (Former C Pond Spoils subarea) bounding the current Duval Canal Extension. The construction of the Duval Canal Extension in 1994 eliminated the need for surface water runoff collection in the Former C Pond.

The Former C Pond is located in a topographically flat (level) area at the east end of the Former Esperanza Mill subarea. The topography of the Former Esperanza Mill subarea slopes gently to the east-northeast. . Currently, the Former C Pond subarea is being used by Freeport-McMoRan Copper and Gold (Sierrita's parent company) for pilot water treatment plants designed to test technologies for the removal of sulfate from water. One plant has been completed and is fully operational while construction has begun on a second plant and there are plans for an eventual third plant. The Duval Canal Extension and an adjacent road occur along the east side of the Former C Pond, separating it from the C Pond Spoils area. The C Pond Spoils are located within a 404 Mitigation Area and support a dense cover of native vegetation.

2.12.2 2004 HGC Investigation

The following soil samples were collected during HGC's 2004 investigation in the vicinity of the Former C Pond and C Pond Spoils:

- 1 surface soil sample from 1 location
- 2 subsurface soil samples from 1 trench location

2.12.3 2008 VRP Investigation

URS collected the following samples to further characterize the Former C Pond and C Pond Spoils:

- 3 random grid soil samples from a soil boring at 1 grid location
- 37 soil samples (including 1 duplicate) from 11 soil borings at judgmental (JS) sample locations
- 4 quarters of groundwater samples from 2 newly installed bedrock monitor wells and from 1 newly installed temporary alluvial monitor well.

Refer to Figure 2-9 for the locations of the soil samples and monitor wells. Refer to Table 2-6 for sample designations, sampling depth intervals, and analytical results.

Three grid soil samples were collected from a soil boring (EM-U25) at 1 randomly selected node on the 200-foot grid applied to the roughly 80 acres that constitute the Former Esperanza Mill subarea. The sample depth intervals ranged from 0 to 1 to 5 to 5.5 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-6.

Thirty-seven judgmental soil samples were collected from 11 soil borings (CS-JS-01 through CS-JS-06 and C-JS-01 through C-JS-05) at nine locations identified in the Work Plan plus two additional locations added during the field investigation.

Two bedrock monitor wells were installed to evaluate groundwater quality upgradient and downgradient (MW-2008-07 and MW-2008-08, respectively) of the Former C Pond. During drilling of MW-2008-08, alluvial groundwater was encountered in the fill material overlying bedrock. Bedrock was encountered at 29 ft bgs. Temporary alluvial monitor well TW-2008-13 was installed adjacent to MW-2008-08 to monitor the alluvial groundwater.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field as follows:

1. The Work Plan proposed collecting 54 soil samples from nine sample locations; however, only 40 samples (including one duplicate) were collected from 12 sample locations because the depth to bedrock was less than anticipated in the Work Plan.
2. Three additional judgmental sample locations (CS-JS-04, CS-JS-05, and CS-JS-06) were added in the C Pond Spoils area. These locations were added because the initial locations (CS-JS-01, CS-JS-02, and CS-JS-03) were not staked within the actual spoils area.

3. A temporary monitor (TW-2008-13) well was installed to evaluate alluvial water encountered during the installation of bedrock monitor well MW-2008-08.

2.12.4 Characterization Results

The following discussion includes results from the 2004 HGC investigation and the 2008 VRP investigation. Analytical results are presented on Table 2-6 and summarized on Figure 2-10. Figure 2-10 only shows sample results for borings with concentrations greater than the nr-SRL or GPL. Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.12.4.1 Physical Characteristics

Six soil borings within the footprint of the Former C Pond subarea were advanced to the top of the underlying granodiorite bedrock. Bedrock was encountered at depths between 4 and 17 ft bgs. The top of bedrock was deeper to the east and south of the Former C Pond. The soils overlying bedrock generally consist of loose silty sands with occasional layers of cobble-size fill material.

In October 2008, the depth to bedrock groundwater ranged from approximately 25ft bgs in upgradient well MW-2008-07 to approximately 22 ft bgs in downgradient well MW-2008-08. The general direction of bedrock groundwater flow is to the east-southeast. The depth to alluvial groundwater in temporary monitor well TW-2008-13 is approximately 10 ft bgs.

2.12.4.2 Soil Samples

A total of 43 soil samples (including 1 duplicate) were collected from 14 locations across the Former C Pond and C Pond Spoils subarea. Arsenic soil concentrations ranged from 1.2 to 23 mg/kg. Concentrations of lead in soil ranged from 3.5 to 3,740 mg/kg. Arsenic and lead are the only two COIs in soil that exceeded their respective nr-SRL and/or GPL. Arsenic and lead concentrations exceeded their respective nr-SRLs; lead exceeded its GPL. Figure 2-10 only shows sample results for borings with concentrations greater than the nr-SRL or GPL.

Arsenic was detected at concentrations greater than the nr-SRL (10 mg/kg) in four (including 1 duplicate) soil samples collected from 3 of 14 sample locations. All four samples that exceeded the arsenic nr-SRL were collected from a depth interval of 0 to 3 ft bgs. The arsenic GPL (290 mg/kg) was not exceeded by any of the sample results.

Lead was detected at a concentration above its nr-SRL (800 mg/kg) in one sample (C-JS-05-01-03) and above its GPL (290 mg/kg) in five samples. The highest lead soil concentration (3,740

mg/kg) was detected in C-JS-05 at a depth interval of 1 to 3 ft bgs. The sample was collected near an area covered with chipped wood debris. To evaluate the soil lead leachability, SPLP analyses was conducted on two soil samples (C-JS-05-00-01 and C-JS-05-01-03) with soil lead concentrations greater than the GPL (477 and 3,740 mg/kg). The SPLP lead results were less than the reporting limit (0.0005 milligrams per liter [mg/L]) and 0.001 mg/L. The leachable lead concentrations were less than the ADEQ aquifer water quality standard of 0.05 mg/L and do not appear to pose a threat to groundwater quality.

Antimony, barium, beryllium, chromium, cobalt, copper, manganese, molybdenum, nickel, selenium, thallium, uranium, and zinc were detected in most of the soil samples but the detected concentrations were less than their respective nr-SRL or GPL. Cadmium and mercury were generally not detected above their reporting limits in most of the soil samples.

2.12.5 Former C Pond and C Pond Spoils Subarea Summary

The eastern half of the Former C Pond and the northern portion of the C Pond Spoils subarea have soil arsenic and lead concentrations that exceed their respective nr-SRL and/or GPL. Arsenic was detected at concentrations greater than the nr-SRL (10 mg/kg) in four (including 1 duplicate) soil samples collected from 3 of 14 sample locations (EM-26, C-JS-05, and CS-JS-05). All four samples that exceeded the arsenic nr-SRL were collected from a depth interval of 0 to 3 ft bgs. The distribution of arsenic in soil appears to be spatially random with the exception that it appears to be found at depths from 0 to 3 ft bgs. The arsenic GPL (290 mg/kg) was not exceeded by any of the sample results.

Lead was detected at a concentration above its nr-SRL (800 mg/kg) in one sample (C-JS-05-01-03) and above its GPL (290 mg/kg) in 5 soil samples in 4 borings (CJ-JS-01, CD-JS-02, C-JS-05, and EM-U25) at depths from 0 to 11 ft bgs. The highest lead soil concentration (3,740 mg/kg) was detected in C-JS-05 at a depth interval of 1 to 3 ft bgs. Lead concentrations appear to be random with respect to the location and depth of samples. The SPLP leachable lead concentrations (less than 0.0005 mg/L and 0.001 mg/L) were less than the ADEQ aquifer water quality standard of 0.05 mg/L and do not appear to pose a threat to groundwater quality.

2.13 Former Raffinate Pond Subarea

The Former Raffinate Pond subarea is an inactive, unlined, and backfilled pond located within the central portion of the Former Esperanza Mill area (Figures 1-2 and 2-11). The Former Raffinate Pond is not an APP-regulated facility.

2.13.1 Subarea Description

Information regarding the Former Raffinate Pond was obtained though interviews with current and former employees and a review of historical aerial photographs. A 1979 aerial photograph depicts the Former Raffinate Pond immediately southeast of the Esperanza Mill building. The Former Raffinate Pond was irregularly shaped, and measured roughly 400 feet by 800 feet. The pond was previously used for containment of raffinate generated at the Precipitation Plant. Use of the Former Raffinate Pond was terminated when the current Raffinate Pond was constructed. No additional information for the Former Raffinate Pond regarding the years of operation or construction specifics has been located.

The Former Raffinate Pond is located in a low area. The topography of the Former Esperanza Mill area slopes gently to the east-northeast. The Former Raffinate Pond collects surface runoff from the western portion of the Former Esperanza Mill subarea and contains some water most of the year. The central portion of the Former Raffinate Pond supports a well established cover of vegetation. Granodiorite bedrock crops out at the surface along the southwest side of the Former Raffinate Pond. The north and east sides of the pond are bordered by fill material.

2.13.2 2004 HGC Investigation

The following soil samples were collected during HGC's 2004 investigation at the Former Raffinate Pond:

- 1 surface soil sample from 1 location
- 4 subsurface soil samples from 1 trench

2.13.3 2008 VRP Investigation

The following samples were collected in July and August 2008 to further characterize the Former Raffinate Pond:

- 15 soil samples (including 3 duplicates) from soil borings at 5 judgmental (JS) sample locations
- 8 sediment samples (including 4 duplicates) from soil borings at 2 sediment (SD) locations
- 3 groundwater samples from 3 newly installed bedrock monitor wells

Please refer to Figure 2-11 for the locations of the soil samples and monitor wells. Refer to Table 2-7 for sample designations, sampling depth intervals, and analytical results.

Five judgmental soil borings (RA-JS-01 through RA-JS-05) were advanced to the top of bedrock within the footprint of the Former Raffinate Pond. Fifteen soil samples (including 3 duplicates) were collected from the 5 borings. The sample depth intervals ranged from 0 to 1 to 5 to 7 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-7. The deepest soil samples were collected from 7 ft bgs at borings RA-JS-01 and RA-JS-02.

Sediment samples (RA-SD-01 and RA-SD-02) were collected from two locations to characterize discolored sediments in the bottom of the Former Raffinate Pond. Two samples were collected from each sample location at depth intervals of 0 to 1 and 1.5 to 3 ft bgs. Duplicate samples were collected for all four primary sediment samples.

Three bedrock monitor wells (MW-2008-09 through MW-2008-11) were installed to evaluate groundwater quality upgradient and downgradient of the Former Raffinate Pond. Monitor well MW-2008-11 was placed upgradient, in the northwest corner of the Former Esperanza Mill area. Monitor wells MW-2008-09 and MW-2008-10 were placed downgradient to the east and southeast, respectively, of the Former Raffinate Pond. One upgradient temporary alluvial monitor well (TW-2008-15) was installed adjacent to bedrock monitor well MW-2008-11.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field:

1. The Work Plan proposed collecting 30 soil samples from 5 sample locations; however, only 15 (including 3 duplicates) samples were collected from 5 sample locations because the depth to bedrock was less than anticipated in the Work Plan.
2. A temporary monitor (TW-2008-15) well was installed to evaluate alluvial water near bedrock monitor well MW-2008-11.

2.13.4 Characterization Results

The following discussion includes results from the 2004 HGC investigation and the 2008 VRP investigation. Analytical results are presented on Table 2-7 and summarized on Figure 2-12. Figure 2-12 only shows sample results for borings with concentrations greater than the nr-SRL or GPL. Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.13.4.1 Physical Characteristics

Five soil borings in the Former Raffinate Pond subarea were advanced to the top of the underlying granodiorite bedrock. Bedrock was encountered between 3 and 7 ft bgs. The soils

overlying bedrock generally consisted of loose silty sands with layers of cobble-sized fill material.

In October 2008, depth to bedrock groundwater ranged from approximately 30 ft bgs in downgradient wells MW-2008-09 and MW-2009-10 to approximately 14 ft bgs in upgradient well MW-2008-11. The general direction of bedrock groundwater flow is to the southeast. Alluvial groundwater was not present at temporary alluvial monitor well TW-2008-15 in October 2008.

2.13.4.2 Soil Samples

A total of 20 soil samples (including 3 duplicates) were collected from 7 locations (RA-JS-01 through RA-JS-05, EM-9, and EM-T-1) across the Former Raffinate Pond subarea. Arsenic concentrations in soil ranged from 1 to 89.7 mg/kg. Concentrations of arsenic in 10 soil samples (including 3 duplicates) exceeded the nr-SRL (10 mg/kg). Lead concentrations in soil ranged from 2.81 to349 mg/kg. Two soil samples had lead concentrations of lead greater than its GPL (290 mg/kg). Copper concentrations in soil ranged between 62 and 88,000 mg/kg. One soil sample had copper concentrations greater than the nr-SRL. Figure 2-12 shows sample results for borings with concentrations greater than the nr-SRL or GPL.

Arsenic was detected at concentrations greater than the nr-SRL (10 mg/kg) in 10 soil samples (including 3 duplicates) collected from 3 sample locations (RA-JS-01, RA-JS-02, and EM-T-1). All samples with arsenic concentrations greater than the nr-SRL were collected from 0 to 7 ft bgs. The deepest borings encountered refusal at 7 ft bgs at two judgmental sample locations. The GPL (290 mg/kg) for arsenic was not exceeded in any samples.

None of the soil lead concentrations exceeded the nr-SRL. Lead was detected at a concentration greater than the GPL (290 mg/kg) in two samples from one location (RA-JS-02). Lead was detected in RA-JS-02-00-01D (a duplicate) and RA-JS-02-01-03 at concentrations of 326 and 349 mg/kg, respectively. The samples were collected from a depth interval of 0 to 3 ft bgs. The lead concentration (137 mg/kg) in the primary sample for the duplicate (RA-JS-02-00-01) was less than the GPL.

One of the soil samples (RA-JS-02-01-03) whose lead concentration (349 mg/kg) exceeded the lead GPL (290 mg/kg) was submitted for SPLP lead analysis to determine its lead leachability. The reported lead SPLP concentration was 0.004 mg/L which is less than the ADEQ aquifer water quality standard and does not appear to pose a threat to groundwater quality.

Copper was detected in one soil sample (a duplicate [RA-JS-02-0-1D]) from a depth interval of 0 to 1 ft bgs at a concentration of 88,000 mg/kg, which exceeds the copper nr-SRL (41,000 mg/kg). The primary sample (RA-JS-02-0-1) had a copper concentration (30,200 mg/kg) less than the nr-SRL. None of the other soil copper results were greater than its nr-SRL. No GPL is established for copper.

Antimony, barium, beryllium, chromium, cobalt, manganese, molybdenum, nickel, selenium, thallium, uranium, and zinc were detected in most of the soil samples but the detected concentrations were less than their respective nr-SRL or GPL. Cadmium and mercury were generally not detected above their reporting limits in most of the soil samples.

2.13.4.3 Sediment Samples

Eight sediment samples (including four duplicates) were collected from two locations (RA-SD-01 and RA-SD-02) along the drainage in the northern portion of the Former Raffinate Pond. A duplicate sample was collected with each primary sample. The samples were collected between 0 and 3 ft bgs. Arsenic was detected above the nr-SRL (10 mg/kg) in every sediment sample at concentrations ranging from 10.1 to 55.1 mg/kg. None of the sediment arsenic concentrations were greater than its GPL (290 mg/kg). No other sediment COIs were detected at concentrations above their respective nr-SRLs or GPLs.

2.13.5 Former Raffinate Pond Subarea Summary

Arsenic, lead, and copper were the only COIs detected in soil samples at concentration(s) exceeding their nr-SRLs; lead was the only COI detected in soil at concentrations exceeding its GPL. The analytical results from the 2004 investigation and the 2008 URS investigation indicate that arsenic is the most frequently detected COI in soils and sediments in the Former Raffinate Pond subarea. Arsenic was detected in all 28 soil and sediment samples (including 7 duplicates) submitted for analysis, with 18 samples (including 7 duplicates) containing arsenic at concentrations exceeding its nr-SRL. All of the arsenic concentrations were less than its GPL. The lead and copper concentrations greater than their nr-SRL and GPL, respectively, only occurred at one sample location (RA-JS-02) at a depth interval of 0 to 3 ft bgs.

Soils and sediments in the central portion of the Former Raffinate Pond contain arsenic at concentrations exceeding its nr-SRL to a depth of at least 7 ft bgs, where the top of bedrock was encountered. Two sediment sample locations, RA-SD-01 and RA-SD-02, were advanced using a hand auger to a target depth of 3 ft bgs. The sediment samples also had arsenic concentrations greater than the nr-SRL to 3 ft bgs.

2.14 Former Laydown Yard Subarea

The Former Laydown Yard is located in the central portion of the Sierrita property within the Former Esperanza Mill subarea (Figures 1-2 and 2-13). The Former Laydown Yard comprises an area of approximately 2.6 acres. The Former Laydown Yard is an inactive, historical operation that is not an APP-regulated facility.

2.14.1 Subarea Description

Interviews with current Sierrita employees indicate that the Former Laydown Yard was used from the 1960's until the Esperanza Mill was demolished in 2005. During this time period, the Former Laydown Yard was used to store equipment, new drums, and salvage materials from decommissioned site facilities such as the Former Esperanza Mill. A subcontractor removed and salvaged the rusted drums and other equipment. The Former Laydown Yard is currently used by a contractor for their mobile office and a few pieces of mobile equipment

The topography of the Former Laydown Yard slopes gently to the southeast. The Former Laydown Yard appears to be largely fill material. The southeastern extent of the fill material forms a steep slope, at a height of approximately 15 feet. Mill balls and miscellaneous metal debris are still visible within the fill material.

2.14.2 2004 HGC Investigation

The following sample was collected during HGC's 2004 investigation at the Former Laydown Yard:

- 1 surface soil sample at 1 location

2.14.3 2008 VRP Investigation

In July and August 2008, URS collected the following samples to supplement the 2004 data:

- 16 soil samples (including 1 duplicate) from soil borings at 4 judgmental (JS) sample locations

Refer to Figure 2-13 for the locations of the soil samples. Refer to Table 2-8 for sample designations, sampling depth intervals, and analytical results.

Sixteen soil samples (including 1 duplicate) were collected from four judgmental soil borings (EM-JS-02 and EM-JS-06 through EM-JS-08) within the footprint of the Former Laydown Yard. These locations were not included as part of the Work Plan, but were added during the VRP investigation to characterize this newly identified subarea. The sample depth intervals ranged

from 0 to 1 to 15 to 16 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-8. The deepest soil samples were collected from 16 ft bgs at boring EM-JS-07.

One temporary alluvial monitor well (TW-2008-14) was installed to monitor alluvial groundwater immediately downgradient of the Former Laydown Yard.

Deviations from the Work Plan (URS 2008) were made due to actual conditions encountered in the field:

1. The field work at the Former Laydown Yard is a deviation from the Work Plan (URS 2008). All of the soil samples and the temporary alluvial well are additions to the Work Plan.

2.14.4 Characterization Results

The following discussion is based on results of the 2004 HGC investigation and the 2008 VRP investigation. Analytical results are presented on Table 2-8 and summarized on Figure 2-14. Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.14.4.1 Physical Characteristics

Four soil borings were advanced through the Former Laydown Yard fill material to the top of the underlying granodiorite bedrock. The thickness of the fill material appears to range from 4 to 16 feet. The top eight feet of fill was characterized as dry, loose, silty sand. Below eight feet the fill material was characterized as black stained silty sand possessing a hydrocarbon odor. Material that appeared to be asphalt was observed in some of the borings.

In October 2008, the depth to bedrock groundwater ranged from approximately 31 ft bgs in PZ-03 to approximately 30 ft bgs in monitor well MW-2008-09. The general direction of bedrock groundwater flow is to the east-southeast. Alluvial groundwater was not present in temporary alluvial monitor well (TW-2008-14) in October 2008.

2.14.4.2 Soil Samples

Seventeen soil samples (including 1 duplicate) were collected from 5 borings within the footprint of the Former Laydown Yard. Arsenic, molybdenum, and lead concentrations in some of the soil samples were greater than their respective nr-SRLs. A summary of the results that exceed the nr-SRLs are listed on Table 2-8 and shown on Figure 2-14. Figure 2-14 only shows sample results for borings with COI concentrations greater than the nr-SRL or GPL.

Arsenic was detected in all soil samples at concentrations ranging from 3.4 to 64.8 mg/kg. Arsenic was detected at concentrations greater than the nr-SRL (10 mg/kg) in 11 soil samples collected from 4 borings. Arsenic concentrations exceeding the nr-SRL were found in soils to a depth of 16 ft bgs in boring EM-JS-07. The arsenic GPL (290 mg/kg) was not exceeded by any of the sample results.

Lead was detected in all soil samples at concentrations ranging from 33.5 to 999 mg/kg. Lead was detected at concentrations above the nr-SRL (800 mg/kg) in one sample from boring EM-JS-08 at a depth interval of 5 to 7 ft bgs. The highest soil lead concentration (999 mg/kg) was detected in EM-JS-08 at a depth interval of 5 to 7 ft bgs. Soil lead concentrations exceeded its GPL (290 mg/kg) in three soil samples (EM-JS-02-01-03, EM-JS-08-05-07, and EM-JS-08-10-12) collected from two borings (EM-JS-02 and EM-JS-08).

To evaluate the soil lead leachability, SPLP analyses was conducted on two soil samples (EM-JS-08-05-07 and EM-JS-08-10-12) with soil lead concentrations greater than the GPL (999 and 303 mg/kg). The SPLP lead results were less than the reporting limit (0.0005 milligrams per liter [mg/L]) and 0.002 mg/L, respectively. The leachable lead concentrations are less than the ADEQ aquifer water quality standard of 0.05 mg/L and do not appear to pose a threat to groundwater quality.

Molybdenum was detected in all soil samples at concentrations ranging from 8 to 6,830 mg/kg. The highest soil molybdenum concentration (6,830 mg/kg) was detected in EM-JS-07 at a depth interval of 0 to 1 ft bgs. Molybdenum concentrations exceeded the nr-SRL (5,100 mg/kg) in four samples (EM-JS-07-00-01, EM-JS-07-10-12, EM-JS-08-05-07, and EM-20) collected from three locations (EM-JS-07, EM-JS-08, and EM-20). Molybdenum concentrations exceeding the nr-SRL were found in soils to a depth of 12 ft bgs in boring EM-JS-07. No GPL has been established for molybdenum.

Antimony, barium, beryllium, cadmium, chromium, cobalt, copper, manganese, mercury, nickel, selenium, thallium, uranium, and zinc were detected in most of the soil samples but the detected concentrations were less than their respective nr-SRL or GPL.

2.14.5 Former Laydown Yard Subarea Summary

Arsenic, lead, and molybdenum were the only soil COIs detected at concentrations above nr-SRLs in the Former Laydown Yard subarea. Lead was the only soil COI detected above its GPL. Every soil boring advanced through the fill material of the Former Laydown Yard contained at least one soil sample with a COI concentration that exceeded either its nr-SRL or GPL. The random occurrence of these COIs suggests that the fill is not homogenous and may be from

various sources. Based on the soil borings it appears that the fill material is laying directly on or very near the bedrock surface.

2.15 Former Rhenium Ponds Subarea

The Former Rhenium Ponds subarea consisted of three parallel impoundments located on the Esperanza Tailing Impoundment (Figures 1-2 and 2-15). The Former Rhenium Ponds are listed as a "to be closed" facility in the APP. The APP reports that the facility will be closed at mine closure under the Mine Closure Reclamation Plan.

2.15.1 Subarea Description

The Former Rhenium Ponds consisted of three impoundments excavated side by side into the surface of the Esperanza Tailing Impoundment. The ponds were used for the storage and evaporation of process solutions from the Rhenium Plant (Montgomery Watson 1999). Each pond measured roughly 250 feet long, 65 feet wide, and 10 to 12 feet deep, and were lined with geosynthetic; however, the integrity of the lining was uncertain (MWH 2005). The operation began in 1981 and continued until 1991.

In 1998 Cyprus Amax closed the impoundments. Closure of these ponds consisted of excavating sediments from the cells and recycling the material on the heap leach stockpiles. The ponds were then backfilled with tailing. In 1999 the area was capped with 12 inches of growth medium and re-vegetated.

The Former Rhenium Ponds are located at the northwest corner of the Esperanza Tailing Impoundment. The topography of the immediate and surrounding area is generally flat (i.e., level) because of the nature of tailing deposition. Surface runoff (if any) would flow east and collect in a slight depression that parallels the road located just south of the Former Rhenium Ponds. The area supports a vegetated cover of native grasses.

2.15.2 Initial Closure Sampling

To verify the 1998 closure, a test pit was excavated into the impoundment area to a depth of 12 ft bgs (MWH 2005). Soil samples were collected every foot throughout the entire depth of the excavation. The soil samples were composited as one sample and submitted for total metals and SPLP analysis.

2.15.3 2008 VRP Investigation

URS collected the following samples to further characterize the Former Rhenium Pond subarea:

- 12 soil samples (including 2 duplicates) from soil borings at 2 judgmental (JS) locations

Refer to Figure 2-15 for the locations of the soil samples. Refer to Table 2-9 for sample designations, sampling depth intervals, and analytical results.

Twelve (including 2 duplicate) judgmental soil samples were collected from two borings (RP-JS-01 and RP-JS-02) within the footprint of the former impoundment. Both soil borings were advanced to 20 ft bgs. The sample depth intervals ranged from 0 to 1 to 15 to 17 ft bgs. Specific soil sample intervals for each boring are listed on Table 2-9. No monitor wells were installed nor sediment or groundwater samples collected.

2.15.4 Characterization Results

The following discussion is based on results of the 2008 VRP investigation. Analytical results are presented on Table 2-9. Laboratory data packages are contained in Appendix B. Data verification and validation results are summarized in Section 3.0 and reported in Appendices C and D.

2.15.4.1 Physical Characteristics

Two borings, RP-JS-01 and RP-JS-02, were advanced within the footprint of the Former Rhenium Ponds into the underlying soil or tailing. The upper material generally consisted of yellowish-brown silt with sand. The deeper materials consisted of well sorted, gray sand.

In October 2008, the depth to bedrock groundwater beneath the Former Rhenium Ponds ranged from 247 to 140 ft bgs at piezometers PZ-2007-05 and PZ-07, respectively. The general direction of bedrock groundwater flow is to the southeast.

2.15.4.2 Soil Samples

Twelve soil samples (including 2 duplicates) were collected from two locations (RP-JS-01 and RP-JS-02) in the Former Rhenium Ponds. In addition, one composite soil sample was collected in 2005. Analysis of these samples did not detect any concentrations of COIs that exceeded the nr-SRLs or GPLs.

2.15.5 Former Rhenium Ponds Subarea Summary

No COIs were detected at concentrations above their respective nr-SRLs or GPLs in the soil samples collected from boring locations RP-JS-01 and RP-JS-02 or during closure (MWH 2005) in the Former Rhenium Pond subarea.

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL) [2]				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																		
		Top	**Bottom**																	
2008 SOIL CHARACTERIZATION																				
CP-JS-01-00-01	7/15/2008	0	1	0.4	7.3	654	1.3	< 2	8	8	1,390	5.93	297	0.06	15	8	0.28	0.3	2.36	45
CP-JS-01-01-03	7/15/2008	1	3	0.4 B,M2	12.3	336	0.8	< 2	7	12	781	7.4	379	< 0.2	53	8	0.69	< 0.3	4.29	39
CP-JS-01-05-07	7/15/2008	5	7	5.9	32.8	130	0.7	< 2	7	12	822	44.3	482	< 0.2	34	7	0.24	0.39	5.11	42
CP-JS-01-10-12	7/15/2008	10	12	0.7	28.1	159	< 5	< 8	3	18	506	8.98	1,240	< 0.2	200	14	1.68	0.36	7.77	65
CP-JS-02-00-01	7/11/2008	0	1	1	6.3	36.8	0.8	< 2	3	12	2,690	39.7	345	0.07	618	2	3.15	0.12	6.34	114
CP-JS-02-01-03	7/11/2008	1	3	0.2	2.8	77.4	0.8	< 2	7	5	174	7.39	122	< 0.2	27	4	0.17	< 0.3	0.93	34
CP-JS-03-00-01	7/14/2008	0	1	< 1	3.3	164 M1	0.3	0.7	7	11	1,700	24.5	456	< 0.2	75 M1	15	0.67 B4	0.29	4.29	158
CP-JS-03-01-03	7/14/2008	1	3	< 1 M2	2	189	0.2	< 2	9	12	888	13	456	< 0.2	20	15	0.3 B4	0.22	3.96	129
CP-JS-03-05-07	7/14/2008	5	7	< 1	2	205	0.4	< 2	8	11	1,680	5.98	496	< 0.2	26	13	0.44	0.49	5.27	78
CP-JS-04-00-01	8/27/2008	0	1	0.4	4.5	165 M2	0.5	< 2	5 B,R8	13	1,710	14.3	396	< 0.2	223	8	1.26	0.35	4.96	82
CP-JS-04-01-03	8/27/2008	1	3	0.2	1.6	172	0.4	< 2	5 R8	12	684	4.55	469	< 0.2	24	8	0.26 B,R8	0.28 B,R8	5.03 R8	77
CP-JS-04-05-07	8/27/2008	5	7	0.4	8.7	183	0.4	< 2	5	11	1,400	10.9	343	< 0.2	202	7	0.76	0.36	16	63
CP-JS-04-10-12	8/27/2008	10	12	< 1	2.3	106	0.4	< 2	5	9	1,080	5.36	347	< 0.2	34	7	0.56	0.26	8.72	71
CP-JS-04-15-17	8/27/2008	15	17	0.2	2.1	108	0.5	< 2	5	8	1,760	7.04	374	< 0.2	51	7	0.48	0.22	7.39	59
CP-JS-04-20	8/27/2008	20	20	< 1	2.2	169	0.4	< 2	7	10	582	4.12	350	< 0.2	24	8	0.29	0.27	6.96	29
CP-M04-00-01	7/11/2008	0	1	2.3	12.6	130	0.5	0.7	9	9	9,390	48.1	333	0.15	704	7	3.09	0.24	5.55	272
CP-M04-01-02.5	7/11/2008	1	2.5	1.1	7.5	142	0.4	0.6	26	5	3,900	48.1	319	0.16	206	7	1.29	0.12	3.01	212
CP-M04-05-05.4	7/11/2008	5	5.4	< 1	1.5	197	0.5	< 2	6	11	1,720	6.55	374	< 0.2	48	7	0.87	0.41	9.05	45
CP-M06-00-01	7/11/2008	0	1	< 1	2.6	67.1	0.5	< 2	6	4	207	7.76	159	< 0.2	23	3	0.23	0.11	1.45	26
CP-M06-01-03	7/11/2008	1	3	0.2	3	92.4	0.7	< 2	7	4	200	8.17	157	< 0.2	14	4	0.35	0.14	1.35	27
CP-N08-00-01	7/11/2008	0	1	< 1 U,M2	4.1	169	0.4	< 2	5	11	1,070	10.1	504	< 0.2	27	8	0.42	0.27	4.77	94
CP-N08-01-03	7/11/2008	1	3	0.6	7.5	188 M1	0.4 B,M2,R8	< 2 U,M2	7 M2,R8	12 M2,R8	2,420	16.3	294	0.04	149 M2,R8	9 M2,R8	0.85	0.53	8.99	161 M2,R8
CP-N08-05-07	7/11/2008	5	7	0.5	7.7	186	0.4	< 2	11	11	1,100	9.56	365	< 0.2	77	9	0.54	0.41	9.35	66
CP-N08-10-11	7/11/2008	10	11	2.9	41.9	213	0.6	< 2	14	9	1,190	9.66	271	0.1	106	9	1.58	0.34	9.05	73
CP-O03-00-01	7/11/2008	0	1	< 1	2.3	251	0.5	< 2	8	14	1,700	5.35	386	< 0.2	102	11	0.45	0.4	4.91	119
CP-O03-01-03	7/11/2008	1	3	< 1	1.2	212	< 1	< 2	5	13	298	1.72	440	< 0.2	2	11	0.81	0.31	7.25	77
CP-O09-00-01	7/11/2008	0	1	< 1	3.5	142	0.5	< 2	5	11	913	11.2	469	< 0.2	69	8	0.39	0.32	4.91	106
CP-O09-01-03	7/11/2008	1	3	< 1	3.4	187	0.5	< 2	7	13	1,500	26.7	442	< 0.2	43	10	0.45	0.35	5.66	146

Table 2-1
Former Clear Plant Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

			Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]			410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL) [2]			35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																	
		Top	**Bottom**																
CP-O09-05-07	7/11/2008	5	7	< 1	2.6	158	0.4	< 2	12	9	2,480	18.6	317	< 0.2	36	9	0.39	0.29	3.4	78
CP-O09-10-12	7/11/2008	10	12	0.4	3.7	155	0.4	1.1	25	11	1,670	46.1	343	< 0.2	73	11	0.84	0.31	3.45	123
CP-O09-15-17	7/11/2008	15	17	< 1	1.4	155	0.3	< 2	7	10	666	6.56	326	< 0.2	16	9	0.23	0.36	2.62	147
CP-P04-00-01	7/15/2008	0	1	< 1	1.6	206	0.4	< 2	8	7	626	4.87	275	< 0.2	33	7	0.48	0.37	3.77	34
CP-P04-01-03	7/15/2008	1	3	< 1	1	154	< 1	< 2	3	8	518	1.2	295	< 0.2	4	6	0.07	0.29	2.41	39
CP-P05-00-01	7/15/2008	0	1	< 1	1.6	115	0.4	< 2	5	9	973	7.41	330	< 0.2	72	7	0.34	0.22	4.75	55
CP-P05-01-03	7/15/2008	1	3	< 1	1.1	197	0.4	< 2	4	7	289	2.05	307	< 0.2	3	6	0.07	0.22	3.16	29
2008 SOIL CHARACTERIZATION																			
CP-P07-00-01	7/17/2008	0	1	< 1	1.5	99.5	0.4	< 2	6	8	538	9.36	293	< 0.2	26	7	0.36	0.15	3.24	44
CP-P07-01-03	7/17/2008	1	3	< 1	1.1	80.4	0.3	< 2	5	7	210	3.38	276	< 0.2	31	6	0.24	0.14	3.79	39
CP-P07-05-07	7/17/2008	5	7	< 1	1.4	101	< 1	< 2	13	8	333	3.79	283	< 0.2	53	8	0.5	0.16	4.03	88
CP-P12-00-01	7/23/2008	0	1	0.9	5.5	81.4	0.7	< 2	13	6	1,680	39	167	< 0.2	239	31	1.48	0.26	3.15	96
CP-P12-01-03	7/23/2008	1	3	0.3	3.4	49.9	0.8	< 2	10	3	337	7.98	85	< 0.2	9	31	0.19	0.18	1.3	27
CP-Q09-00-01	7/23/2008	0	1	0.3 B,M2	2.3	120	0.6	< 2	12	8	724	4.61	202	< 0.2	123	29	0.35	0.26	2.21	44
CP-Q09-01-03	7/23/2008	1	3	< 1	1.5	247	0.3	< 2	7	5	499	3.19	170	< 0.2	8	22	0.14	0.49	2.67	30
2008 SEDIMENT CHARATERIZATION																			
CP-SD-01-00-01.5	7/16/2008	0	1.5	< 1	2.1	145	0.4	< 2	6	10	979	5.49	342	< 0.2	121	8	0.37	0.23	4.04	49
CP-SD-01-01.5-03.0	7/16/2008	1.5	3	< 1	1	140	0.4	< 2	6	9	253	1.72	314	< 0.2	4	8	0.08	0.25	2.34	30
CP-SD-02-00-01.5	7/16/2008	0	1.5	< 1	1.1	117	< 1	< 2	3	6	451	4	207	< 0.2	32	6	0.31	0.18	2.5	31
CP-SD-02-01.5-03.0	7/16/2008	1.5	3	< 1	1.5	41.1	0.3	< 2	2	3	780	3.78	148	< 0.2	18	2	0.21	< 0.3	2.82	30
CP-SD-03-00-01.5	7/16/2008	0	1.5	< 1	2.9	95.3	0.7	< 2	5	7	995	9.49	257	< 0.2	114	5	0.36	0.13	4.05	48
CP-SD-03-01.5-03.0	7/16/2008	1.5	3	< 1	1.9	112	0.5	< 2	4	7	335	5.32	302	< 0.2	44	6	0.2	0.14	3.86	34
CP-SD-04-00-01.5	7/17/2008	0	1.5	< 1	1.8	166	0.6	< 2	7	11	1,180	4.25	403	< 0.2	40	10	0.36	0.43	4.05	57
CP-SD-04-01.5-03.0	7/17/2008	1.5	3	< 1	1	170	0.4	< 2	7	11	512	2.14	448	< 0.2	7	10	0.12	0.35	4.76	46
CP-SD-05-00-01.5	7/16/2008	0	1.5	< 1	5.4	123	0.6	< 2	6	11	561	8.74	343	< 0.2	126	7	0.51	0.13	3.61	43
CP-SD-05-01.5-03.0	7/16/2008	1.5	3	< 1	3.6	181	0.5	< 2	6	11	283	4.91	359	< 0.2	24	8	0.31	0.17	2.86	42

Table 2-1
Former Clear Plant Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL) [2]				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																		
		Top	**Bottom**																	
CP-SD-06-00-01.5	7/16/2008	0	1.5	< 1	3.7	177	0.7	< 2	6	17	976	4.17	447	< 0.2	43	10	0.46	0.29	5.54	86
CP-SD-06-01.5-03.0	7/16/2008	1.5	3	< 1	4	174	0.5	< 2	6	11	729	3.75	375	< 0.2	37	8	0.26	0.28	3.81	39
CP-SD-07-00-01.5	7/23/2008	0	1.5	0.2	2.9	136	0.9	< 2	14	9	439	7.05	298	< 0.2	42	33	0.34	0.27	3.45	45
CP-SD-07-01.5-03.0	7/23/2008	1.5	3	0.2	0.8	166	0.5	< 2	9	11	180	2.49	344	< 0.2	2	31	< 0.3	0.3	2.19	47
CP-SD-08-00-01.5	7/28/2008	0	1.5	0.2	2	135	0.5	< 2	12	10	599	6.87	283	< 0.2	86	31	0.27	0.25	5.96	50
CP-SD-08-01.5-03.0	7/28/2008	1.5	3	< 1	1.2	164	0.5	< 2	11	11	142	3.69	300	< 0.2	9	27	0.09	0.33	3.99	52
CP-SD-09-00-01.5	7/28/2008	0	1.5	0.3	1.9	139	0.4	< 2	11	10	1,100	11.3	312	< 0.2	157	29	0.3	0.21	2.44	75
CP-SD-09-01.5-03.0	7/28/2008	1.5	3	< 1	0.7	131	0.2	< 2	11	9	380	26.6	239	< 0.2	25	28	< 0.3	0.25	2.46	52
CP-SD-10-00-01.5	7/28/2008	0	1.5	0.2	3.6	161	0.5	< 2	11	9	570	6.23	278	< 0.2	84	29	0.34	0.25	4.13	47
CP-SD-10-01.5-03.0	7/28/2008	1.5	3	< 1	1.2	193	0.4	< 2	13	12	269	1.81	332	< 0.2	3	31	< 0.3	0.32	4.41	53
2004 INVESTIGATION																				
CP-1	8/13/2004	0	0.25	**52***	105	NA	0.38	3	42	76	45,600	**638***	156	<0.04	1,440	38	40	0.7	NA	34
CP-2	8/13/2004	0	0.25	**66***	166	NA	0.11	4	35	40	9,020	**1820***	71	0.62	3,020	17	50	5.2	NA	300
CP-3	8/13/2004	0	0.25	4.5	16.3	NA	0.27	3.23	21	37	21,700	51.7	317	0.07	1,900	26	13.4	0.35	NA	143
CP-5	8/13/2004	0	0.25	2	17.1	NA	0.58	4.5	58	20	6,220	141	332	0.12	522	64	4	0.46	NA	793
CP-7	8/13/2004	0	0.25	4.5	31.3	NA	0.52	5.01	9	NA	20,000	152	295	0.32	2,820	7	10.3	0.23	NA	451
CP-9	8/13/2004	0	0.25	10.3	40.1	NA	0.51	24.9	20	20	59,300	200	587	0.18	2,290	23	16.1	0.23	NA	6210
CP-13	8/13/2004	0	0.25	0.6	5.44	NA	1.08	0.48	12	NA	1,090	15.4	177	<0.05	273	7	0.7	0.31	NA	76
CP-14	8/13/2004	0	0.25	0.3	4.63	NA	0.44	1.01	6	NA	2,080	12.7	464	<0.04	369	8	0.9	0.23	NA	118
CP-15	8/13/2004	0	0.25	1.9	13.7	NA	0.51	7.38	22	NA	8,260	116	335	0.11	456	14	3.2	0.17	NA	730
2004 INVESTIGATION																				
CP-16	8/13/2004	0	0.25	11	34.9	NA	0.39	21.2	17	NA	109,000	**950***	384	0.37	1,980	31	12	0.4	NA	4400
CP-19	8/13/2004	0	0.25	1.6	9.1	NA	0.42	5.95	7	NA	23,800	45.0	273	0.11	2,430	12	28.4	0.21	NA	658
CP-21	8/13/2004	0	0.25	0.4	4.81	NA	0.46	1.26	7	NA	2,360	25.1	377	<0.04	446	9	1	0.21	NA	134
CP-T-1-1.5'	10/4/2004	-	1.5	0.8	18.1	NA	0.7	8.9	25	NA	40,100	77.1	347	0.06	377	37	2.1	1.00	NA	1,270
CP-T-1-2'	10/4/2004	-	2	NA	8.64	NA	0.82	NA	NA	NA	2,520	21.7	NA	NA	368	NA	NA	NA	NA	NA
CP-T-1-4'	10/4/2004	-	4	NA	14.3	NA	1.29	NA	NA	NA	4,390	37.2	NA	NA	182	NA	NA	NA	NA	NA
CP-T-1-8'	10/4/2004	-	8	NA	4.2	NA	0.52	NA	NA	NA	1,200	12.7	NA	NA	114	NA	NA	NA	NA	NA
CP-T-2-2'	10/4/2004	-	2	NA	3.6	NA	0.63	NA	NA	NA	765	12.5	NA	NA	38	NA	NA	NA	NA	NA
CP-T-2-7'	10/4/2004	-	7	NA	5.63	NA	0.58	NA	NA	NA	2,160	39.8	NA	NA	135	NA	NA	NA	NA	NA

Table 2-1
Former Clear Plant Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL) [2]				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	Sample Date	Depth (ft bgs)																		
		Top	Bottom																	
CP-T-2-7'BL	10/4/2004	-	7	7.6	37.1	NA	0.2	2.2	9	NA	1,470	270	157	<0.05	535	4	8.1	0.20	NA	43
CP-T-2-10'	10/4/2004	-	10	NA	5.43	NA	0.63	NA	NA	NA	2,850	44.7	NA	NA	99	NA	NA	NA	NA	NA
CP-T-2-15'	10/4/2004	-	15	NA	3.62	NA	0.73	NA	NA	NA	4,350	80.10	NA	NA	72	NA	NA	NA	NA	NA
CP-T-2-B-6'	10/4/2004	-	6	1.4	11.8	NA	0.35	2.75	10	NA	2,600	62.4	569	0.05	625	9	2.5	0.32	NA	127
CP-T-2-C-6'	10/4/2004	-	6	2.1	14.8	NA	0.3	1.5	9	NA	1,950	**293***	197	<0.04	331	6	3.9	0.30	NA	92
CP-T-3-0.5'	10/4/2004	-	0.5	NA	5.6	NA	1.4	NA	NA	NA	4,750	31.1	NA	NA	62	NA	NA	NA	NA	NA
CP-T-3-0.75'	10/4/2004	-	0.75	1.2	20.9	NA	0.48	1.07	7	NA	978	6.03	379	<0.04	264	9	0.6	0.37	NA	47
CP-T-3-8'	10/4/2004	-	8	NA	26.9	NA	0.5	NA	NA	NA	14,100	**488***	NA	NA	615	NA	NA	NA	NA	NA
CP-T-4-1.5'	10/4/2004	-	1.5	0.4	1.1	NA	1	18.1	470	NA	57,300	4.1	759	<0.04	60	70	3.7	<0.1	NA	4,900
CP-T-4-1.5'C	10/5/2004	-	1.5	0.5	4.88	NA	0.28	1.74	24	NA	2,790	14.4	244	<0.04	347	11	2.6	0.34	NA	153
CP-T-4-2.5'	10/4/2004	-	2.5	NA	16.4	NA	0.41	NA	NA	NA	998	7.26	NA	NA	330	NA	NA	NA	NA	NA
CP-T-4-14'	10/4/2004	-	14	NA	10.4	NA	0.45	NA	NA	NA	1,570	3.66	NA	NA	91	NA	NA	NA	NA	NA
CP-T-5-1.5'	10/4/2004	-	1.5	0.4	4.7	NA	0.23	0.62	9	NA	839	13.9	235	<0.04	115	4	0.8	0.18	NA	57
CP-T-5-3'	10/4/2004	-	3	NA	4.14	NA	0.57	NA	NA	NA	1,050	12.4	NA	NA	95	NA	NA	NA	NA	NA
CP-T-5-6'	10/4/2004	-	6	NA	5.27	NA	0.44	NA	NA	NA	746	3.98	NA	NA	60	NA	NA	NA	NA	NA
CP-T-6-2'	10/4/2004	-	2	NA	5.38	NA	0.6	NA	NA	NA	1,900	29.2	NA	NA	76	NA	NA	NA	NA	NA
CP-T-6-4'	10/4/2004	-	4	NA	4.75	NA	0.6	NA	NA	NA	2,150	45	NA	NA	143	NA	NA	NA	NA	NA
CP-T-6-6'	10/4/2004	-	6	NA	3.96	NA	0.51	NA	NA	NA	1,410	28.1	NA	NA	52	NA	NA	NA	NA	NA

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

mg/kg - milligrams per Kilogram

Cr III - trivalent chromium

NE - not established

ft bgs - feet below ground surface

NA - not analyzed

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

B - Results reported between MDL and RL were flagged with a B by the laboratory.

B4 - Target analyte detected in blank at or above method acceptance criteria.

M1 - Matrix spike recovery was high; the associated blank recovery was acceptable.

M2 - Matrix spike recovery was low; the associted blank spike recovery was acceptable.

R8 - Sample RPD exceeded the method acceptance limit.

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 limit.

Table 2-1
Former Clear Plant Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																		
		Top	**Bottom**																	
2008 CHARACTERIZATION																				
E-JS-01-00-01	7/14/2008	0	1	0.3	2.9	146	< 1	0.8	5	10	2650	22.9	369	< 0.2	104	11	0.78	0.17	3.11	197
E-JS-01-01-03	7/14/2008	1	3	0.2	2.5	122	< 1	< 2	3	8	1810	19.1	327	< 0.2	79	10	0.59	0.13	3.04	165
E-JS-01-05-07	7/14/2008	5	7	< 1	2	203	0.3	< 2	4	6	1510	6.62	182	< 0.2	246	9	0.42	0.12	2.9	134
E-JS-02-00-01	7/14/2008	0	1	0.3	3	183	0.3	0.5	7	10	1160	83.5	408	< 0.2	138	15	0.57	0.21	3.62	98
E-JS-02-01-03	7/14/2008	1	3	< 1	4	75.1	0.5	< 2	6	8	1290	10.2	719	< 0.2	98	12	0.67	< 0.3	9.68	87

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

mg/kg - milligrams per Kilogram

Cr III - trivalent chromium

NE - not established

NA - not analyzed

ft bgs - feet below ground surface

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

Table 2-2
Former E-Pond Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

			Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]			410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)			35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																	
		Top	**Bottom**																
2008 CHARACTERIZATION																			
EV-JS-01-00-01	7/14/2008	0	1	1.1	9.9	122	0.2	0.6	6	7	3,380	196	208	<0.2	547	11	3.43	0.4	4.26	100
EV-JS-01-01-03	7/14/2008	1	3	0.4	5.7	213	0.4	1.6	9	15	5,440	73.8	402	<0.2	258	18	1.85	0.44	7.05	224
EV-JS-01-05-07	7/14/2008	5	7	<1	5.5	169	0.6	6	7	12	1,550	12	342	<0.2	77	14	1.69	0.1	8.51	407
EV-JS-02-00-01	7/14/2008	0	1	0.3	2.8	105	0.2	<2	4	9	2,020	19.1	330	<0.2	67	14	0.47	0.1	2.87	124
EV-JS-02-01-03	7/14/2008	1	3	<1	1.1	96.2	<1	<2	7	10	583	1.59	357	<0.2	11	13	1.02	0.12	4.14	54
EV-JS-02-05-07	7/14/2008	5	7	<1	3.5	142	<1	<2	20	9	890	11.3	394	<0.2	37	17	0.46	0.14	5.53	77

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

mg/kg - milligrams per Kilogram

Cr III - trivalent chromium

NE - not established

ft bgs - feet below ground surface

NA - Not Analyzed

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

Table 2-3
Former Evaporation Pond Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																		
		Top	**Bottom**																	
2008 CHARACTERIZATION																				
OD-JS-01-00-01	7/29/2008	0	1	0.3	3.6	121	0.3	< 2	15	9	1,770	17.7	231	< 0.2	95	6	1.1	0.25	5.3	99
OD-JS-01-01-03	7/29/2008	1	3	< 1	1.8	149	< 1	< 2	9	10	121	2.1	328	< 0.2	8	7	0.11	0.28	2.54	42
OD-JS-02-00-01	7/29/2008	0	1	0.4	3.4	96.8	< 1	< 2	8	7	1,840	13.8	250	< 0.2	304	6	1.44	0.28	2.92	83
OD-JS-02-01-03	7/29/2008	1	3	< 1	1.4	170	0.5	< 2	9	13	1,310	4.43	391	< 0.2	9	9	0.11	0.32	3.68	89
OD-JS-02-05-07	7/29/2008	5	7	< 1	0.8	139	0.5	< 2	9	11	110	2.12	378	< 0.2	8	9	0.71	0.35	7.34	45
OD-JS-03-00-01	8/27/2008	0	1	0.6	10.6	118	0.3	< 2	8	8	1,470	19.3	236	< 0.2	97	7	0.85	0.23	4.32	111
OD-JS-03-01-03	8/27/2008	1	3	0.4	6.4	114	< 1	< 2	5	6	1,510	10.6	203	< 0.2	74	6	0.72	0.23	3.31	71
OD-JS-03-01-03D	8/27/2008	1	3	0.3	2.9	87.4	< 1	< 2	7	9	1,800	14.9	186	< 0.2	74	6	0.78	0.22	3.89	76
OD-SD-01-00-01.5	7/28/2008	0	1.5	0.3	2	184	0.4	< 2	13	11	361	5.32	332	< 0.2	87	30	0.23	0.29	3.11	51
OD-SD-01-01.5-03.0	7/28/2008	1.5	3	< 1	1.2	185	< 1	< 2	14	10	125	2.59	346	< 0.2	6	29	0.08	0.28	7.42	43
OD-SD-02-00-01.5	7/28/2008	0	1.5	0.2	2.2	173	0.5	< 2	13	12	376	7.63	390	< 0.2	107	32	0.42	0.3	4.66	60
OD-SD-02-01.5-03.0	7/28/2008	1.5	3	< 1	0.9	173	0.2	< 2	9	9	27	1.89	320	< 0.2	3	26	0.07	0.32	3.37	41
OD-SD-03-00-01.5	7/28/2008	0	1.5	0.3	2.7	158 M1	0.4	< 2	18	11	2,350	46.7	316	< 0.2	100	31	0.41	0.28	7.57	147
OD-SD-03-01.5-03.0	7/28/2008	1.5	3	< 2	2.8	87.9 M1	0.3	0.5	13	8	4,390	253	173	0.05	145	30	0.4	0.2	7.8	201
OD-SD-04-00-01.5	7/28/2008	0	1.5	0.3	3.1	118	0.4	< 2	11	11	1,640	8.86	262	< 0.2	128	29	0.53	0.3	4.25	68
OD-SD-04-01.5-03.0	7/28/2008	1.5	3	< 1	2.1	133	0.3	< 2	9	9	671	2.2	258	< 0.2	25	27	0.19	0.26	2.18	48
OD-SD-05-00-01.5	7/29/2008	0	1.5	0.8	6.2	141	0.6	1.1	22	13	3,960	102	365	0.05	230	8	1.04	0.39	5.57	179
OD-SD-05-01.5-03.0	7/29/2008	1.5	3	0.3	4.6	169	0.5	< 2	13	12	916	35.3	402	< 0.2	63	7	0.47	0.28	10.3	105
OD-SD-06-00-01.5	7/29/2008	0	1.5	0.5	5.3	109	0.5	< 2	13	11	2,590	29.3	334	< 0.2	115	7	1.04	0.3	4.33	198
OD-SD-06-01.5-03.0	7/29/2008	1.5	3	< 1	3.2	122	0.5	< 2	12	14	1,130	7.26	552	< 0.2	9	11	0.23	0.23	6.42	218

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

mg/kg - milligrams per Kilogram

Cr III - trivalent chromium

NE - not established

ft bgs - feet below ground surface

NA - Not Analyzed

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

M1 - Matrix spike recovery was high; the associated blank recovery was acceptable.

Table 2-4
Former Old "D" Pond Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	SPLP-Lead (mg/L)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/Kg)	Zinc (mg/Kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	NE	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	NE	12	NE	590	290	12	NE	NE
Sample ID	Sample Date	Depth (ft bgs)																			
		Top	Bottom																		
2008 CHARACTERIZATION																					
EM-JS-01-00-01	8/1/2008	0	1	0.5	4.3	103	0.6	< 2	7	8	840	24	NA	238	< 0.2	143	7	0.46	0.28 B,B4	2.9	88
EM-JS-01-01-03	8/1/2008	1	3	< 1	3.1	228	0.8	0.8	11	10	543	9.8	NA	388	< 0.2	8	13	0.12	0.26 B,B4	3.64	187
EM-C22-00-01	7/29/2008	0	1	2	13.9	82.7	0.5	0.8	19	16	5480	85.2	NA	323	0.2	4800	5	7.25	0.21	4.74	332
EM-C22-01-03	7/29/2008	1	3	0.5	5.1	161	0.5	< 2	13	13	1120	12.1	NA	378	< 0.2	270	9	0.28	0.25	3.37	122
EM-C22-05-07	7/29/2008	5	7	< 1	2.2	234	0.5	< 2	10	14	739	5.13	NA	370	< 0.2	5	8	0.15	0.26	2.45	85
EM-E24-00-01	7/29/2008	0	1	0.6	5	149	0.8	< 2	10	9	2270	26.5	NA	364	0.04	234	2	1.65	0.18	4.05	132
EM-E24-01-03	7/29/2008	1	3	1	7.6	116	0.9	< 2	11	10	2470	47.9	NA	369	< 0.2	362	3	2.42	0.22	5.32	159
EM-E24-05-07	7/29/2008	5	7	0.2	2.2	198	0.6	< 2	12	14	364	13.1	NA	434	< 0.2	57	10	0.32	0.38	4.07	68
EM-G27-00-01	8/7/2008	0	1	0.3	3.5	81.2	0.5	< 2	6	7	2750	30.9	NA	233	< 0.2	403	5	0.8	0.2	2.8	90
EM-G27-01-03	8/7/2008	1	3	< 1 U,M2	1.2	126	0.4	< 2	4	11	933	3.92	NA	399	< 0.2	3	7	0.07	0.29	3.7	57
EM-H22-00-01	7/30/2008	0	1	3.7	11.7	115 M2	0.5	1.6	8	10	10000	91.3	NA	294	0.05	821	7	4.53	0.42	3.34	293
EM-H22-01-03	7/30/2008	1	3	0.4	3.7	70.4	0.3	1	5	5	2330	15	NA	188	< 0.2	118	7	1.07	0.24	2.3	181
EM-H22-05-07	7/31/2008	5	7	< 1	1.1	199	0.5	1.7	6	14	1740	3.75	NA	594	< 0.2	10	14	0.06	0.51	3.75	464
EM-K24-00-01	7/31/2008	0	1	< 1	3	78.7	0.8	< 2	7	8	629	15.9	NA	175	< 0.2	66	6	0.52	0.28	2.5	46
EM-K24-01-03	7/31/2008	1	3	0.2	2.5	79.4	0.6	< 2	8	5	530	13.1	NA	124	< 0.2	19	6	0.21	0.26	3.16	47
EM-K24-05-07	7/31/2008	5	7	< 1	2.4	152	0.6	< 2	6	8	486	12.3	NA	241	< 0.2	24	7	0.27	0.25	2.89	45
EM-M26-00-01	8/1/2008	0	1	< 1	2.6	126	< 1	< 2	7	5	358	21.9	NA	146	< 0.2	66	5	0.35	0.18 B,B4	3.13	57
EM-M26-01-03	8/1/2008	1	3	0.3	3.7	48.4	0.4	< 2	8	4	469	20.3	NA	109	< 0.2	23	5	0.28	0.16 B,B4	5.3	97
EM-M26-05-07	8/1/2008	5	7	0.2	4.6	67.5	0.7	0.5	10	6	536	19.5	NA	144	< 0.2	44	7	0.16	0.19 B,B4	5.57	142
EM-N29-00-01	8/6/2008	0	1	0.4	5.2	56	0.9	< 2	9	6	495	25.8	NA	194	< 0.2	124	3	0.5	0.13	1.96	78
EM-N29-01-03	8/6/2008	1	3	0.6	7.5	65.9	1.1	< 2	6	17	805	41.8	NA	429	< 0.2	94	3	0.79	0.13	2.7	59
EM-P24-00-01	8/7/2008	0	1	< 1	2.3	104	0.7	< 2	5	10	719	15	NA	379	< 0.2	60	7	0.36	0.24	4.54	82
EM-P24-01-03	8/7/2008	1	3	< 1		79.9	0.5	< 2	6	5	483	14.6	NA	146	< 0.2	260	4	0.48	0.17	5.44	64
EM-P24-05-07	8/7/2008	5	7	< 1	2.3	86.5	0.4	< 2	8	6	540	24.6	NA	230	< 0.2	106	5	0.27	0.16	3.97	89
EM-P24-10-11	8/7/2008	10	11	< 1	2.1	132	0.9	< 2	3	8	348	104	NA	293	< 0.2	9	8	0.14	0.28	6.46	550

Table 2-5
Former Esperanza Mill Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	SPLP-Lead (mg/L)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/Kg)	Zinc (mg/Kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	NE	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																			
		Top	**Bottom**																		
EM-X26-00-01	8/6/2008	0	1	0.4	3.2	94.8	0.6	< 2	6	10	1390	12.8	NA	356	< 0.2	154	5	0.52	0.3	3.78	67
EM-X26-01-03	8/6/2008	1	3	< 1	1.7	52.8	0.2	< 2	5	7	424	6.02	NA	199	< 0.2	51	3	0.27	0.14	2.38	37
EM-X26-05-07	8/6/2008	5	7	0.5	4.5	101	0.5	< 2	5	7	1030	75.2	NA	232	0.06	307	5	0.63	0.24	5.86	77
2004 INVESTIGATION																					
EM-3	8/13/2004	0	0.25	4.7	34.8	NA	1	5.65	6	NA	11,600	133	NA	715	0.14	1,570	11	9.4	0.17	NA	824
EM-4	8/13/2004	0	0.25	0.9	10.8	NA	0.55	2.55	10	NA	8,360	61.9	NA	657	0.08	630	25	1.5	0.15	NA	443
EM-5	8/13/2004	0	0.25	0.3	3.62	NA	0.37	0.59	7	NA	1,880	12	NA	323	<0.04	122	8	<0.5	0.27	NA	195
EM-10	8/13/2004	0	0.25	0.6	9.52	NA	0.93	1.78	10	12	814	54.5	NA	538	<0.04	239	8	0.7	0.22	NA	256
EM-13	8/13/2004	0	0.25	0.3	4.23	NA	0.72	0.83	8	NA	668	12.7	NA	172	<0.05	2,640	8	<0.5	0.27	NA	64
EM-14	8/13/2004	0	0.25	0.4	11.8	NA	0.26	0.85	14	<5	409	8.87	NA	30	<0.05	471	< 5	1	0.89	NA	29
EM-17	8/13/2004	0	0.25	**69***	101	NA	0.33	2.8	3	3	2,330	80.7	NA	75.5	0.3	1,690	< 1	<5	<0.3	NA	77
EM-18	8/13/2004	0	0.25	0.7	10.4	NA	0.48	2.31	8	NA	3,560	54.8	NA	173	0.04	1,470	4	2.9	0.19	NA	67
EM-21	8/13/2004	0	0.25	0.5	4.09	NA	0.17	0.32	2	4	514	8.79	NA	110	<0.04	151	< 1	1.5	0.07	NA	25
EM-T-2-2'	10/5/2004	-	2	NA	3.58	NA	0.51	NA	16	NA	533	17.2	NA	NA	NA	16	NA	NA	NA	NA	NA
EM-T-2-2.5'	10/5/2004	-	2.5	<0.2	5.3	NA	0.70	3.6	36	NA	1,170	19	NA	31	<0.05	1,050	< 5	0.9	1.1	NA	40
EM-T-2-B-18''	10/5/2004	-	1.5	0.3	6.4	NA	0.90	0.5	33	NA	1,400	17.5	NA	198	<0.04	103	< 5	2.2	0.2	NA	169
EM-T-3-4'	10/5/2004	-	4	3.1	38.8	NA	0.90	1.6	90	NA	1,850	43.8	NA	212	<0.05	260	< 5	0.9	0.2	NA	111
EM-T-3-6'	10/5/2004	-	6	2	4.7	NA	1.03	1.37	8	NA	1,270	10.8	NA	593	<0.04	21	8	0.31	0.16	NA	209
EM-T-3-12'	10/5/2004	-	12	NA	3.52	NA	1.43	NA	NA	NA	733	12.4	NA	NA	NA	20	NA	NA	NA	NA	NA

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

mg/Kg - milligrams per Kilogram

mg/L - milligrams per Liter

Cr III - trivalent chromium

NE - not established

ft bgs - feet below ground surface

NA - not analyzed

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

B - Results reported between MDL and RL were flagged with a B by the laboratory.

B4 - Target analyte detected in blank at or above method acceptance criteria.

M2 - Matrix spike recovery waslow; the associated blank spike recovery was acceptable.

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 limit.

Table 2-5
Former Esperanza Mill Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	SPLP-Lead (mg/L)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	NE	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																			
		Top	**Bottom**																		
2008 CHARACTERIZATION																					
C POND SPOILS																					
CS-JS-01-00-01	8/4/2008	0	1	0.5	8.7	82.3	0.6	< 2	14	7	423	65.1	NA	386	< 0.2	142	6	0.62 B4	0.22	3.67	124
CS-JS-01-01-03	8/4/2008	1	3	< 1	2.2	121	0.6	< 2	37	8	432	90.5	NA	546	< 0.2	54	6	0.26 B,B4	0.2	4.66	172
CS-JS-01-05-07	8/4/2008	5	7	0.3	3.6	146	0.7	< 2	5	10	602	**343***	NA	486	< 0.2	134	5	0.48 B4	0.23	6.09	302
CS-JS-01-10-12	8/4/2008	10	12	1	5.8	123	0.7	< 2	9	12	4,580	47.9	NA	392	< 0.2	735	5	3.37 B4	0.27	6.9	150
CS-JS-02-00-01	8/4/2008	0	1	0.3	4	157	0.6	< 2	8	9	640	126	NA	348	< 0.2	81	6	0.41 B4	0.32	3.77	218
CS-JS-02-01-03	8/4/2008	1	3	0.2	3.3	85.6	0.7	< 2	7	7	448	25.7	NA	269	< 0.2	28	5	0.32 B4	0.26	3.28	269
CS-JS-02-05-07	8/4/2008	5	7	< 1	1.6	366	0.5	< 2	5	11	131	20.3	NA	430	< 0.2	5	9	0.19 B,B4	0.38	3	1,140
CS-JS-02-10-11	8/4/2008	10	11	0.7 B,M2	5.3	138	0.6	8.3	5	12	448	**376***	NA	717	< 0.2	15	8	0.24 B,B4	0.4	7.77	3,630
CS-JS-03-00-01	8/5/2008	0	1	0.3	3.8	95.4	0.4	< 2	8	17	562	57.2	NA	279	< 0.2	51	5	0.28	0.17	11	129
CS-JS-03-01-03	8/5/2008	1	3	0.3	3.5	123	0.6	< 2	8	8	802	48.8	NA	273	< 0.2	66	6	0.37	0.23	3.24	154
CS-JS-03-05-07	8/5/2008	5	7	0.2	2.9	142	0.6	< 2	13	10	770	88.7	NA	478	< 0.2	46	10	0.3	0.31	3.01	217
CS-JS-03-10-12	8/5/2008	10	12	0.3	3.3	201	0.4	< 2	8	11	641	71.4	NA	371	0.04	98	9	0.34	0.35	3	456
CS-JS-04-00-01	8/6/2008	0	1	0.4	3.2	111	0.4	< 2	7	8	557	131	NA	375	< 0.2	281	6	0.49	0.31	2.94	207
CS-JS-04-01-03	8/6/2008	1	3	0.6	4.3	101	0.4	< 2	17	8	658	18.2	NA	209	< 0.2	822	5	0.88	0.19	3.42	76
CS-JS-04-05-07	8/6/2008	5	7	< 1	1.6	216	0.6	1.4	6	14	425	16.3	NA	495	< 0.2	8	9	0.1	0.4	3.29	451
CS-JS-05-00-01	8/27/2008	0	1	0.2	3.9	294	0.5	< 2	5	12	116	38.1	NA	515	< 0.2	19	11	0.16	0.36	5.08	134
CS-JS-05-01-03	8/27/2008	1	3	0.5	14.6	103	0.6	1.7	4	6	148	280	NA	538	< 0.2	17	6	0.39	0.17	8.01	502
CS-JS-05-01-03D	8/27/2008	1	3	0.4	14.5	147	0.6	1.7	5	7	120	212	NA	495	< 0.2	13	7	0.37	0.23	8.81	417
CS-JS-06-00-01	8/27/2008	0	1	0.2	1.6	213	0.4	< 2	5	16	175	30.5	NA	501	< 0.2	7	12	0.14	0.49	3.15	168
CS-JS-06-01-03	8/27/2008	1	3	0.2 M2	1.2	168	0.5	1	5	11	149	3.5	NA	373	< 0.2	3	9	0.13	0.5	2.88	257
EM-U25-00-01	8/6/2008	0	1	0.4	3.2	265	0.6	0.6	7	10	728	100	NA	398	< 0.2	113	7	0.32	0.25	3.65	234
EM-U25-01-03	8/6/2008	1	3	0.4	4.6	156	0.7	< 2	8	11	1210	136	NA	366	< 0.2	292	7	0.72	0.23	3.89	233
EM-U25-05-05.5	8/6/2008	5	5.5	0.3		88.7	0.6	0.6	7	9	204	**433***	NA	693	0.05	57	6	0.26	0.15	14.1	971

Table 2-6
Former C Pond and C Pond Spoils Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	SPLP-Lead (mg/L)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	NE	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																			
		Top	**Bottom**																		
C POND																					
C-JS-01-00-01	8/1/2008	0	1	0.4	5.3	79.2	0.6	< 2	9	7	677	56.6	NA	338	< 0.2	135	7	0.33	0.19 B,B4	3.39	149
C-JS-01-01-03	8/1/2008	1	3	0.5	4.5	136	0.7	0.6	8	8	763	46.3	NA	329	0.04	194	6	0.4	0.18 B,B4	4.1	188
C-JS-02-00-01	8/1/2008	0	1	0.2	3.4	116	1.3	1.7	8	14	794	30.5	NA	551	< 0.2	99	9	0.39	0.19 B,B4	4.64	362
C-JS-02-01-03	8/1/2008	1	3	< 1	1.8	64.9	0.5	< 2	6	5	399	10	NA	170	< 0.2	18	6	0.18	0.12 B,B4	4.34	180
C-JS-02-05-07	8/1/2008	5	7	< 1 U,M2,R8	1.6	143	0.7	1	4	9	442	37.3 M2,R8	NA	373	< 0.2	5	7	0.07	0.19 B,B4	9.38	1,070
C-JS-03-00-01	8/4/2008	0	1	0.5	6.6	82.5	1.4	< 2	11	12	1,020	74.8	NA	573	< 0.2	199	10	0.69 B4	0.2	6.11	256
C-JS-03-01-03	8/4/2008	1	3	< 1	3.3	136	0.7	0.7	8	8	485	53.2	NA	351	< 0.2	37	6	0.29 B,B4	0.22	3.7	442
C-JS-03-05-07	8/4/2008	5	7	< 1	2.7	88.1	0.6	< 2	12	6	371	45.9	NA	256	< 0.2	18	6	0.23 B,B4	0.15	3.15	255
C-JS-03-10-12	8/4/2008	10	12	< 1	2.2	85.8	0.7	< 2	8	4	365	89.3	NA	211	0.04	7	4	0.41 B4	0.18	13	178
C-JS-03-15-17	8/4/2008	15	17	< 1	2.8	95.6	0.8	< 2	10	6	442	66.6	NA	270	< 0.2	14	5	0.42 B4	0.2	15.3	207
C-JS-04-00-01	8/5/2008	0	1	0.4	8.9	73	1.2	< 2	23	12	671	44.4	NA	664	< 0.2	98	11	0.3	0.18	4.05	245
C-JS-04-01-03	8/5/2008	1	3	< 1	1.4	137	0.5	< 2	6	7	491	15.1	NA	333	< 0.2	16	6	0.15	0.28	3.28	45
C-JS-04-05-07	8/5/2008	5	7	< 1	2.3	152	0.6	< 2	11	11	420	56.1	NA	388	< 0.2	38	8	0.26	0.27	3.23	106
C-JS-04-10-12	8/5/2008	10	12	0.7	4.7	88.1	0.4	2.1	9	11	2,780	41.4	NA	187	< 0.2	537	6	2.39	0.22	7.23	135
C-JS-04-15-16	8/5/2008	15	16	0.7	3.9	103	0.5	< 2	7	7	1,150	54.8	NA	155	< 0.2	276	4	1.02	0.12	4.43	65
C-JS-05-00-01	8/5/2008	0	1	0.2 B,M2	4.2	120	0.9	1.2	16	10	481	**477***	< 0.0005	838	< 0.2	74	7	< 1	0.18	5.66	315
C-JS-05-01-03	8/5/2008	1	3	0.3	11.2	104 M1	< 1	0.6	3	1	185	**3740***	0.001	78.1 M1	< 0.2	18	< 5	< 5	0.62	4.19	156 M1
2004 INVESTIGATION																					
EM-26	8/13/2004	0	0.25	2.5	23	NA	2.36	1.99	15	NA	5,220	127	NA	928	0.18	936	20	2.2	0.4	NA	429
EM-T-4-6'	10/5/2004	-	6	0.7	6.77	NA	0.76	2.83	7	NA	2,020	64.3	NA	250	0.05	550	6	2.27	0.21	NA	104
EM-T-4-10'	10/5/2004	-	10	NA	2.66	NA	0.76	NA	NA	NA	643	21.6	NA	NA	NA	88	NA	NA	NA	NA	NA

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

mg/kg - milligrams per Kilogram

mg/L - milligrams per Liter

Cr III - trivalent chromium

NE - not established

ft bgs - feet below ground surface

NA - not analyzed

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

B - Results reported between MDL and RL were flagged with a B by the laboratory.

B4 - Target analyte detected in blank at or above method acceptance criteria.

M1 - Matrix spike recovery was high; the associated blank recovery was acceptable.

M2 - Matrix spike recovery was low; the associted blank spike recovery was acceptable.

R8 - Sample RPD exceeded the method acceptance limit.

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 limit.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

Table 2-6
Former C Pond and C Pond Spoils Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Hexavalent Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	SPLP Lead (mg/L)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	65 (Cr VI)	13,000	41,000	800	NE	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	NE	290	NE	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																				
		Top	**Bottom**																			
2008 CHARACTERIZATION																						
RA-JS-01-00-01	8/7/2008	0	1	0.6	9.7	67.3	0.9	<2	5	NA	7	3,550	64.7	NA	401	0.07	955	4	1.9	0.22	4.42	133
RA-JS-01-01-03	8/7/2008	1	3	0.8	16.8	99.1	2.1	<2	8	NA	13	4,020	120	NA	566	0.08	767	7	2.17	0.28	13.4	173
RA-JS-01-05-07	8/7/2008	5	7	0.9	13.5	83.7	0.8	<2	6	NA	16	7,520	78.6	NA	276	<0.2	525	7	2.43	0.19	6.59	125
RA-JS-02-00-01	8/11/2008	0	1	8	35.4 B4	74.1	<5	1.5	10	NA	17	30,200	137	NA	384	0.36	1,430	2	11.1 B4	0.35	5.63	281
RA-JS-02-00-01D	8/11/2008	0	1	18.1	81.6	70	<10	<20	<50	NA	30	88,000	**326***	NA	223	0.09	3430	10	26.3	0.3	3.4	540
RA-JS-02-01-03	8/11/2008	1	3	17.4	89.7 B4	68.9	<5	2.5	18	NA	22	27,800	**349***	<0.004	327	0.28	3,430	2	9.76 B4	0.36	8.62	466
RA-JS-02-01-03D	8/11/2008	1	3	5.2	44.9	73.7	0.8	1.4	9	NA	14	10,600	134	NA	383	0.22	1,950	6	4.77	0.35	10.5	426
RA-JS-02-05-07	8/11/2008	5	7	9.6	60 B4	78.1	6.2	1.8	35	<8 U,H,M2,H1	26	19,600	199	NA	382	0.32	1,950	8	6.25 B4	0.39	29.9	629
RA-JS-02-05-07D	8/11/2008	5	7	9.2	76 B4	81.1	5	2	32	<7 U,H,H1	25	18,000	185	NA	415	0.57	1,960	9	7.83 B4	0.52	32.2	589
RA-JS-03-00-01	8/7/2008	0	1	<1	1.7	163	0.3	<2	5	NA	7	113	4.99	NA	239	<0.2	26	6	0.13	0.32	3.7	75
RA-JS-03-01-03	8/7/2008	1	3	<1	1.1	127	<1	<2	4	NA	6	62	2.81	NA	228	<0.2	12	6	0.05	0.26	3.33	63
RA-JS-04-00-01	8/7/2008	0	1	<1	1.4	121	<1	<2	4	NA	6	201	10.8	NA	232	<0.2	13	5	0.09	0.34	2.75	60
RA-JS-04-01-02.5	8/7/2008	1	2.5	<1	1	98.9	<1	<2	3	NA	5	136	3	NA	220	<0.2	<5	4	0.06	0.22	3.4	51
RA-JS-05-00-01	8/7/2008	0	1	0.4	5.2	52.2	0.4	<2	2	NA	4	380	24.5	NA	169	<0.2	157	3	0.33	0.14	6.88	82
RA-JS-05-01-03	8/7/2008	1	3	0.6	3.1	53.5	<1	<2	2	NA	5	284	8.63	NA	210	<0.2	25	3	0.15	0.15	8.31	87
RA-SD-01-00-01.5	8/11/2008	0	1.5	1.3	10.1 B4	73.1	0.7	<2	11	NA	6	7,630	86.9	NA	277	0.09	998	2	2.61 B4	0.2	7.72	91
RA-SD-01-00-01.5D	8/11/2008	0	1.5	0.8	10.9	87.2	0.7	<2	11	NA	5	3,410	57.3	NA	344	<0.3	1,160	5	3.66	0.3	4.32	110
RA-SD-01-01.5-3.0	8/11/2008	1.5	3	4	24.7 B4	81.7	0.7	0.8	14	NA	10	6,960	114	NA	226	0.11	1,590	2	3.46 B4	0.31	10.9	186
RA-SD-01-01.5-3.0D	8/11/2008	1.5	3	3.2	21.5	77.3	0.8	<2	13	NA	6	6,150	95.5	NA	255	0.09	1,090	4	3.99	0.28	9.04	150
RA-SD-02-00-01.5	8/11/2008	0	1.5	5.8	32.4 B4	52.4	<1	<2	7	NA	4	4,210	106	NA	108	0.13	530	<5	3.13	0.18	2.12	51
RA-SD-02-00-01.5D	8/11/2008	0	1.5	4.3	26.6	56.6	0.3	<2	4	NA	3	4240	137	NA	115	0.09	550	2	4.12	0.31	1.63	44
RA-SD-02-01.5-3.0	8/11/2008	1.5	3	7.4	39.1 B4	57.4	0.5	<2	8	NA	5	4,180	91.3	NA	181	0.13	1,000	2	3.02	0.25	3.98	77
RA-SD-02-01.5-3.0D	8/11/2008	1.5	3	9.4 M2	55.1 M2	99.6	0.7	<2	7	NA	4	4,790	87.8 M2	NA	175	0.1	1,430	4	4.73	0.29	3.58	86

Table 2-7
Former Raffinate Pond Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Hexavalent Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	SPLP Lead (mg/L)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	65 (Cr VI)	13,000	41,000	800	NE	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	NE	290	NE	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																				
		Top	**Bottom**																			
2004 INVESTIGATION																						
EM-9	8/13/2004	0	0.25	0.6	5.01	NA	0.44	0.57	8	NA	NA	522	38.1	NA	340	<0.04	230	5	<0.5	0.22	NA	86
EM-T-1-1.5'	10/5/2004	-	1.5	1.4	28.3	NA	0.41	1.3	9	NA	NA	2,200	60.9	NA	151	<0.05	305	6	3.76	0.17	NA	51
EM-T-1-2'	10/5/2004	-	2	NA	23	NA	0.82	NA	NA	NA	NA	9,850	63.9	NA	NA	NA	229	NA	NA	NA	NA	NA
EM-T-1-6'	10/5/2004	-	6	0.5	5.49	NA	0.85	0.26	12	NA	NA	1,700	36.5	NA	146	0.06	24	9	0.41	0.22	NA	100
EM-T-1-13'	10/5/2004	-	13	NA	1.35	NA	0.69	NA	NA	NA	NA	159	65.9	NA	NA	NA	3	NA	NA	NA	NA	NA

Notes:

[1] ADEQ May 2007 Remediation Standards
[2] ADEQ September 1996
mg/kg - milligrams per Kilogram
mg/L - milligrams per Liter
Cr III - trivalent chromium
Cr VI - hexavalent chromium
NE - not established
ft bgs - feet below ground surface
NA - not analyzed
Results in red indicate an exceedance of the non-residential SRL.
Result in **bold** with an * denotes an exceedance of the GPL.
< 0.20 denotes the element was not detected at a concentration above the method detection limit

B4 - Target analyte detected in blank at or above method acceptance criteria.
H1 - Sample analsis performed past holding time.
M2 - Matrix spike recovery was low; the associted blank spike recovery was acceptable.
U - Analyte was analyzed for but not detected at the indictated MDL.
H - Analysis exceeded method hold time.

Table 2-7
Former Raffinate Pond Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

			Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Hexavalent Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	SPLP-Lead (mg/L)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]			410	10	170,000	1,900	510	1,000,000 (Cr III)	65 (Cr VI)	13,000	41,000	800	NE	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)			35	290	12,000	23	29	590 (total)	NE	NE	NE	290	NE	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																			
		Top	**Bottom**																		
2008 CHARACTERIZATION																					
EM-JS-02-00-01	8/1/2008	0	1	0.4	5.1	115	0.7	0.9	7	NA	9	2160	187	NA	566	0.11	382	9	0.55	0.22 B,B4	6.85	531
EM-JS-02-01-03	8/1/2008	1	3	< 1	3.4	89.6	0.5	1.5	5	NA	6	722	**576***	NA	684	< 0.2	8	5	0.23	0.17 B,B4	10.2	640
EM-JS-06-00-01	8/13/2008	0	1	1.5	10.3	45	0.7	< 2	9	NA	18	4090	86.1	NA	448	0.06	1180	4	3.01	0.21	6.63	161
EM-JS-06-01-03	8/13/2008	1	3	1	6.5	40.2	0.4	< 2	6	NA	14	1900	33.5	NA	288	< 0.2	472	2	2.58	0.19	4.13	53
EM-JS-06-05-07	8/13/2008	5	7	0.9	8.1	39.2	0.5	< 2	14	NA	17	2650	157	NA	371	< 0.2	309	4	2.53	0.21	5.12	110
EM-JS-06-10-11	8/13/2008	10	11	2.1	15.8	142	0.9	1	22	NA	16	5870	93.3	NA	579	0.05	481	19	1.85	0.25	18.1	283
EM-JS-07-00-01	8/13/2008	0	1	1.4	11.7	96.2	0.2	0.6	12	NA	19	3770	96.4	NA	382	0.09	6830	< 5	3.68	0.27	6.01	122
EM-JS-07-01-03	8/13/2008	1	3	2.3	10.7	77.8	0.7	0.7	13	NA	17	4840	151	NA	556	0.05	1000	10	2.77	0.21	8.97	238
EM-JS-07-05-07	8/13/2008	5	7	1.2	9.1	75.8	0.7	0.9	10	NA	17	3840	144	NA	590	0.07	343	11	2.13	0.26	6.49	274
EM-JS-07-10-12	8/13/2008	10	12	2.6	16.1	62.6	0.5	2	36	< 4	25	5150	147	NA	645	0.23	5610	16	3.96	0.26	9.21	393
EM-JS-07-15-16	8/13/2008	15	16	2.8	17.8	118	2.1	6	45	< 5	19	6910	120	NA	475	0.13	1050	12	2.45	0.35 M1	36.9 M1,R8	386
EM-JS-08-00-01	8/12/2008	0	1	1.1	11.9 L1	55.7	< 1	< 2	5	NA	4	2040	57	NA	166	0.08	1240	< 5	3.24	0.12	2.41	39
EM-JS-08-01-03	8/12/2008	1	3	0.4	7.7 L1	47.3	< 1	< 2	2	NA	5	1800	152	NA	190	0.09	315	< 5	3.38	0.2	1.17	39
EM-JS-08-01-03D	8/12/2008	1	3	0.6	8.2 L1	69.5	< 1	< 2	3	NA	5	1430	51.9	NA	193	0.07	342	< 5	2.85	0.17	1.29	43
EM-JS-08-05-07	8/12/2008	5	7	13.6	64.8 L1	150	< 1	5	36 M1	NA	42	26800	**999***	< 0.0005	932	0.6	6470	33	7.85	0.22	5.2	1550
EM-JS-08-10-12	8/12/2008	10	12	2 M2	16 L1	77.6	0.9	5.3	193	< 4 U,M2	23	4120	**303***	0.0002	683	0.4	2220	29	2.86	0.17	7.78	741
2004 INVESTIGATION																					
EM-20	8/13/2004	0	0.25	2	13.7	NA	0.55	2.39	17	NA	NA	4,710	87.8	NA	405	0.07	6,500	14	5.5	0.2	NA	234

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

mg/kg - milligrams per Kilogram

mg/L - milligrams per Liter

Cr III - trivalent chromium

Cr VI - hexavalent chromium

NE - not established

ft bgs - feet below ground surface

NA - not analyzed

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

B - Results reported between MDL and RL were flagged with a B by the laboratory.

B4 - Target analyte detected in blank at or above method acceptance criteria.

L1 - The associate blank spike recovery was above laboratory accpetance limits.

M1 - Matrix spike recovery was high; the associated blank recovery was acceptable.

M2 - Matrix spike recovery waslow; the associated blank spike recovery was acceptable.

R8 - Sample RPD exceeded the method acceptance limit.

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 limit.

Table 2-8
Former Laydown Yard Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

				Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Thallium (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
Non-Residential Soil Remediation Level (nr-SRL)[1]				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																		
		Top	**Bottom**																	
2008 CHARACTERIZATION																				
RP-JS-01-00-01	8/12/2008	0	1	<1	3.5 L1	127	0.6	<2	4	5	124	11.4	271	0.07	51	2	0.91	0.15	2.64	40
RP-JS-01-01-03	8/12/2008	1	3	<1	3.1 L1	46.1	0.2	<2	4	5	183	12.7	244	<0.2	86	2	0.8	0.13	2.44	43
RP-JS-01-01-03D	8/12/2008	1	3	<1	3.1 L1	41.8	<1	<2	4	5	181	13.4	239	<0.2	66	1	0.8	0.14	2.35	42
RP-JS-01-05-07	8/12/2008	5	7	<1	1.9 L1	49	<1	<2	2	5	137	6.43	231	<0.2	33	2	0.6	0.08	1.26	36
RP-JS-01-10-12	8/12/2008	10	12	<1	2.6 L1	50.8	0.3	<2	2	5	466	9.69	207	0.06	126	2	1.04	0.09	2.25	48
RP-JS-01-15-17	8/12/2008	15	17	0.3	3.6 L1	56.8	0.3	<2	2	6	254	11.3	368	<0.2	67	2	0.93	0.15	4.6	84
RP-JS-02-00-01	8/12/2008	0	1	0.2	3.5 L1	303	1.6	<2	7	10	63	10.8	975	0.04	6	6	0.34	0.25	2.11	51
RP-JS-02-01-03	8/12/2008	1	3	<1	3.5 L1	47.3	<1	<2	3	2	74	8.5	160	<0.2	121	<5	0.74	0.11	1.07	23
RP-JS-02-01-03D	8/12/2008	1	3	<1	3.7 L1	49.3	<1	<2	3	2	81	9.53	169	0.05	109	<5	0.89	0.12	1.25	26
RP-JS-02-05-07	8/12/2008	5	7	<1	5.2 L1	188	0.8	<2	4	10	123	7.69	1,250	<0.2	32	4	0.7	0.17	2.12	71
RP-JS-02-10-12	8/12/2008	10	12	0.3	3.3 L1	50.9	0.5	<2	2	16	323	14.5	713	0.07	93	5	0.93	0.12	9.12	139
RP-JS-02-15-17	8/12/2008	15	17	0.2	3.1 L1	47.5	0.2	<2	2	7	289	14.7	386	<0.2	51	2	0.84	0.15	4.35	64

Notes:

[1] ADEQ May 2007 Remediation Standards

[2] ADEQ September 1996

L1 - The associate blank spike recovery was above laboratory accpetance limits.

mg/kg - milligrams per Kilogram

mg/L - milligrams per Liter

Cr III - trivalent chromium

NE - not established

ft bgs - feet below ground surface

NA - not analyzed

Results in red indicate an exceedance of the non-residential SRL.

Result in **bold** with an * denotes an exceedance of the GPL.

< 0.20 denotes the element was not detected at a concentration above the method detection limit

Table 2-9
Former Rhenium Ponds Subarea
Soil and Sediment Analytical Results
Sierrita Mine VRP Investigation

P:\WRES\Freeport_McMoRan\24096838_Sierrita\GIS\mxds\Phase1Soil\Figure 2-1_Former_CLEAR_Plant_Locations.pdf (lw)

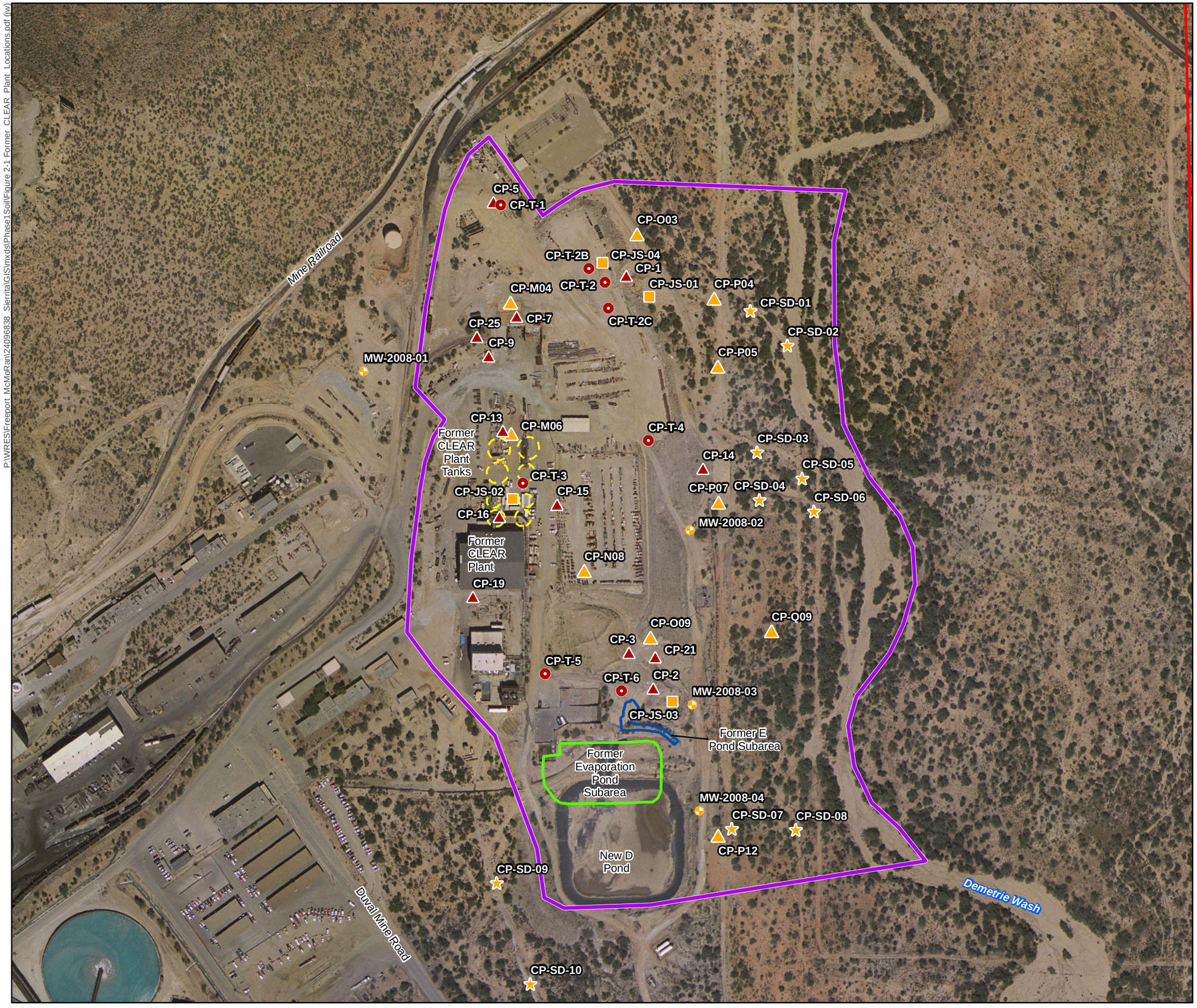


Figure 2-1

Former CLEAR Plant Subarea Soil Sample and Well Locations

Freeport-McMoRan Sierrita Inc.

Legend

2004 Sampling Location

- Surface Soil Sample
- Trench Location

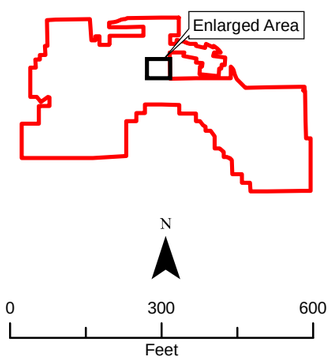
2008 Sampling Location

- Judgement Soil Boring
- 2008 Monitor Well
- Random Soil Boring
- Sediment Sample

Mine Feature

- Property Boundary
- Former CLEAR Plant Subarea
- Former Evaporation Pond Subarea (1979 aerial)
- Former E Pond Subarea (1979 aerial)
- Former CLEAR Plant Tanks (1979 aerial)

Source:
Imagery: Sierrita Mine 2007
Sample Locations: URS Survey 2008, Hydro Geo Chem 2008



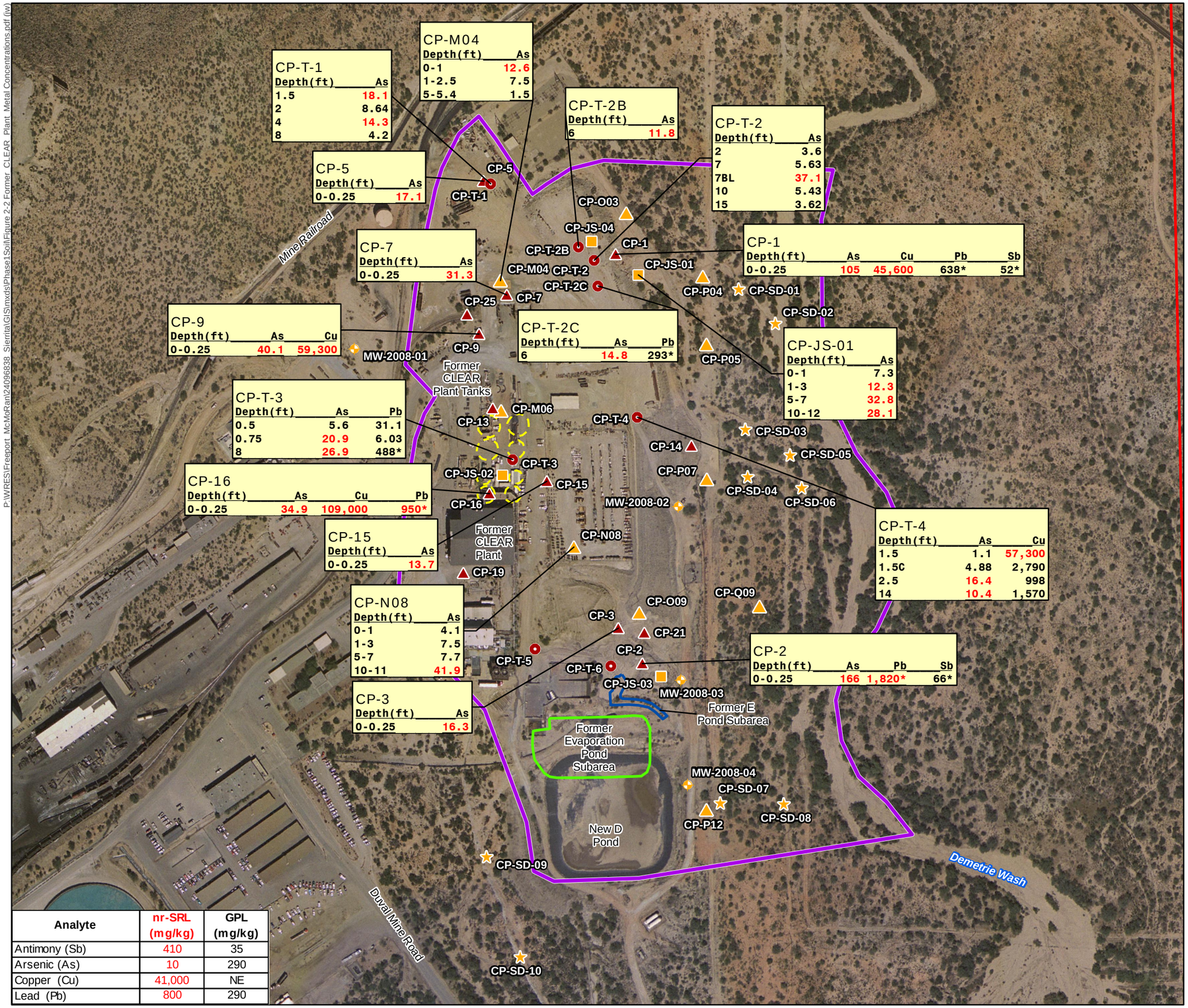
1 inch = 300 feet

URS

P:\WRES\Freeport_McMoRan\24096838_SierritaGIS\mxds\Phase1\SoilFigure 2-2 Former_CLEAR_Plant_Metal Concentrations.pdf (lw)

Figure 2-2
Former CLEAR Plant Subarea Selected Soil Samples Total Metal Concentrations (mg/kg)

Freeport-McMoRan Sierrita Inc.



Analyte	nr-SRL (mg/kg)	GPL (mg/kg)
Antimony (Sb)	410	35
Arsenic (As)	10	290
Copper (Cu)	41,000	NE
Lead (Pb)	800	290

Legend

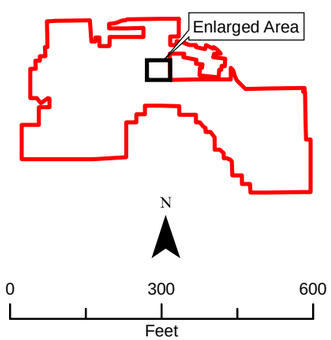
2004 Sampling Location
- Surface Soil Sample
- Trench Location

2008 Sampling Location
- Judgement Soil Boring
- 2008 Monitor Well
- Random Soil Boring
- Sediment Sample

Mine Feature
- Property Boundary
- Former CLEAR Plant Subarea
- Former Evaporation Pond Subarea (1979 aerial)
- Former E Pond Subarea (1979 aerial)
- Former CLEAR Plant Tanks (1979 aerial)

Key
100 - Values in red indicate an exceedance of the Non-residential Soil Remediation Level (nr-SRL)
100* - Values with an asterisk indicate an exceedance of the Groundwater Protection Limit (GPL)
100 - Values in black indicate no exceedance
NA - Not Analyzed
NE - Not Established

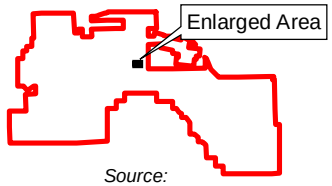
Source:
Imagery: Sierrita Mine 2007
Sample Locations: URS Survey 2008, Hydro Geo Chem 2008



1 inch = 300 feet

URS

P:\WRES\Freeport_McMoRan\24096838_SierritaGIS\mxds\Phase1Soil\Figure 2-3 Former_E_Pond_Locations.pdf (jw)



Source:
Imagery: Sierrita Mine 2007
Sample Locations:
URS Survey 2008
Hydro Geo Chem 2008

URS

LEGEND

2008 Sampling Location

- Judgement Soil Boring
- 2008 Monitor Well

Mine Feature

- Former CLEAR Plant Subarea
- Former Evaporation Pond Subarea (1979 aerial)
- Former E Pond Subarea (1979 aerial)

Figure 2-3

Former E Pond Subarea
Soil Sample and Well Locations

Freeport-McMoRan
Sierrita Inc.

N

0 50 100

Feet

1 inch = 100 feet

P:\WRES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1Soil\Figure 2-4 Former Evaporation Pond Locations.pdf (jw)

Enlarged Area

Source:
Imagery: Sierrita Mine 2007
Sample Locations:
URS Survey 2008

URS

LEGEND

2008 Sampling Location

- Judgement Soil Boring
- 2008 Monitor Well

Mine Feature

- Former CLEAR Plant Subarea
- Former Evaporation Pond Subarea (1979 aerial)
- Former E Pond Subarea (1979 aerial)

Figure 2-4

Former Evaporation Pond Subarea Soil Sample and Well Locations

Freeport-McMoRan Sierrita Inc.

N 0 50 100

Feet

1 inch = 100 feet

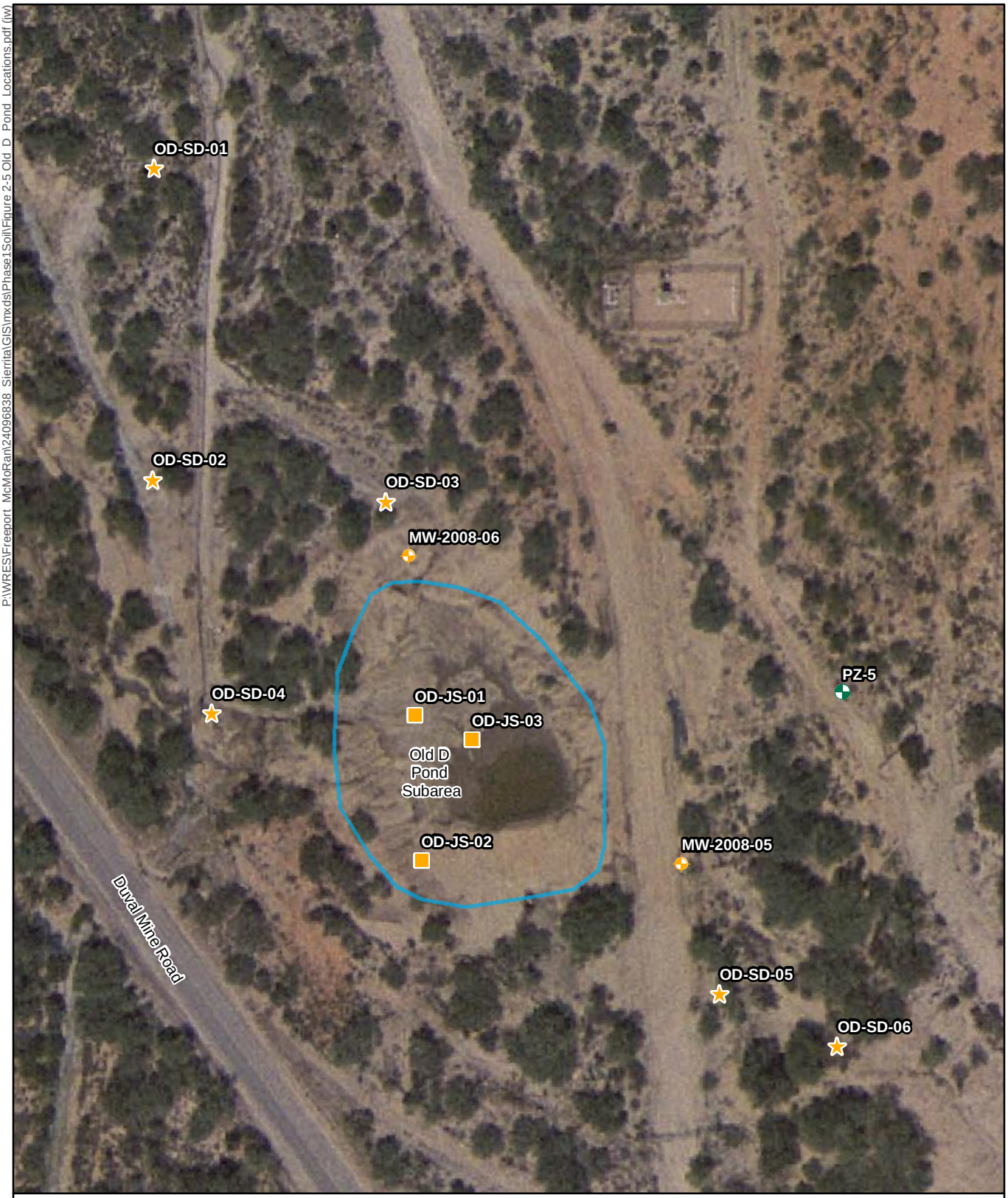
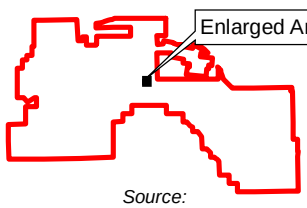


Figure 2-5

Old D Pond Subarea
Soil Sample and Well Locations

Freeport-McMoRan
Sierrita Inc.

Analyte	nr-SRL (mg/kg)	GPL (mg/kg)
Arsenic (As)	10	290



Source:
Imagery: Sierrita Mine 2007
Sampling Locations: URS Survey 2008

URS

LEGEND

Pre-2008 Piezometer

2008 Sampling Location

Judgement Soil Boring

2008 Monitor Well

Sediment Sample

Mine Feature

Old D Pond Subarea

Key

100 - Values in red indicate an exceedance of the Non-residential Soil Remediation Level (nr-SRL)

100 - Values in black indicate no exceedance

Figure 2-6

Old D Pond Subarea
Selected Soil Samples
Total Metal Concentrations (mg/kg)

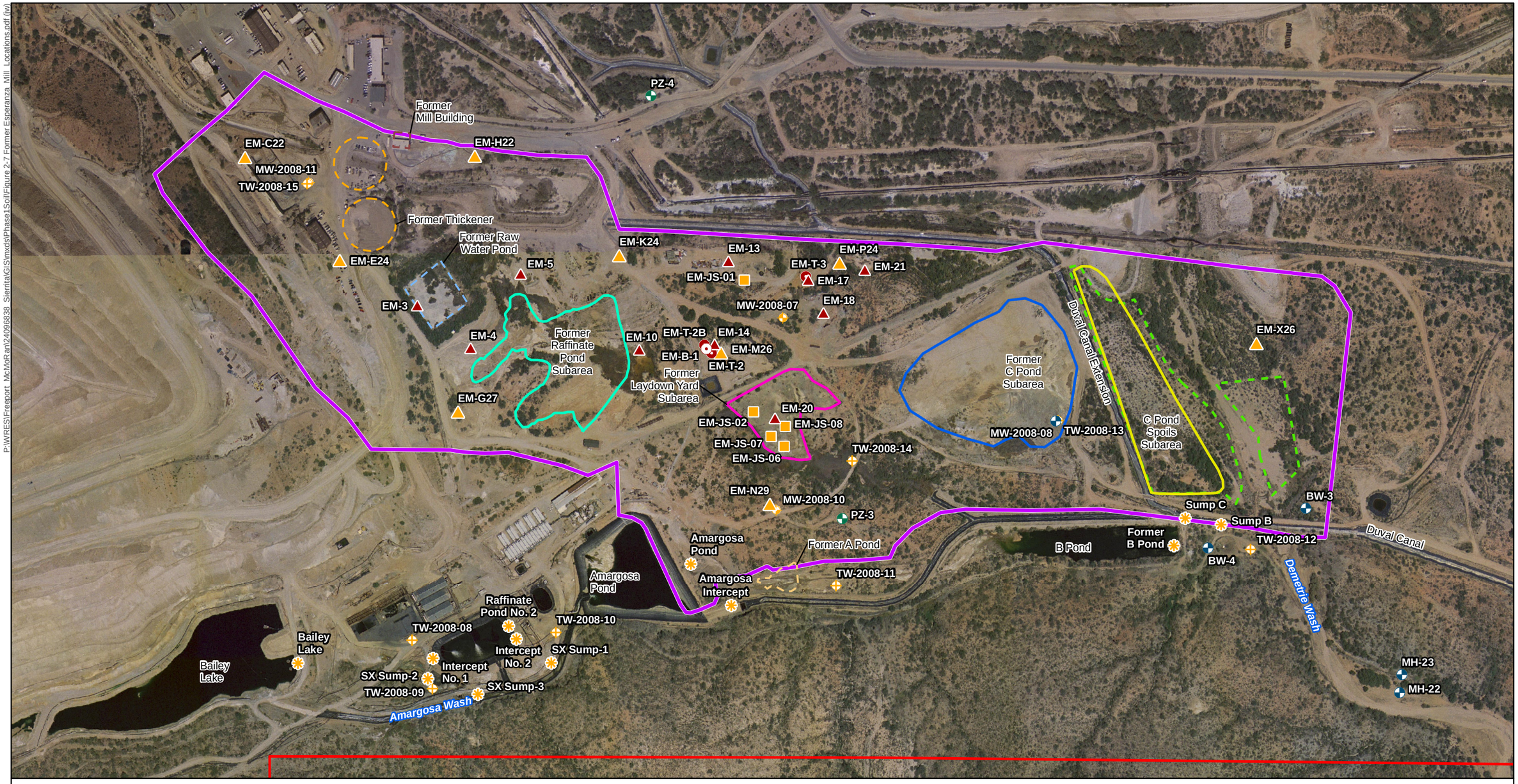
Freeport-McMoRan Sierrita Inc.

N 0 50 100

Feet

1 inch = 100 feet

P:\WRES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1 Soil\Figure 2-7 Former Esperanza Mill Locations.pdf (lw)



Source:
Imagery: Sierrita Mine 2007
Sample Locations:
URS Survey 2008,
Hydro Geo Chem 2008

URS

Legend

- Pre-2008 Monitor Well
- Pre-2008 Piezometer

2004 Sampling Location

- Boring Location
- Surface Soil Sample
- Trench Location

2008 Sampling Location

- Judgement Soil Boring
- 2008 Monitor Well
- Random Soil Boring
- Temporary Alluvial Well
- Process Solution

Mine Feature

- Property Boundary
- Former Esperanza Mill Subarea
- Former Laydown Yard Subarea
- Former C Pond Subarea
- C Pond Spoils Subarea
- Former Raffinate Pond Subarea
- Former Mill Building
- Former Thickener
- Former Raw Water Pond
- Former A Pond
- 404 Mitigation Area

Figure 2-7

Former Esperanza Mill Subarea Soil Sample and Well Locations

Freeport-McMoRan
Sierrita Inc.

N

0 400 800
Feet

1 inch = 400 feet

P:\WRES\Freeport_McMoRan\24096838_Sierrita\GIS\mxds\Phase1Soil\Figure 2-8 Esperanza_Mill_Metal Concentrations.pdf (lw)

Analyte	nr-SRL (mg/kg)	GPL (mg/kg)
Antimony (Sb)	410	35
Arsenic (As)	10	290

EM-C22

Depth(ft)	As
0-1	13.9
1-3	5.1
5-7	2.2

EM-H22

Depth(ft)	As
0-1	11.7
1-3	3.7
5-7	1.1

EM-T-3

Depth(ft)	As
4	38.8
6	4.7
12	3.52

EM-17

Depth(ft)	As	Sb
0-0.25	101	69*

EM-3

Depth(ft)	As
0-0.25	34.8

EM-14

Depth(ft)	As
0-0.25	11.8

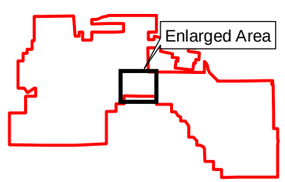
EM-4

Depth(ft)	As
0-0.25	10.8

EM-18

Depth(ft)	As
0-0.25	10.4

PZ-4
Former Mill Building
EM-C22
MW-2008-11
TW-2008-15
EM-H22
Former Thickener
Former Raw Water Pond
EM-E24
EM-5
EM-K24
EM-13
EM-JS-01
EM-T-3
EM-P24
EM-17
EM-21
MW-2008-07
EM-18
EM-3
EM-4
EM-10
Former Raffinate Pond Subarea
EM-T-2B
EM-14
EM-M26
EM-B-1
EM-T-2
Former Laydown Yard Subarea
EM-G27
EM-20
EM-JS-02
EM-JS-08
EM-JS-07
EM-JS-06
TW-2008-14
Former C Pond Subarea
MW-2008-08
TW-2008-13
C Pond Spoils Subarea
Duval Canal Extension
EM-X26
EM-N29
MW-2008-10
PZ-3
Sump C
Sump B
BW-3
TW-2008-12
Duval Canal
B Pond
Former B Pond
BW-4
Demetrie Wash
Former A Pond
Amargosa Pond
TW-2008-11
Amargosa Intercept
Amargosa Pond
Raffinate Pond No. 2
TW-2008-08
TW-2008-10
Intercept No. 2
Bailey Lake
Intercept No. 1
SX Sump-1
SX Sump-2
TW-2008-09
SX Sump-3
Amargosa Wash
MH-23
MH-22



Source:
Imagery: Sierrita Mine 2007
Sample Locations: URS Survey 2008, Hydro Geo Chem 2008

URS

Legend

- Pre-2008 Monitor Well
- Pre-2008 Piezometer

2004 Sampling Location

- Boring Location
- Surface Soil Sample
- Trench Location

2008 Sampling Location

- Judgement Soil Boring
- 2008 Monitor Well
- Random Soil Boring
- Temporary Alluvial Well
- Process Solution

Mine Feature

- Property Boundary
- Former Esperanza Mill Subarea
- Former Laydown Yard Subarea
- Former C Pond Subarea
- C Pond Spoils Subarea
- Former Raffinate Pond Subarea
- Former Mill Building
- Former Thickener
- Former Raw Water Pond
- Former A Pond
- 404 Mitigation Area

Key

100 - Values in red indicate an exceedance of the Non-residential Soil Remediation Level (nr-SRL)
100* - Values with an asterisk indicate an exceedance of the Groundwater Protection Limit (GPL)
100 - Values in black indicate no exceedance
NA - Not Analyzed
NE - Not Established

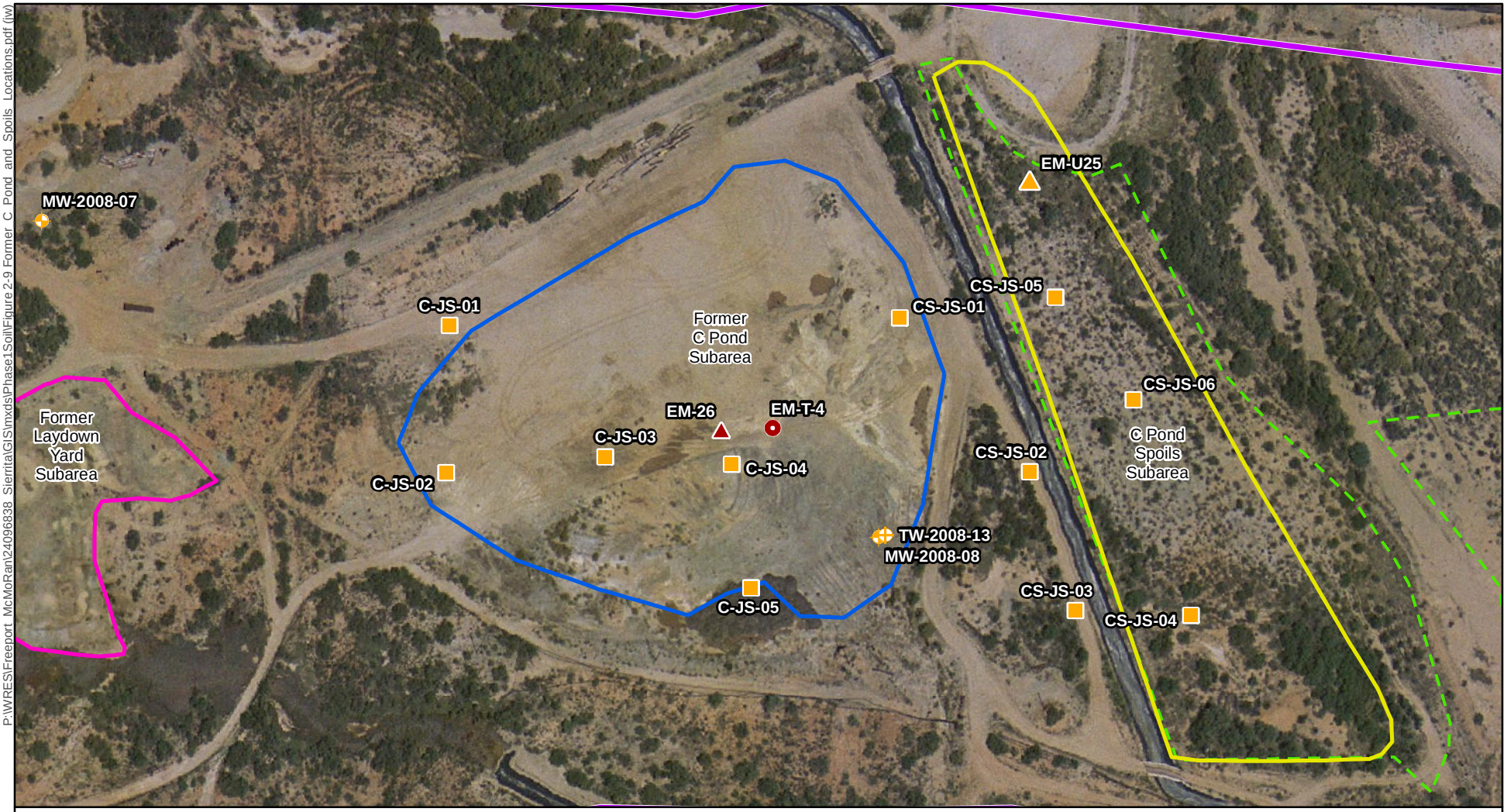
N

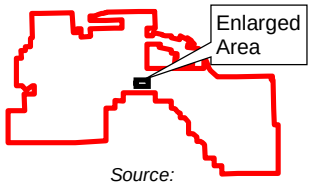
0 200 400
Feet

1 inch = 400 feet

Figure 2-8
Former Esperanza Mill Subarea
Selected Soil Samples
Total Metal Concentrations (mg/kg)

Freeport-McMoRan Sierrita Inc.





Source:
Imagery: Sierrita Mine 2007
Sampling Locations:
URS Survey 2008,
Hydro Geo Chem 2008

URS

LEGEND

2004 Sampling Location
- Surface Soil Sample
- Trench Location

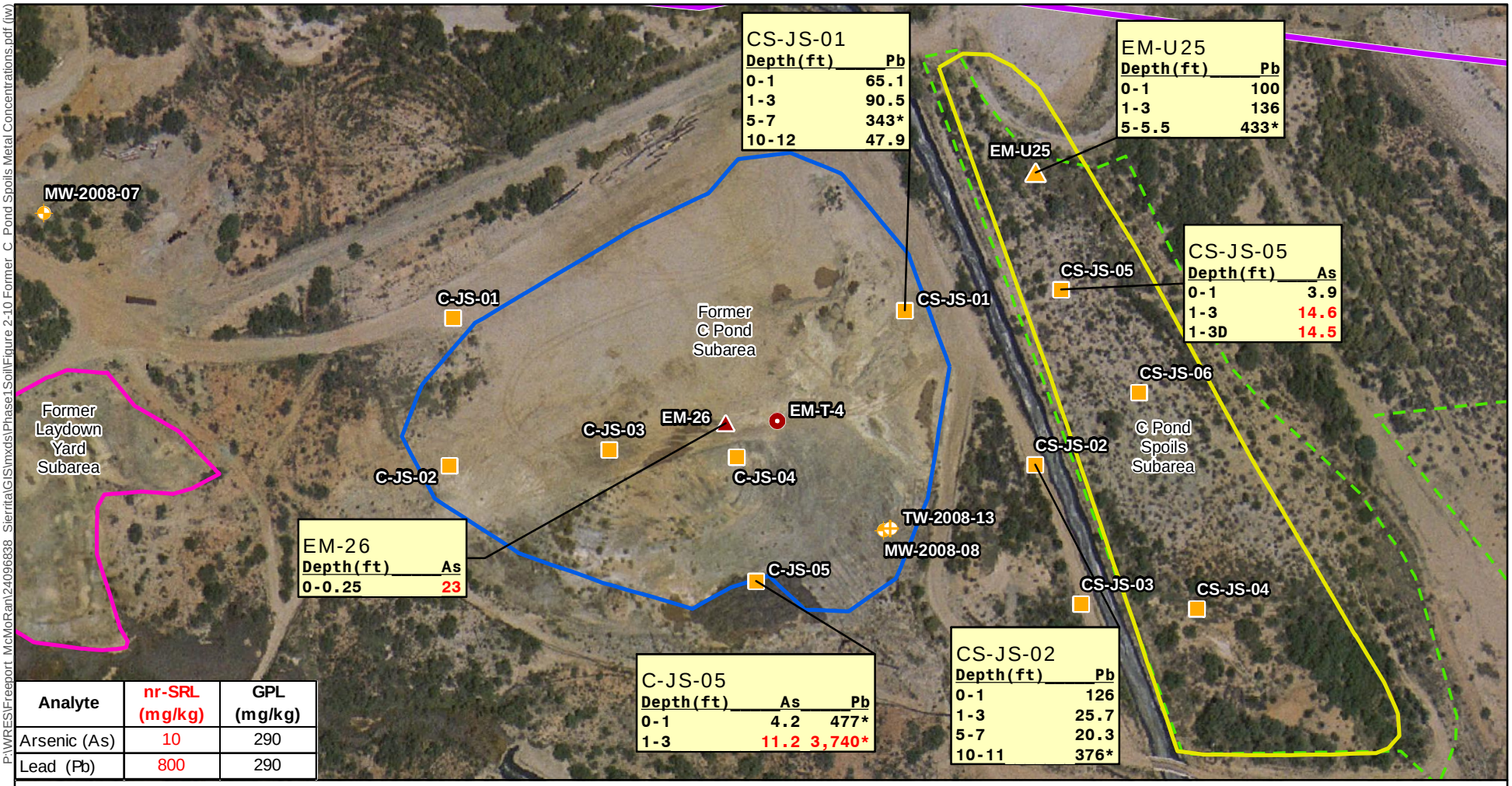
2008 Sampling Location
- Judgement Soil Boring
- 2008 Monitor Well
- Random Soil Boring
- Temporary Alluvial Well

Mine Feature
- Former Esperanza Mill Subarea
- Former Laydown Yard Subarea
- Former C Pond Subarea
- C Pond Spoils Subarea
- 404 Mitigation Area

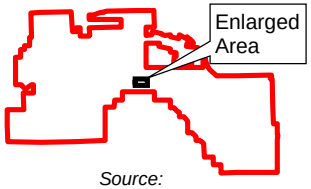
Figure 2-9
Former C Pond and
C Pond Spoils Subarea
Soil Sample and Well Locations
Freeport-McMoRan
Sierrita Inc.

N
0 100 200
Feet
1 inch = 200 feet

P:\WRES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1Soil\Figure 2-9 Former C Pond and Spoils Locations.pdf (jw)



Analyte	nr-SRL (mg/kg)	GPL (mg/kg)
Arsenic (As)	10	290
Lead (Pb)	800	290



Source:
Imagery: Sierrita Mine 2007
Sampling Locations:
URS Survey 2008,
Hydro Geo Chem 2008

URS

LEGEND

2004 Sampling Location
- Surface Soil Sample
- Trench Location

2008 Sampling Location
- Judgement Soil Boring
- 2008 Monitor Well
- Random Soil Boring
- Temporary Alluvial Well

Mine Feature
- Former Esperanza Mill Subarea
- Former Laydown Yard Subarea
- Former C Pond Subarea
- C Pond Spoils Subarea
- 404 Mitigation Area

Key
100 - Values in red indicate an exceedance of the Non-residential Soil RemediationLevel (nr-SRL)
100* - Values with an asterisk indicate an exceedance of the Groundwater Protection Limit (GPL)
100 - Values in black indicate no exceedance

Figure 2-10

Former C Pond and C Pond Spoils Subarea Selected Soil Samples Total Metal Concentrations (mg/kg)

Freeport-McMoRan Sierrita Inc.

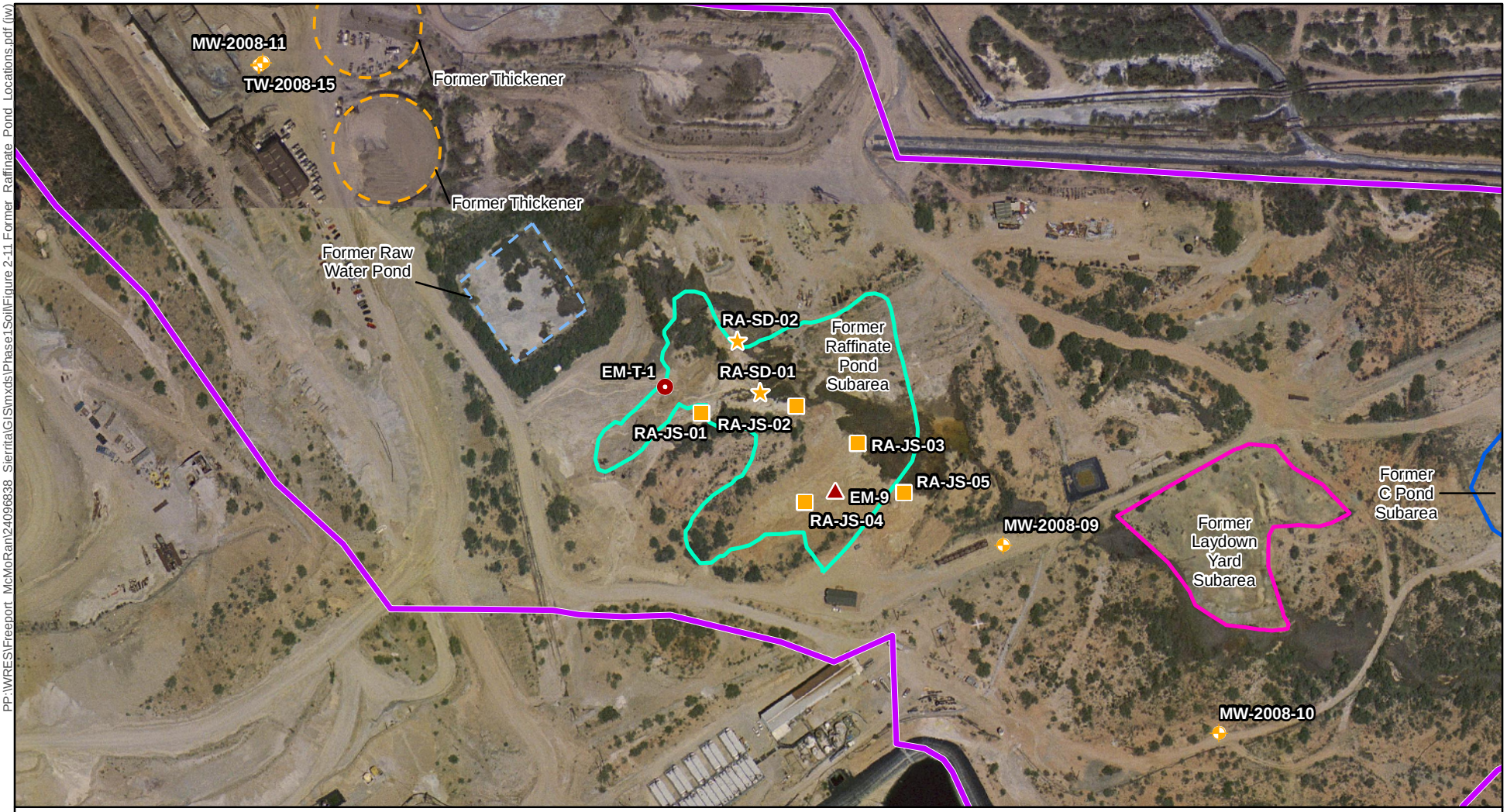
N

0 100 200

Feet

1 inch = 200 feet

P:\WRES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1Soil\Figure 2-10 Former C Pond Spoils Metal Concentrations.pdf (jw)

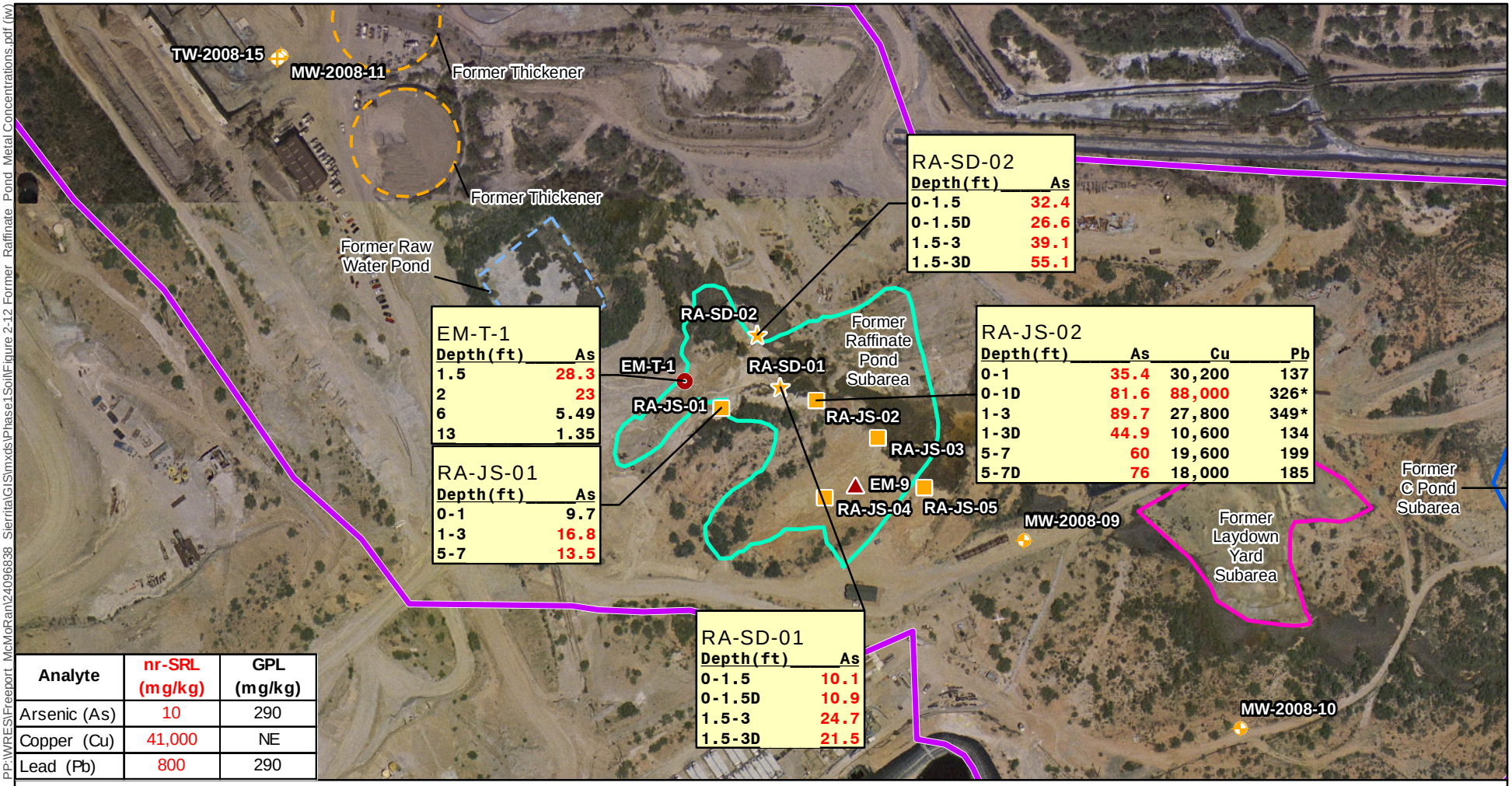


PP:\WRES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1Soil\Figure 2-11 Former Raffinate Pond Locations.pdf (jw)

Figure 2-11

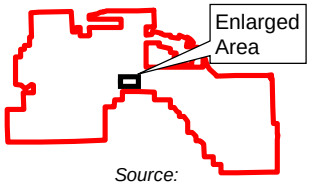
Former Raffinate Pond Subarea Soil Sample Locations

Freeport-McMoRan Sierrita Inc.



PP:\WRES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1Soil\Figure 2-12 Former Raffinate Pond Metal Concentrations.pdf (jw)

Analyte	nr-SRL (mg/kg)	GPL (mg/kg)
Arsenic (As)	10	290
Copper (Cu)	41,000	NE
Lead (Pb)	800	290



Source:
Imagery: Sierrita Mine 2007
Sampling Locations:
URS Survey 2008,
Hydro Geo Chem 2008

URS

LEGEND

2004 Sampling Location
- Surface Soil Sample
- Trench Location

2008 Sampling Location
- Judgement Soil Boring
- 2008 Monitor Well
- Sediment Sample
- Temporary Alluvial Well

Mine Feature
- Former Esperanza Mill Subarea
- Former Laydown Yard Subarea
- Former C Pond Subarea
- Former Raffinate Pond Subarea
- Former Thickener
- Former Raw Water Pond

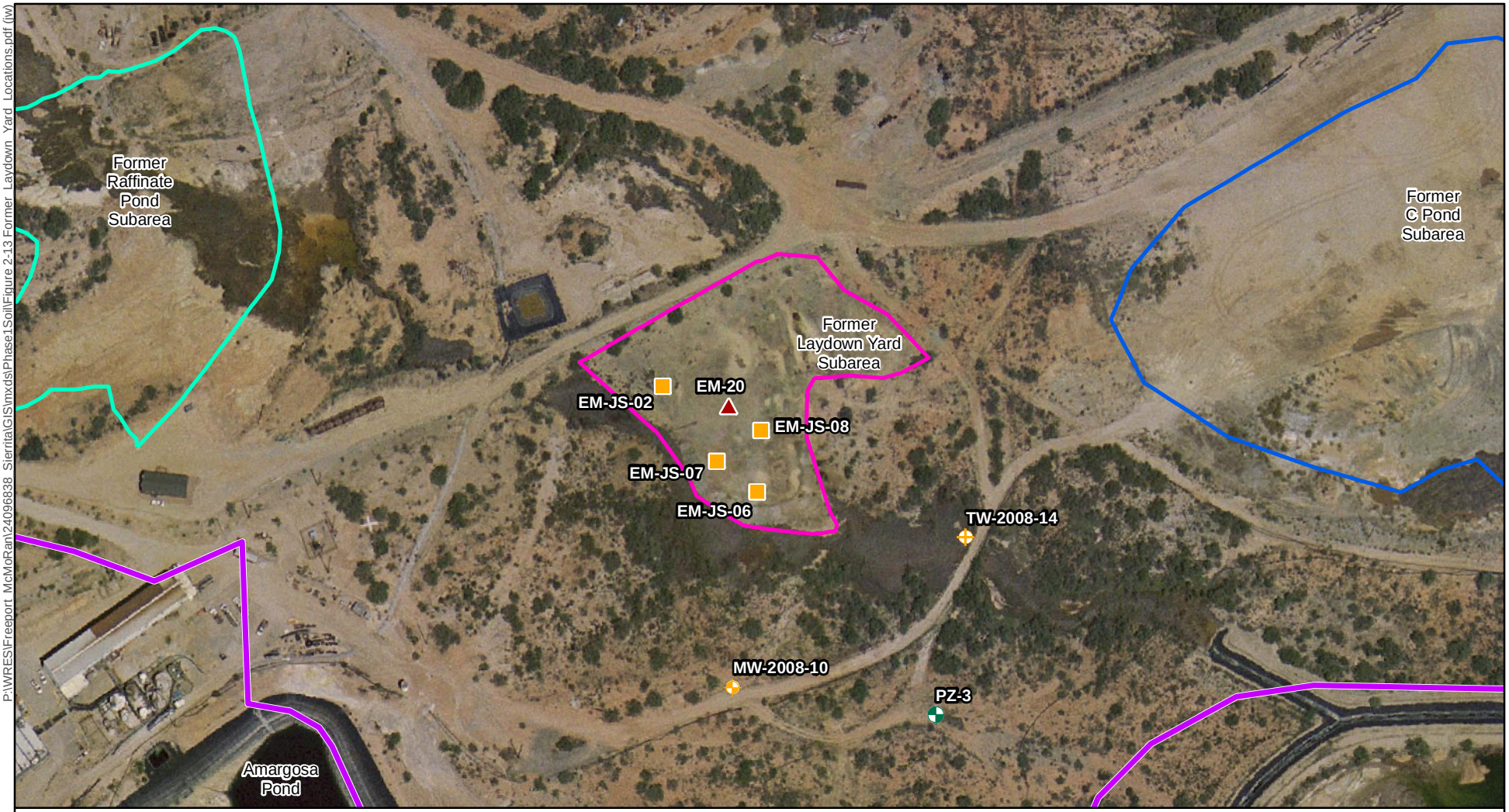
Key
100 - Values in red indicate an exceedance of the Non-residential Soil Remediation Level (nr-SRL)
100*- Values with an asterisk indicate an exceedance of the Groundwater Protection Limit (GPL)
100 - Values in black indicate no exceedance
NE - Not Established

Figure 2-12

Former Raffinate Pond Subarea
Selected Soil Samples
Total Metal Concentrations (mg/kg)

Freeport-McMoRan
Sierrita Inc.

N 0 150 300
Feet
1 inch = 300 feet

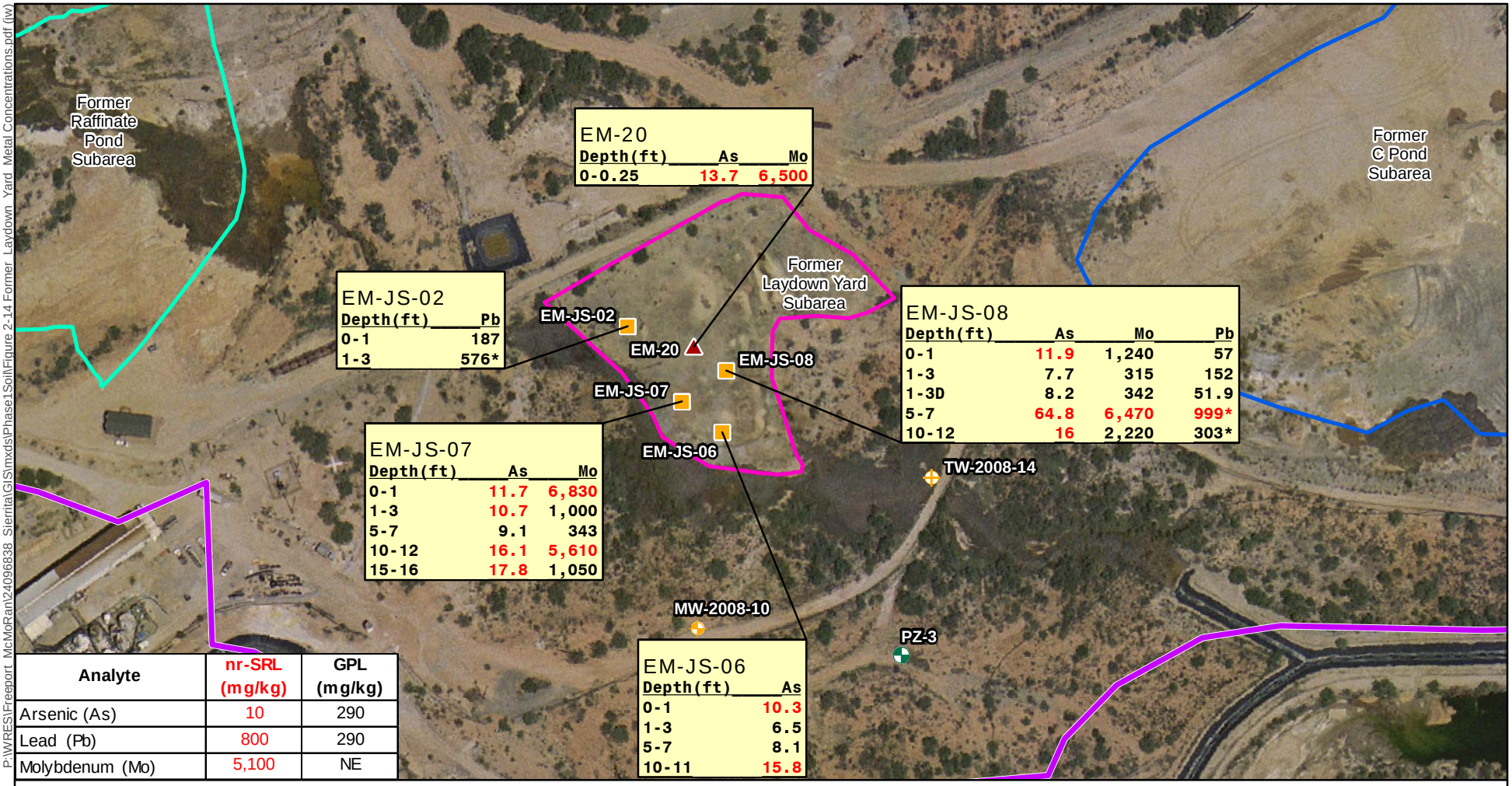


P:\WRES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1Soil\Figure 2-13 Former Laydown Yard Locations.pdf (jw)

Figure 2-13

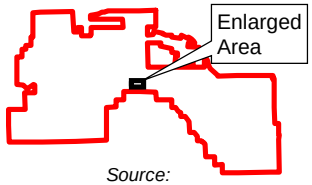
Former Laydown Yard Subarea Soil Sample Locations

Freeport-McMoRan Sierrita Inc.



P:\RES\Freeport McMoRan\24096838 Sierrita\GIS\mxds\Phase1Soil\Figure 2-14 Former Laydown Yard Metal Concentrations.pdf (jw)

Analyte	nr-SRL (mg/kg)	GPL (mg/kg)
Arsenic (As)	10	290
Lead (Pb)	800	290
Molybdenum (Mo)	5,100	NE



Source:
Imagery: Sierrita Mine 2007
Sampling Locations:
URS Survey 2008,
Hydro Geo Chem 2008

URS

LEGEND

- Pre-2008 Piezometer

2004 Sampling Location

- Surface Soil Sample

2008 Sampling Location

- Judgement Soil Boring
- 2008 Monitor Well
- Temporary Alluvial Well

Mine Feature

- Former Esperanza Mill Subarea
- Former C Pond Subarea
- Former Laydown Yard Subarea
- Former Raffinate Pond Subarea

Key

100 - Values in red indicate an exceedance of the Non-residential Soil Remediation Level (nr-SRL)
100*- Values with an asterisk indicate an exceedance of the Groundwater Protection Limit (GPL)
100 - Values in black indicate no exceedance
NE - Not Established

Figure 2-14

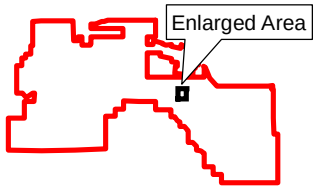
Former Laydown Yard Subarea Selected Soil Samples Total Metal Concentrations (mg/kg)

Freeport-McMoRan Sierrita Inc.

N 0 100 200 Feet

1 inch = 200 feet

P:\WRES\Freeport_McMoRan\24096838_Sierrita\GIS\mxds\Phase1Soil\Figure 2-15 Rehnium_Ponds_Locations.pdf (jw)



LEGEND

2008 Sampling Location

Judgement Soil Boring

Mine Feature

Former Rhenium Ponds Subarea

Source:
Imagery: Sierrita Mine 2008
Well Data: URS Survey 2008

URS

Figure 2-15

Former Rhenium Ponds Subarea Soil Sample Locations

Freeport-McMoRan Sierrita Inc.

N 0 100 200

Feet

1 inch = 200 feet

3.0 QUALITY ASSURANCE/QUALITY CONTROL

The quality of data collected during the 2008 VRP investigation is dependent upon the quality and thoroughness of field sampling activities. General field operations and practices, and specific sample collection methods, were well planned and carefully implemented. Section 4.0 of the Sierrita VRP Investigation Quality Assurance Project Plan (QAPP; URS 2008) detailed the sample collection procedures and data collection forms to be used for the data gathering activities. All personnel involved with the sampling were properly trained in these procedures as discussed in the QAPP.

3.1 Sample Collection and Preparation Procedures

No changes to the sample collection and preparation procedures provided in the Sierrita VRP Investigation Work Plan (URS 2008) and the QAPP were made during implementation of the work.

3.2 Field Decontamination Procedures

Decontamination procedures were followed as described in the QAPP. All down-hole drilling and dedicated sampling equipment was cleaned with high-pressure hot water prior to arrival on site and between drilling locations.

For most soil sampling a disposable acetate liner was used for each sample collected and therefore decontamination of equipment was not necessary. However, seven soil/sediment samples from three locations in the Former Raffinate Pond were collected with stainless-steel, bucket auger because the former pond was not accessible with the Geoprobe® because of ground conditions. Use of the bucket auger required decontamination between samples since the sampler was reused without the use of liners. Following decontamination of the sampler, an equipment blank was collected per the QAPP guidelines by pouring reagent grade water over the decontaminated sampler and collecting the resulting rinsate in a sample container. The equipment rinsate sample was analyzed for soil COIs. All results for soil COIs were below levels of analytical detection.

3.3 Field Duplicate Sample Evaluation

Duplicate samples of soil and sediment were collected during the investigation to assess the precision of the sample collection process. Duplicate samples were collected using identical recovery techniques, and were treated in an identical manner during storage, transportation, and analysis.

A total of 12 soil and sediment duplicates were collected during the 2008 investigation program. These 12 duplicates were collected to represent a total of 200 primary soil and sediment samples. Thus, one duplicate was collected for approximately every seventeenth sample (one duplicate per every 16.67 primary samples). Thus, the VRP Work Plan requirement of one duplicate sample collected and analyzed for every 20 primary samples was satisfied.

A summary of the primary and duplicate soil/sediment/tailing samples collected during the field investigation is provided in Table 3-1. This table also provides an evaluation of the relative percent difference (RPD) between the sample pairs. Relative percent difference is a measure of precision calculated by the following formula:

$$RPD = \frac{|X_1 - X_2|}{X_{ave}} \times 100$$

Where: X1 and X2 are the observed concentration values
X_{ave} is the average concentration, and
$|X_1 - X_2|$ is the absolute value of the difference between observed values

Results of the RPD calculations for sediment and judgmental soil samples are plotted in Figure 3-1 for each of the COI metals as well as an overall average RPD for each matrix. In general, the sediment (23.0%) and soil (23.1%) had similar RPDs and are considered acceptable.

3.4 Performance Evaluation Samples

The Work Plan (URS 2008) suggested that the submission of performance evaluation samples may be required if there were unexpected or unexplained sample results, or if continued quality issues were detected through the data verification/validation process. None of these issues were identified during the sampling effort, therefore, no performance samples were submitted to the laboratory for evaluation.

3.5 Analytical Data Packages

The analytical data packages for the soil and sediment samples are provided in Appendix B.

3.6 Data Verification

One hundred percent of analytical results were verified in accordance with the methods and procedures identified in Section 5.2 of the QAPP (URS 2008). Data in each of the laboratory work orders was reviewed in accordance with the QAPP-defined criteria, and a data verification

memo and summary table was prepared. These verification memos are provided in Appendix C. All data were determined to be usable, with some of the data qualified per Arizona Data Qualifiers, Revision 3.0, September 20, 2007.

3.7 Data Validation

Level IV validation was performed on 3 of the 28 analytical data packages for the soil sampling effort. Thus, 1 in 9.3 packages were validated; exceeding the 1 in 10 requirement requested by ADEQ in the QAPP review comments. A validation memo was prepared for each analytical data package that was reviewed. These validation memos are provided in Appendix D. All data was determined to usable, with some of the data qualified per Arizona Data Qualifiers.

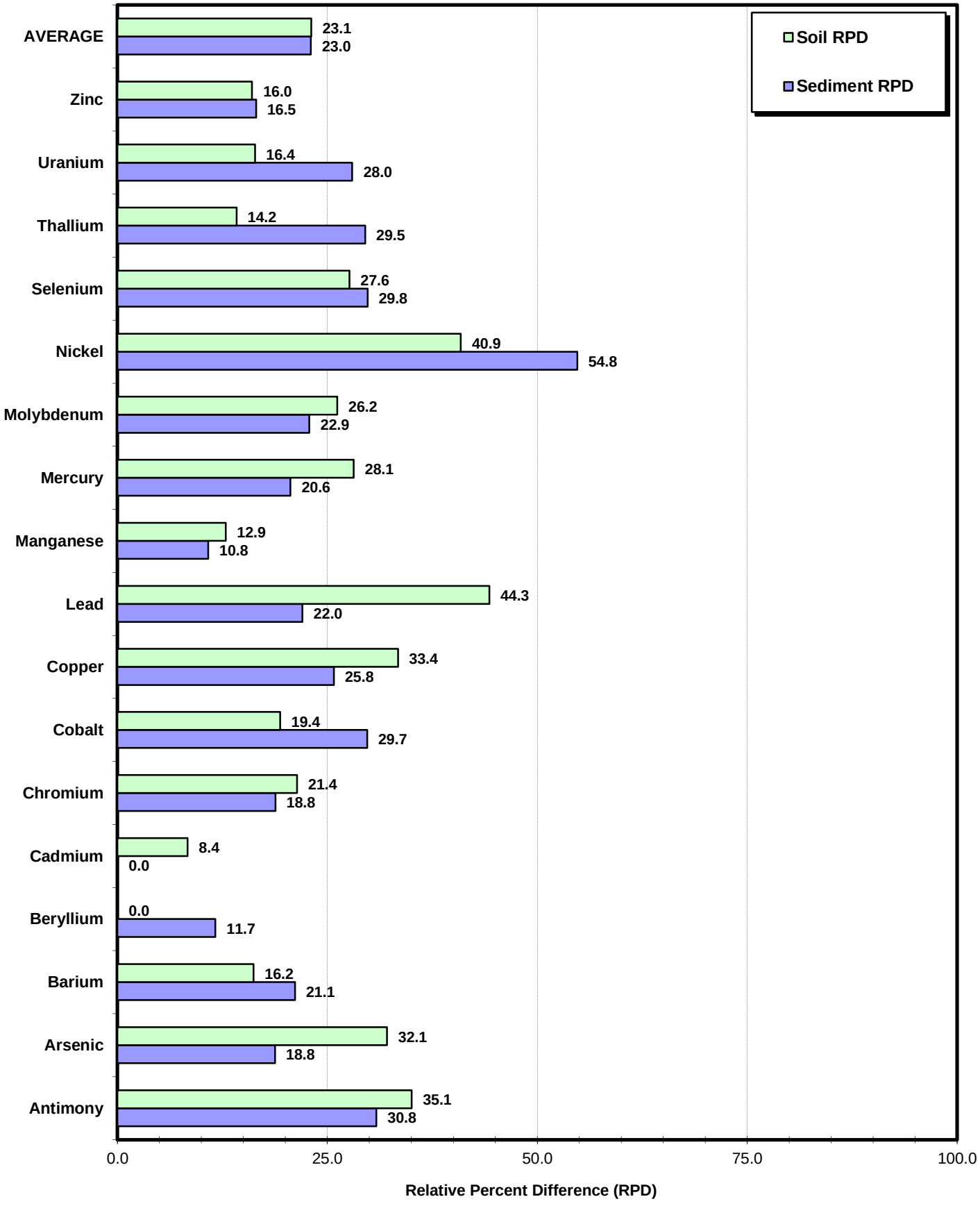
Table 3-1
Sample Replicate Statistical Data Summary For Soil and Sediment Samples
Sierrita Mine VRP Investigation

				Antimony (mg/Kg)	Arsenic (mg/Kg)	Barium (mg/Kg)	Beryllium (mg/Kg)	Cadmium (mg/Kg)	Chromium (mg/Kg)	Cobalt (mg/Kg)	Copper (mg/Kg)	Lead (mg/Kg)	Manganese (mg/Kg)	Mercury (mg/Kg)	Molybdenum (mg/Kg)	Nickel (mg/Kg)	Selenium (mg/Kg)	Thallium (mg/Kg)	Uranium (mg/Kg)	Zinc (mg/Kg)
Non-Residential SRL				410	10	170,000	1,900	510	1,000,000 (Cr III)	13,000	41,000	800	32,000	310	5,100	20,000	5,100	67	200	310,000
Groundwater Protection Level (GPL)				35	290	12,000	23	29	590 (total)	NE	NE	290	NE	12	NE	590	290	12	NE	NE
Sample ID	**Sample Date**	**Depth (ft bgs)**																		
		Top	**Bottom**																	
OD-JS-03-01-03	8/27/2008	1	3	0.4	6.4	114	< 1	< 2	5	6	1510	10.6	203	< 0.2	74	6	0.72	0.23	3.31	71
OD-JS-03-01-03D	8/27/2008	1	3	0.3	2.9	87.4	< 1	< 2	7	9	1800	14.9	186	< 0.2	74	6	0.78	0.22	3.89	76
			RPD	28.6	75.3	26.4	0.0	0.0	33.3	40.0	17.5	33.7	8.7	0.0	0.0	0.0	8.0	4.4	16.1	6.8
CS-JS-05-01-03	8/27/2008	1	3	0.5	14.6	103	0.6	1.7	4	6	148	280	538	< 0.2	17	6	0.39	0.17	8.01	502
CS-JS-05-01-03D	8/27/2008	1	3	0.4	14.5	147	0.6	1.7	5	7	120	212	495	< 0.2	13	7	0.37	0.23	8.81	417
			RPD	22.2	0.7	35.2	0.0	0.0	22.2	15.4	20.9	27.6	8.3	0.0	26.7	15.4	5.3	30.0	9.5	18.5
EM-JS-08-01-03	8/12/2008	1	3	0.4	7.7	47.3	< 1	< 2	2	5	1800	152	190	0.09	315	< 5	3.38	0.2	1.17	39
EM-JS-08-01-03D	8/12/2008	1	3	0.6	8.2	69.5	< 1	< 2	3	5	1430	51.9	193	0.07	342	< 5	2.85	0.17	1.29	43
			RPD	40.0	6.3	38.0	0.0	0.0	40.0	0.0	22.9	98.2	1.6	25.0	8.2	0.0	17.0	16.2	9.8	9.8
RA-JS-02-00-01	8/11/2008	0	1	8	35.4	74.1	<5	1.5	10	17	30,200	137	384	0.36	1,430	2	11.1	0.35	5.63	281
RA-JS-02-00-01D	8/11/2008	0	1	18.1	81.6	70	<2	<5	<10	30	88,000	326	223	0.09	3,430	10	26.3	0.3	3.4	540
			RPD	77.4	79.0	5.7	0.0	0.0	0.0	55.3	97.8	81.6	53.0	120.0	82.3	133.3	81.3	15.4	49.4	63.1
RA-JS-02-01-03	8/11/2008	1	3	17.4	89.7	68.9	<5	2.5	18	22	27,800	349	327	0.28	3,430	2	9.76	0.36	8.62	466
RA-JS-02-01-03D	8/11/2008	1	3	5.2	44.9	73.7	0.8	1.4	9	14	10,600	134	383	0.22	1,950	6	4.77	0.35	10.5	426
			RPD	108.0	66.6	6.7	0.0	56.4	66.7	44.4	89.6	89.0	15.8	24.0	55.0	100.0	68.7	2.8	19.7	9.0
RA-JS-02-05-07	8/11/2008	5	7	9.6	60	78.1	6.2	1.8	35	26	19,600	199	382	0.32	1,950	8	6.25	0.39	29.9	629
RA-JS-02-05-07D	8/11/2008	5	7	9.2	76	81.1	5	2	32	25	18,000	185	415	0.57	1,960	9	7.83	0.52	32.2	589
			RPD	4.3	23.5	3.8	0.0	10.5	9.0	0.0	8.5	7.3	8.3	56.2	0.5	11.8	22.4	28.6	7.4	6.6
RA-SD-01-00-01.5	8/11/2008	0	1.5	1.3	10.1	73.1	0.7	<2	11	6	7,630	86.9	277	0.09	998	2	2.61	0.2	7.72	91
RA-SD-01-00-01.5D	8/11/2008	0	1.5	0.8	10.9	87.2	0.7	<0.5	11	5	3,410	57.3	344	<0.05	1,160	5	3.66	0.3	4.32	110
			RPD	47.6	7.6	17.6	0.0		0.0	18.2	76.4	41.1	21.6	0.0	15.0	85.7	33.5	40.0	56.5	18.9
RA-SD-01-01.5-3.0	8/11/2008	1.5	3	4	24.7	81.7	0.7	0.8	14	10	6,960	114	226	0.11	1,590	2	3.46	0.31	10.9	186
RA-SD-01-01.5-3.0D	8/11/2008	1.5	3	3.2	21.5	77.3	0.8	<0.5	13	6	6,150	95.5	255	0.09	1,090	4	3.99	0.28	9.04	150
			RPD	22.2	13.9	5.5	13.3	0.0	7.4	50.0	12.4	17.7	12.1	20.0	37.3	66.7	14.2	10.2	18.7	21.4
RA-SD-02-00-01.5	8/11/2008	0	1.5	5.8	32.4	52.4	<1	<2	7	4	4,210	106	108	0.13	530	<5	3.13	0.18	2.12	51
RA-SD-02-00-01.5D	8/11/2008	0	1.5	4.3	26.6	56.6	0.3	<2	4	3	4,240	137	115	0.09	550	2	4.12	0.31	1.63	44
			RPD	29.7	19.7	7.7	0.0	0.0	54.5	28.6	0.7	25.5	6.3	36.4	3.7	0.0	27.3	53.1	26.1	14.7
RA-SD-02-01.5-3.0	8/11/2008	1.5	3	7.4	39.1	57.4	0.5	<2	8	5	4,180	91.3	181	0.13	1,000	2	3.02	0.25	3.98	77
RA-SD-02-01.5-3.0D	8/11/2008	1.5	3	9.4	55.1	99.6	0.7	<2	7	4	4790	87.8	175	0.10	1430	4	4.73	0.29	3.58	86
			RPD	23.8	34.0	53.8	33.3	0.0	13.3	22.2	13.6	3.9	3.4	26.1	35.4	66.7	44.1	14.8	10.6	11.0
RP-JS-01-01-03	8/12/2008	1	3	<1	3.1	46.1	0.2	<2	4	5	183	12.7	244	<0.2	86	2	0.8	0.13	2.44	43
RP-JS-01-01-03D	8/12/2008	1	3	<1	3.1	41.8	<1	<2	4	5	181	13.4	239	<0.2	66	1	0.8	0.14	2.35	42
			RPD	0.0	0.0	9.8	0.0	0.0	0.0	0.0	1.1	5.4	2.1	0.0	26.3	66.7	0.0	7.4	3.8	2.4
RP-JS-02-01-03	8/12/2008	1	3	<1	3.5	47.3	<1	<2	3	2	74	8.5	160	<0.2	121	<5	0.74	0.11	1.07	23
RP-JS-02-01-03D	8/12/2008	1	3	<1	3.7	49.3	<1	<2	3	2	81	9.53	169	0.05	109	<5	0.89	0.12	1.25	26
			RPD	0.0	5.6	4.1	0.0	0.0	0.0	0.0	9.0	11.4	5.5	0.0	10.4	0.0	18.4	8.7	15.5	12.2

Table 3-1
Sample Replicate Statistical Data Summary For Soil and Sediment Samples
Sierrita Mine VRP Investigation

	Antimony (mg/Kg)	Arsenic (mg/Kg)	Barium (mg/Kg)	Beryllium (mg/Kg)	Cadmium (mg/Kg)	Chromium (mg/Kg)	Cobalt (mg/Kg)	Copper (mg/Kg)	Lead (mg/Kg)	Manganese (mg/Kg)	Mercury (mg/Kg)	Molybdenum (mg/Kg)	Nickel (mg/Kg)	Selenium (mg/Kg)	Thallium (mg/Kg)	Uranium (mg/Kg)	Zinc (mg/Kg)	Overall Average RPD
ALL SETS OF DUPLICATES INCLUDING NON-DETECTED RESULTS																		**ALL**
Minimum RPD	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.7	3.9	1.6	0.0	0.0	0.0	0.0	2.8	3.8	2.4	0.0
Maximum RPD	108.0	79.0	53.8	33.3	56.4	66.7	55.3	97.8	98.2	53.0	120.0	82.3	133.3	81.3	53.1	56.5	63.1	133.3
Average RPD	33.6	27.7	17.9	3.9	6.1	20.5	22.8	30.9	36.9	12.2	25.6	25.1	45.5	28.4	19.3	20.2	16.2	23.1
Number of Data Points	12 data points	12 data points	12 data points	12 data points	11 data points	12 data points	12 data points	12 data points	12 data points	12 data points	12 data points	12 data points	12 data points	12 data points	12 data points	12 data points	12 data points	
ALL SETS OF DUPLICATE SEDIMENT SAMPLES																		**SEDMIENT**
Minimum RPD	22.2	7.6	5.5	0.0	0.0	0.0	18.2	0.7	3.9	3.4	0.0	3.7	0.0	14.2	10.2	10.6	11.0	0.0
Maximum RPD	47.6	34.0	53.8	33.3	0.0	54.5	50.0	76.4	41.1	21.6	36.4	37.3	85.7	44.1	53.1	56.5	21.4	85.7
Average RPD	30.8	18.8	21.1	11.7	0.0	18.8	29.7	25.8	22.0	10.8	20.6	22.9	54.8	29.8	29.5	28.0	16.5	23.0
Number of Data Points	4 data points	4 data points	4 data points	4 data points	3 data point	4 data points	4 data points	4 data points	4 data points	4 data points	4 data points	4 data points	4 data points	4 data points	4 data points	4 data points	4 data points	
ALL SETS OF DUPLICATE SOIL SAMPLES																		**SOIL**
Minimum RPD	0.0	0.0	3.8	0.0	0.0	0.0	0.0	1.1	5.4	1.6	0.0	0.0	0.0	0.0	2.8	3.8	2.4	0.0
Maximum RPD	108.0	79.0	38.0	0.0	56.4	66.7	55.3	97.8	98.2	53.0	120.0	82.3	133.3	81.3	30.0	49.4	63.1	133.3
Average RPD	35.1	32.1	16.2	0.0	8.4	21.4	19.4	33.4	44.3	12.9	28.1	26.2	40.9	27.6	14.2	16.4	16.0	23.1
Number of Data Points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	8 data points	

Figure 3-1
Soil and Sediment Duplicate Sample Evaluation
Sierrita Mine VRP Investigation



March 2011

4.0 RESULTS EVALUATION

The following sections present an evaluation of the analytical results of the VRP soil and sediment investigation. The subarea characterization data were evaluated by comparing the concentrations of each COI in soil and sediment to its nr-SRL (ADEQ 2007) and soil GPL (ADEQ 1996).

The nr-SRL values are risk-based concentrations considered protective of direct contact occupational exposures to chemicals in soil (e.g., soil ingestion, inhalation, and dermal contact). Specifically, nr-SRLs are concentrations in soil that a worker could be exposed to every working day for 25 years without adverse health effects.

Soil GPLs are the maximum constituent concentrations in soil that if leached to groundwater are assumed to be protective of groundwater quality. The GPL is based on the assumption that 100 percent of the leachable fraction of COIs in soil will reach groundwater, regardless of the depth to the aquifer. Therefore, GPLs are a conservative measure of groundwater protection and represent a "worst case" correlation between COIs in the soil and the leachable fraction.

Upon completion of site characterization activities, Sierrita may opt to perform a site-specific risk assessment, rather than rely solely on comparing sampling results to nr-SRLs and GPLs. Sierrita may also perform a site-specific determination of background concentrations for selected constituents (e.g., arsenic).

4.1 Evaluation Methodology

The subarea characterization data were initially evaluated by comparing the concentrations of each COI in soil and sediment directly to its nr-SRL (ADEQ 2007) and soil GPL (ADEQ 1996). This comparison indicated that COI concentrations in soils and sediments in three subareas, the Former E Pond, Former Evaporation Pond, and Former Rhenium Ponds, were less than their respective nr-SRL and GPLs in all samples collected. The comparison also found that COI concentrations in six subareas (Former CLEAR Plant, Former Esperanza Mill, Old D Pond, Former C Pond and C Pond Spoils, Former Raffinate Pond, and Former Laydown Yard) were greater than their respective nr-SRL or GPL in at least one sample.

COIs detected at concentrations greater than the nr-SRLs were arsenic (Former Clear Plant, Old D Pond, Former Esperanza Mill, Former C Pond and C Pond Spoils, Former Raffinate Pond, and Former Laydown Yard), copper (Former CLEAR Plant and Former Raffinate Pond), lead (Former CLEAR Plant, Former C Pond and C Pond Spoils, Former Raffinate Pond, and Former Laydown Yard), and molybdenum (Former Laydown Yard), as summarized on Table 4-1.

COIs detected at concentrations greater than the GPLs included antimony (Former CLEAR Plant and Former Esperanza Mill) and lead (Former CLEAR Plant, Former C Pond and C Pond Spoils, Former Raffinate Pond, and Former Laydown Yard).

For constituents in each subarea where at least one COI was detected at a concentration greater than its nr-SRL or GPL, the exceedances were further evaluated as follows:

- **Evaluation of the frequency of nr-SRL exceedance.** In accordance with ADEQ and federal U. S. Environmental Protection Agency (EPA) risk assessment guidance, long term exposures are estimated using the 95 percent upper confidence limit (95UCL) of the mean concentration for each chemical within each exposure area. Risk calculations are based on an estimate of average exposure concentration over time, not the maximum concentration. Therefore, if the 95UCL is less than the nr-SRL and the frequency that the nr-SRL is exceeded is low, there is no human health risk at a site.
- **Evaluation of the magnitude of nr-SRL exceedance.** In some cases, there may be a concern that concentrations significantly greater than an nr-SRL level may require further evaluation, even if the 95UCL is below the nr-SRL.
- **Evaluation of GPL exceedance**. ADEQ guidance allows the use of alternative GPLs which are based on the ratio between the total metals concentration and the leachable fraction determined using SPLP analysis.

4.2 Evaluation of Sites with nr-SRL Exceedances

Per EPA guidance, risk-based screening levels are used to identify those sites requiring further evaluation. Exceedance of risk-based screening levels does not indicate inherent risk at a site, but suggests that further evaluation of the site's COI concentrations is necessary. This section discusses the results of the evaluation of the direct contact pathway for subareas where nr-SRLs are exceeded.

The most likely potential exposures to COIs in soil are through direct contact by site workers. The Former CLEAR Plant, Former Esperanza Mill Area, Former C Pond and Spoils, Old "D" Pond, Former Raffinate Pond, and the Former Laydown Yard were further evaluated because nr-SRLs were exceeded in at least one sample at each of these sites.

The soil and sediment data were further evaluated by calculating the 95 percent upper confidence limit on the mean (95UCL) using surface soil data for each subarea. For risk assessment purposes, the ADEQ (Hanley 2010) considers surface soils to occur from 0 to 15 ft bgs. Soils below 15 ft bgs are considered subsurface soils (Hanley 2010). The 95UCL were calculated

using ProUCL Version 4 (EPA 2007). Table 4-2 and the following bullets summarize the results of this evaluation.

- **Former CLEAR Plant** Subarea– Arsenic, copper, and lead were detected at concentrations in soil that exceeded the nr-SRL. The maximum arsenic concentration is 17 times greater than the nr-SRL, and exceeded the nr-SRL in 22 (24 percent) of the samples collected in the subarea. In addition, the 95UCL of 23.1 mg/kg, calculated exceeded the nr-SRL of 10 mg/kg. Therefore, arsenic is tentatively identified as a constituent of potential concern (COPC) at the Former CLEAR Plant.

  Copper and lead concentrations exceeded the nr-SRL, ranging from four samples (4 percent) to two samples (2 percent), respectively. The maximum copper and lead concentrations exceeded the nr-SRL by a factor of three and two, respectively. The calculated 95UCL values for copper and lead were below their respective nr-SRLs (Table 4-2). Therefore, copper and lead are not present at concentrations in soil and sediment that represent a health risk for non-residential populations in the Former CLEAR Plant subarea and are not considered COPCs.

- **Former Esperanza Mill Subarea** – Arsenic concentrations in soil at the Former Esperanza Mill subarea exceeded its nr-SRL (Table 4-2). The maximum arsenic concentration is one order of magnitude (10 times) greater than the nr-SRL, and exceeded the nr-SRL in eight (19 percent) of the samples. The calculated 95UCL (19.4 mg/kg) also exceeded the nr-SRL (10 mg/kg; Table 4-2). Therefore, arsenic is tentatively identified as a COPC in the Former Esperanza Mill Area subarea.

- **Old D Pond Subarea** – A single arsenic result (10.6 mg/kg) slightly exceeded its nr-SRL (10 mg/kg). The arsenic nr-SRL was exceeded in 1 (5 percent) of the samples collected in the subarea. The 95UCL value (4.38 mg/kg) calculated for arsenic is below the nr-SRL (10 mg/kg; Table 4-2). Therefore, arsenic is not present in soil in this subarea at concentrations that represent a health concern for non-residential populations and are not considered COPCs.

- **Former C Pond and C Pond Spoils Subarea** – Arsenic and lead concentrations in soil at the Former C Pond and C Pond Spoils subarea exceeded their respective nr-SRLs. The maximum arsenic concentration exceeded the nr-SRL by a factor of two, and the nr-SRL was exceeded in four (10 percent) of the samples collected at the Subarea. Lead exceeded the nr-SRL in one sample (2 percent) by a factor of five.

The 95UCL values calculated for arsenic and lead are below the nr-SRLs (Table 4-2). Therefore, neither arsenic nor lead is present in soil in this subarea at concentrations that represent a health concern for non-residential populations and are not considered COPCs.

- **Former Raffinate Pond Subarea** – Arsenic and copper concentrations in soil and sediment at the Former Raffinate Pond subarea exceeded its nr-SRL. The maximum arsenic concentration was nearly one order of magnitude (10 times) greater than the nr-SRL and exceeded the nr-SRL in 18 (64 percent) of the samples. In addition, the calculated 95UCL (38.3 mg/kg) also exceeded the nr-SRL (10 mg/kg). Therefore, arsenic is tentatively identified as a COPC in the Former Raffinate Pond subarea.

  Copper exceeded the nr-SRL in 1 sample (4 percent) by a factor of two. The 95UCL calculated for copper of 16,589 mg/kg was below the nr-SRL of 41,000 mg/kg (Table 4-2). Therefore, copper is not present in soil at the Former Raffinate Pond at concentrations that represent a health risk for non-residential populations. Therefore copper is not considered a COPC.

- **Former Laydown Yard** – Arsenic, lead, and molybdenum concentrations in soil exceeded the nr-SRLs. The maximum arsenic concentration is six times greater than the nr-SRL and exceeded the nr-SRL in 10 (63 percent) of the samples. In addition, the calculated 95UCL (19.0 mg/kg) also exceeded the arsenic nr-SRL (10 mg/kg). Therefore, arsenic is tentatively identified as a COPC at the Former Laydown Yard subarea.

  Lead and molybdenum exceeded the nr-SRLs by less than a factor of two. Lead exceeded the nr-SRL in one sample (6 percent); molybdenum exceeded the nr-SRL in four samples (25 percent). The 95UCL values calculated for lead and molybdenum are below their respective nr-SRLs (Table 4-2). Therefore, lead and molybdenum are not present in soil at concentrations that represent a health risk for non-residential populations in the Former Laydown Yard and are not considered COPCs.

4.3 Evaluation of Sites with GPL Exceedances

This section discusses the results of the evaluation of the soil to groundwater migration pathway for subareas where GPLs are exceeded. To evaluate the groundwater migration pathway, COI concentrations in soil were compared to GPLs. Table 4-3 summarizes the COIs detected in soil at concentrations greater than their respective GPLs.

Antimony and lead were the only COIs detected in soil or sediment at concentrations greater than their respective GPLs. Antimony exceeded its GPL in the Former CLEAR Plant and the Former Esperanza Mill subareas. Lead exceeded its GPL in the Former CLEAR Plant, the

Former C Pond and C Pond Spoils, Former Raffinate Pond, and the Former Laydown Yard subareas.

As with direct exposure to soil, the 95UCL represents a broader range of the concentrations that would likely leach to groundwater because leaching occurs over a generalized area, not at a single location within a site. The 95UCLs calculated for antimony and lead in all of the subareas were below the GPLs, with the exception of the 95UCL for lead in the Former Laydown Yard subarea which was slightly greater than the GPL by about 1.2 times (Table 4-3).

Five soil samples containing the highest lead concentrations (ranging from 303 to 3,740 mg/kg) were submitted to the laboratory for SPLP extraction and total lead analysis of the resulting leachate. The leachate concentrations of these samples contained lead at concentrations ranging from less than the reporting limit (0.0005) to 0.001 mg/L. An alternate GPL for lead was calculated using the highest SPLP result of 0.001 mg/L in accordance with *A Screening Method To Determine Soil Concentrations Protective of Groundwater Quality*, (ADEQ 1996). The alternative GPL for lead was calculated at 54,772,300 mg/kg, well below any detected lead concentrations in soil in any of the subareas.

Table 4-1
Summary of Results and Recommendations

Area of Potential Concern	Soil COPC	Soil Characterization Summary	GPL/Groundwater Characterization Summary	Recommendations
Former CLEAR Plant	Arsenic	Arsenic, copper, and lead were detected in soils at concentrations greater than the nr-SRL. The 95% UCL for copper and lead is less than the nr-SRL. The 95% UCL for arsenic exceeds the nr-SRL.	Antimony and lead were detected in soils at concentrations greater than the GPL. The 95% UCL for both detected COIs is less than the GPL.	Develop site-specific arsenic soil remediation level.
Former E Pond	None	No detected COIs have concentrations greater than the nr-SRLs.	No detected COIs have concentrations greater than the GPLs.	Request no further action determination.
Former Evaporation Pond	None	No detected COIs have concentrations greater than the nr-SRLs.	No detected COIs have concentrations greater than the GPLs.	Request no further action determination.
Old D Pond	None	Arsenic was detected in soil at concentrations that slightly greater than the nr-SRL.	No detected COIs have concentrations greater than the GPLs.	Request no further action determination.
Former Esperanza Mill Area	Arsenic	Arsenic was detected in soil at concentrations greater than the nr-SRL. The 95% UCL for arsenic is greater than the nr-SRL.	Antimony was detected in soils at concentrations greater than the GPL. The 95% UCL concentration for antimony is less than the GPL.	Develop site-specific arsenic soil remediation level.
Former C Pond and C Pond Spoils	None	Arsenic and lead were detected in soils at concentrations greater than the nr-SRL. The 95% UCL for arsenic and lead are less than the nr-SRL.	Lead was detected in soils at concentrations greater than the GPL. The 95% UCL concentration for lead is less than the GPL.	Request no further action determination.
Former Raffinate Pond	Arsenic	Arsenic and copper were detected in soils at concentrations greater than the nr-SRL. The 95% UCL for copper is less than the nr-SRL. The 95% UCL for arsenic is greater than the nr-SRL.	Lead was detected in soils at concentrations greater than the GPL. The 95% UCL concentration for lead is less than the GPL.	Develop site-specific arsenic soil remediation level.
Rhenium Pond	None	No detected COIs have concentrations greater than the nr-SRLs.	No detected COIs have concentrations greater than the GPLs.	Request no further action determination.
Former Laydown Yard	Arsenic	Arsenic, lead, and molybdenum were detected in soils at concentrations greater than the nr-SRL. The 95% UCL for lead and molybdenum is less than the nr-SRL. The 95% UCL for arsenic is greater than the nr-SRL.	Lead was detected in soils at concentrations slightly greater than the GPL. The 95% UCL concentration is only slightly greater than the GPL.	Develop site-specific arsenic soil remediation level.

Notes

COPC - Constituent of Potential Concern

95% UCL - 95 percent upper confidence limit of the mean

AWQS - ambient water quality standards

nr-SRL - non-residential soil remediation level

GPL - groundwater protection level

Table 4-2
Results of Soil Screening Against Non-Residential Soil Remediation Levels

Area of Potential Concern	Constituent	Number of Samples	nr-SRL (mg/kg)	Maximum Concentration Screening				95% UCL Concentration Screening		
				Maximum Site Concentration (mg/kg)	Magnitude of Exceedance	Number of Exceedances		95% UCL Concentration (mg/kg)	Does 95% UCL Exceed nr-SRL?	Approximate Magnitude of 95% UCL Exceedance
Former CLEAR Plant (soil and sediment)	Arsenic	93	10	166	16.6	22	24%	19.6	Yes	2
	Copper	96	41,000	109,000	2.7	4	4%	12,209	No	
	Lead	95	800	1820	2.3	2	2%	166	No	
Former Esperanza Mill Area (soil)	Arsenic	43	10	101	10.1	8	19%	19.4	Yes	2
Old D Pond (soil and sediment)	Arsenic	20	10	10.6	1.1	1	5%	4.38	No	
Former C Pond and C Pond Spoils (soil)	Arsenic	41	10	23	2.3	4	10%	6.131	No	
	Lead	41	800	3740	4.7	1	2%	231	No	
Former Raffinate Pond (soil and sediment)	Arsenic	28	10	89.7	9.0	18	64%	38.3	Yes	4
	Copper	28	41,000	88,000	2.1	1	4%	16,589	No	
Former Laydown Yard (soil)	Arsenic	16	10	64.8	6.5	10	63%	19.0	Yes	2
	Lead	16	800	999	1.2	1	6%	349	No	
	Molybdenum	16	5,100	6,830	1.3	4	25%	4,023	No	

Notes

95% UCL - 95 percent upper confidence limit of the mean

nr-SRL - non-residential soil remediation level

Table 4-3
Results of Soil Screening Against Groundwater Protection Levels

Area of Potential Concern	Constituent	Number of Samples	GPL (mg/kg)	Maximum Concentration Screening				95% UCL Concentration Screening		
				Maximum Site Concentration (mg/kg)	Magnitude of Exceedance	Number of Exceedances		95% UCL Concentration (mg/kg)	Does 95% UCL Exceed nr-SRL?	Approximate Magnitude of 95% UCL Exceedance
Former Clear Plant (soil and sediment)	Antimony	78	35	66	2	2	3%	7.524	No	
	Lead	95	290	1,820	6	4	4%	166	No	
Former Esperanza Mill Area (soil)	Antimony	41	35	69	2	1	2%	9.868	No	
Former C Pond and C Pond Spoils (soil)	Lead	41	290	3,740	13	5	12%	231	No	
Former Raffinate Pond (soil and sediment)	Lead	28	290	349	1	2	7%	135.6	No	
Former Laydown Yard (soil)	Lead	16	290	999	3	3	19%	349	**Yes**	1.2

Notes

95% UCL - 95 percent upper confidence limit of the mean

GPL - groundwater protection level

mg/kg - milligrams per kilogram

5.0 REFERENCES

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Appendix A

Soil Boring Logs

Appendix B

Soil and Sediment Analytical Data Packages

March 2011

Appendix C

Data Verification Reports

March 2011

Appendix D

Level IV Data Validation Reports

March 2011

Appendix A

Soil Boring Logs