NOTICE OF AVAILABILITY AND 30-DAY PUBLIC COMMENT PERIOD
RESOLUTION COPPER MINING LLC
VOLUNTARY REMEDIATION PROGRAM (VRP) SITE
WORK PLAN FOR REMEDIATION

The Arizona Department of Environmental Quality (ADEQ) has received a Remedial Action Work Plan (work plan) for the Resolution Copper Mining – West Plant VRP Site. The work plan proposes sampling, characterization, remediation, and disposal of impacted soils from the historic smelting operations on the mine property. Constituents of concern at the site are arsenic, lead, and copper. The work plan was submitted in accordance with Arizona Revised Statutes (A.R.S.) § 49-175 and A.R.S. § 49-176. The Resolution Copper Mining – West Plant VRP Site is located near Superior, Arizona.

The work plan is available for review online at: https://azdeq.gov/environ/waste/cleanup/vrp.html, or in hard copy at the ADEQ Records Center, 1110 W. Washington St., Phoenix, (602) 771-4380, or (800) 234-5677, ext. 6022345677; please call for hours of operation and to schedule an appointment. You may also review a hard copy of the work plan by calling the Mine Information Office at (520) 689-3409 to schedule an appointment. Additional information about the Resolution Copper Mining – West Plant VRP Site, as well as an electronic copy of the work plan, can be found at http://resolutioncopper.com/environment/vrp.

PARTIES WISHING TO SUBMIT WRITTEN COMMENTS regarding the work plan for the Resolution Copper Mining – West Plant VRP Site may do so to Resolution Copper Mining, Attention: Casey McKeon at 102 Magma Heights Rd., Superior, Arizona 85173. Comments may also be submitted to ADEQ, Attention: Joey Pace, Voluntary Remediation Program, 1110 W. Washington St., Phoenix, AZ 85007. Please reference this listing when commenting. **Comments must be postmarked or received no later than 5 p.m. on May 6, 2016.**

To request an auxiliary aid or service for accessible communication, please contact ADEQ at (602) 771-4791 or at vega.christina@azdeq.gov or dial 7-1-1 for TTY/TTD Services.

Si desea esta información en Español, por favor llame al (602) 771-4189 ó sin tarifa al (800) 234-5677 y marque el número 2 para Español.

Dated this 6 day of April 2016

WORK PLAN

REMEDIAL ACTION WORK PLAN FOR SMELTER AFFECTED SOIL IN THE INDUSTRIAL AREA SOUTH

West Plant Site, Superior, Arizona

VRP Site Code 502878-11

Submitted To: Resolution Copper Mining LLC
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Superior, Arizona 85273

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Distribution: ADEQ – 3 Copies and 3 CDs
RCML – 1 Copy and 1 CD
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March 2016

Project No. 1527097-04

Golder Associates

VOLUNTARY REMEDIATION PROGRAM CHECKLIST

Reference	Summary of Statutory Requirement	Section Where Addressed in Work Plan
§49-175A.1	Summary of existing site characterization and assessment information; information regarding any remediation previously conducted; copies of referenced reports not previously submitted;	Section 2.0
§49-175A.2	If the site has not been characterized, a plan to conduct site characterization and a schedule for completion.	Not Applicable
§49-175A.3.a	If site characterization is completed, a description of how the remediation will comply with §49-175B ("Work Plans") and how the completion of remediation will be verified. A schedule for completion must be included.	Sections 3.0 and 4.0
§49-175A.3.b	If site characterization is completed, the work plan may provide for the remediation to be conducted in phases or tasks. A schedule for completion must be included.	Section 3.7
§49-175A.4	Schedule for submission of progress reports.	Section 3.8
§49-175A.5	A proposal for community involvement as prescribed by §49-176 ("Community Involvement Requirements")	Section 6.0
§49-175A.6	If known, a list of institutional or engineering controls necessary during remediation and after completion of the proposed remediation to control exposure to contaminants.	Section 3.2
§49-175A.7	A proposal for monitoring during remediation and after the remediation if necessary to verify whether the approved remediation levels or controls have been attained and will be maintained.	Section 4.0

Reference	Summary of Statutory Requirement	Section Where Addressed in Work Plan
§49-175A.8	A list of any permits or legal requirements known to apply to the work or already performed by the applicant.	Section 1.0
§49-175A.9	If requested by the department, information regarding the financial capability of the applicant to conduct the work identified in the application (if applicable).	Not Applicable
§49-175B	Remediation levels or controls for remediation conducted pursuant to this article shall be established in accordance with rules adopted pursuant to §49-282.06 unless one or more of the following applies: see §49-175B.1 through §49-175B.4, below.	Section 2.5
§49-175B.1	The applicant demonstrates that remediation levels, institutional controls, or engineering controls for remediation of contaminated soil comply with §49-152 and the rules adopted.	Sections 3.1 and 3.2
§49-175B.2	The applicant demonstrates that remediation levels, institutional controls, or engineering controls for remediation of landfills or other facilities that contain materials that are not subject to §49-152 (i.e. asbestos) do not exceed a cumulative excess lifetime cancer risk between 1x10-4 to 1x10-6, and a hazard index of no greater than 1.	Not Applicable
§49-175B.3	The applicant demonstrates that on achieving remediation levels or controls for a source or potential source of contamination to a navigable water, the source of contamination will not cause or contribute to an exceedance of surface water quality standards, or if a permit is required pursuant to 33 United States Code §1342 for any discharge from the source, that any discharges from the source will comply with the permit.	Section 3.3

Reference	Summary of Statutory Requirement	Section Where Addressed in Work Plan
§49-175B.4	The applicant demonstrates that on achieving remediation levels or controls for a source of contamination to an aquifer, the source will not cause or contribute to an exceedance of aquifer water quality standards (AWQS) beyond the boundary of the facility where the source is located.	Section 3.4
§49-175B.5.c	The VRP may waive any work plan requirement under this section that it determines to be unnecessary to make any of the determinations required under §49-177. If any waivers are requested in the Work Plan or have been previously requested and approved by the VRP, cite them in the Work Plan, including a citation of the statute for which the waiver applies.	Not Applicable

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ACRONYM AND ABBREVIATION LIST

Acronym	Definition
AAC	Arizona Administrative Code
ACGIH	American Conference of Governmental Industrial Hygienists
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
AIHA	American Industrial Hygiene Association
ALM	Adult Lead Model
Amsl	Above mean sea level
APP	Aquifer protection permit
ARS	Arizona Revised Statutes
ATSDR	Agency for Toxic Substances and Disease Registry
AWQS	Aquifer water quality standards
AZPDES	Arizona Pollutant Discharge Elimination System
B&C	Brown & Caldwell
bgs	below ground surface
BHP	Broken Hill Propriety - Billiton
BMP	Best management practice
CIH	Certified industrial hygienist
COC	Constituents of concern
CSM	Conceptual site model
DEUR	Declaration of Environmental Use Restriction
DMAMP	Dust Management and Air Monitoring Plan
EH&S	Environment, Health, and Safety
EMF	East Mountain Front
EMPA	Electron microprobe analysis
Golder	Golder Associates, Inc.
GPL	Groundwater protection level
GPS	Global positioning system
HEPA	High efficiency particulate air
HSO	Health and safety officer
HUD	Housing and Urban Development
IAN	Industrial Area North
IAS	Industrial Area South
ICP/AES	Inductively coupled plasma/atomic emission spectroscopy
ICP/GFAA	Inductively coupled plasma/graphite furnace atomic adsorption
ICP/MS	Inductively coupled plasma/mass spectroscopy
IDLH	Immediately dangerous to life and health
IVBA	In Vitro Bioaccessibility
mg/kg	Milligrams per kilogram
MSGP	Multi-Sector General Permit
MSHA	Mine Safety and Health Administration
Mg/ft^3	Milligram per cubic foot
Mg/kg	Milligram per kilogram
mg/L	Milligrams per Liter
Mg/m^3	Milligram per cubic meter
Mps	Meters per second

Acronym	Definition
MRL	Minimum risk level
NAAQS	National Primary Ambient Air Quality Standards
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMF	North mountain front
PEL	Permissible exposure limit
PM_{10}	Particulate with an aerodynamic diameter of 10 microns or less
PPE	Personal protective equipment
ppm	Parts per million
QA/QC	Quality assurance/quality control
RAWP	Remedial action work plan
RCML	Resolution Copper Mining LLC
REL	Recommended exposure limit
SAP	Sampling and Analysis Plan
SAS	Smelter-affected soils
SKW	Silver King Wash
SPLP	Synthetic precipitation leaching procedure
SRL	Soil remediation level
SRU	Soil Removal Unit
SSSRL	Site specific soil remediation level
SWPPP	Stormwater Pollution Prevention Plan
TLV	Threshold limit value
TP	Tailing pond
TRW	Technical Review Workshop
UCL	Upper Confidence Limit
$\mu g/m^3$	Microgram per cubic meter
USEPA	US Environmental Protection Agency
VRP	Voluntary Remediation Program
WHASP	Worker health and safety plan
XRF	X-ray fluorescence

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) was prepared by Golder Associates Inc. (Golder) on behalf of Resolution Copper Mining LLC (RCML) for the remediation of the smelter-affected soils (SAS) at the West Plant Site, Superior, Arizona (Figure 1-1). The SAS in the West Plant Site is regulated by the Arizona Department of Environmental Quality (ADEQ) Voluntary Remediation Program (VRP). Remediation of SAS in the West Plant Site will be conducted per site-specific soil remediation levels (SSSRLs) approved by the VRP (ADEQ 2015).

SAS at the West Plant Site was previously regulated under RCML's Area-wide Aquifer Protection Permit (APP) No. P-101703 administered by ADEQ from 2007 to 2010. In the spring of 2010, RCML elected to switch the regulatory authority of the SAS to the VRP within ADEQ. RCML applied to the VRP program in May 2010, and the application was accepted on May 18, 2010 (VRP Site Code: 502878-11). The remediation of the SAS at the West Plant Site will take place under the ADEQ VRP as described in Arizona Revised Statutes (ARS) §49-171 to -188.

While the West Plant Site has moved from the Area-wide APP to the VRP program, the Area-wide APP continues to play a role in the remediation process because the soil slated for removal at the West Plant Site will be used as mass grading fill in Tailings Pond 6 (TP-6) that continues to be regulated under the Area-wide APP. The APP and VRP programs have agreed to coordinate their efforts at the West Plant Site so that remediated soil will be available in a timely manner for use as mass grading fill in closure.

There are five land areas within the West Plant Site, including the Industrial Area South (IAS) portion, as described in Section 2.1. Discrete SSSRLs were developed for each of the land areas (Golder 2015a), however, the arsenic SSSRLs for the other land areas may be revised in the future, as explained in Section 2.5, pending decisions by the US Environmental Protection Agency (USEPA) regarding the use of in vitro arsenic bioaccessibility as a parameter in the calculation of SSSRLs. Since most of the IAS is slated for remediation (regardless of potential revisions to the SSSRLs), the IAS remediation will be initiated with the existing approved SSSRLs. Therefore, this work plan applies only to the IAS of the West Plant Site. Although this RAWP is developed for the IAS only, the rationale and background information for all areas are included in order to demonstrate the overall approach for remediation of SAS.

1.1 Environmental Covenants

RCML developed SSSRLs for the SAS in each land area using probabilistic human health risk-based calculations, as described in detail in Section 2.5, based on current and future mining use, with industrial workers and trespassers as potential receptors. The VRP has approved the Preliminary SSSRLs for SAS remediation (ADEQ 2015).

The approved Preliminary SSSRLs provide remediation levels that exceed the applicable residential soil remediation levels (Residential SRLs) for the property. Therefore, as required under ARS §49-152, at the completion of soil remediation at the West Plant Site, RCML will record a restrictive covenant entitled "Declaration of Environmental Use Restriction" (DEUR) in Pinal County. The DEUR will list the institutional controls that RCML will implement at the property. In accordance with ARS §49-152K, RCML will submit an annual report regarding the status of the institutional controls, as described in further detail in Section 3.8.3.

2.0 SITE SUMMARY

The West Plant Site is located adjacent to the northern edge of the town of Superior in Pinal County, Arizona (Figure 1-1). As detailed in the Site Characterization Report (Golder 2011), the West Plant Site has been in mining operations since 1902, with concentrator operations beginning in 1914, and smelting operations occurring from 1924 through 1972. The West Plant Site has been used for various mining support activities since 1972.

The property was purchased by Broken Hill Property (BHP) Billiton in the mid-1990s and mining continued until mid-1996. From 2001 to 2004 exploration activities were led by Kennecott Canada Exploration and RCML. RCML is a Limited Liability Company owned by Resolution Copper Company (55%), a subsidiary of Rio Tinto, plc, and BHP Copper, Inc. (45%), a subsidiary of BHP Billiton plc.

Redevelopment planning for the West Plant Site is currently underway. The SAS containing concentrations above the SSSRLs will be remediated by excavation and placement as mass grading fill in TP-6 under the Area-wide APP. The volume of SAS to be remediated is an essential input parameter needed in the closure design for TP-6, which is scheduled for submittal under Compliance Schedule Item No. 37 by the end of March 2016. The volume of soil to be excavated during remediation is directly related to the SSSRL selected for the SAS. The estimated soil areas, depths, and volumes are included in this RAWP, and have been incorporated into the TP-6 closure design.

The current plan of operations for the West Plant Site has recently been revised to support mining operations at the East Plant Site underground mine (Figure 1-1), and will include a concentrator complex, a development rock stockpile, and various support facilities.

2.1 Site Land Areas

For the purposes of site characterization and the initial screening risk evaluation, the West Plant Site was divided into five discrete land areas based on West Plant Site history, topography, accessibility, contaminant transport, and receptor frequency of use characteristics (Figure 1-2). The five land areas are:

- Eastern Mountain Front (EMF) – This 149 acre land area comprises the ridge bounded along the east side of the West Plant Site. It is open land that is owned but not utilized by RCML.
- Northern Mountain Front (NMF) – This 501 acre land area is bounded by the IAN and IAS to the west and south, by the property line to the north, and by rocky outcrops to the east. It is also open land that is owned but not utilized by RCML.
- Industrial Area North (IAN) – This 521 acre land area is bounded by the property line in some places and by the other land areas in other places. The industrial use is mining related, currently at a low level, however redevelopment plans in this area are expected to result in higher levels of use.

- Industrial Area South (IAS) – This 572 acre land area is bounded by the property line in some places and by the other land areas in other places. The industrial use is mining related.
- Silver King Wash (SKW) – This 37 acre land area is generally the channel and floodplain bounded by the property line on the west and north, and the hill slopes on the east.

2.2 Previous Reports

There are several reports that have been submitted to the APP and VRP related to characterization of the West Plant Site. The major reports and their roles in characterization are summarized below:

- **Brown & Caldwell (B&C) Draft Remediation Action Plan (B&C 1998)** - B&C developed a remediation action plan for Broken Hill Propriety- Billiton (BHP) to delineate affected areas, to provide data for risk evaluation and to evaluate remediation options. This report presents the soil sampling results for the 10-series dataset resulting from that investigation.
- **Site Characterization Report (SCR) for the West Plant Site, Superior, Arizona (Golder 2011)** – Golder conducted a comprehensive site characterization study to summarize previously collected data as well as new data for the characterization of SAS at the West Plant Site. The SCR was approved by the VRP in 2013 (ADEQ 2013).
- **Study Report: In Vitro Bioaccessibility (IVBA) Evaluation of Soils, West Plant Site (Golder 2015b)** – This report provides the results of an IVBA study of arsenic-containing soils at the Site as one of several input parameters in the development of SSSRLs for the Site.
- **Development of Site-Specific Soil Remediation Levels (SSSRLs) for the West Plant Site (Golder 2015a)** – This report summarizes the computational approach, model input parameters, and results of the calculation of SSSRLs using human health risk-based probabilistic methodology for constituents of concern (COCs) at the West Plant Site. The Preliminary SSSRLs were approved by VRP in 2015 (ADEQ 2015).

2.3 Existing Site Characterization Information

The SCR provided a comprehensive summary of the physical characteristics and existing environmental characterization information for the Site (Golder 2011). The quantity and quality of the existing data were evaluated for use in the development of risk-based evaluations, a preliminary conceptual site model was presented, and the COCs were identified (arsenic, copper, and lead).

SAS investigations at the West Plant Site were conducted by both B&C and Golder. The Golder and B&C datasets are comparable with respect to particle size fraction and laboratory methods and are summarized in this section.

A thin surface "gray layer" is present near the stack. This layer diminishes with distance from the stack until it is no longer visible. The B&C sample collection methods did not differentiate the gray layer and may have mixed the gray layer and the underlying brown soil, whereas the Golder sample collection methods separated the gray layer and the underlying brown soil where present.

Figure 2-1 shows the soil sample locations for the SAS investigations. Figures 2-2 and 2-3 provide the arsenic and copper concentrations, respectively, for each sample location. Figure 2-4 presents the lead concentrations for sample locations where lead data were collected. The following are summaries of the data collection events at the West Plant Site:

- B&C 10-Series Soil Samples – A total of 270 samples were collected at 186 locations on a grid that did not distinguish between soil and waste facilities, and are called the 10-series dataset. The samples also did not distinguish any soil layering. These samples included 190 surface samples (0 to 0.8 inch below ground surface [bgs]) and 60 subsurface samples (varying depth intervals between 0.8 and 24 inches bgs). The samples were analyzed for arsenic and copper. A subset of 10 samples was analyzed for additional constituents: antimony, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, thallium, and zinc.
- Golder 2001 Surface Soil Investigation – Golder collected additional soil samples in October 2001 to evaluate the earlier B&C data (Golder 2011). Samples were collect in two transects approximately perpendicular and parallel to two possible predominant wind directions (i.e., southwest to northeast, southeast to northwest). The sample locations were also varied by hill slope position (i.e., toe, mid-slope, and crest); aspect (i.e., facing stack and facing away from stack); distance from the stack; and location with respect to the stack (i.e., upwind and downwind). A total of 19 soil samples were collected with 9 samples from the surface gray layer, 9 samples from the underlying brown soil. Care was taken to not mix material from the gray layer and underlying brown soil during sampling. Samples were analyzed for arsenic and copper, and select samples were analyzed for a suite of 23 metals.
- Golder February 2008 Surface Soil Investigation – Golder evaluated the adequacy of the existing soil data and concluded that additional data were needed for the SKW and EMF (Golder 2011). At the request of ADEQ, additional samples were also collected in the EMF and NMF. The 41 additional soil samples were collected in February of 2008 at 0 to 2 inches bgs. Samples were analyzed for arsenic, copper and lead.
- February 2009 Surface Soil Investigation – Surface soil total metals results from the February 2008 sampling event indicated high lead in the hills to the east and north of the West Plant Site (Golder 2011). In order to confirm or disprove that these lead results were anomalous Golder conducted additional sampling of surface soils in these areas. Sampling consisted of in-situ x-ray fluorescence (XRF) measurements in 52 locations where anomalous lead concentrations were observed, and total metals analysis of 11 bulk samples with lead concentrations above groundwater protection levels (GPLs) for lead (290 mg/L). In addition, 11 sieved samples were analyzed for synthetic precipitation leaching procedure (SPLP) metals analysis for arsenic, copper and lead.
- April 2008 Test Pit Investigation – Golder collected 123 sediment samples from 30 shallow test pits in the IAN and IAS (Golder 2011). The <250 um fraction (sieved) was analyzed on all samples, and the bulk fraction (unseived) samples were variably analyzed. The test pits were mostly excavated in the IAS, and 2 were excavated in the IAN. This sampling was undertaken in support of the planned remedial action, but also provided SPLP data to be used in the calculation of Alternative GPLs.
- In Vitro Bioaccessibility Study – An IVBA study was conducted in 2015, because arsenic was found to be driving risk for the incidental soil ingestion pathway (Golder 2011) and the oral bioaccessibility of arsenic is an important parameter in the incidental soil ingestion pathway model calculations. The ADEQ suggested that the relative probability distribution from the ADEQ-approved risk assessment for the Northwest Study Area, located in the adjacent town of Superior (B&C 2009), be used for default IVBA data. However RCML

elected to develop a site-specific probability distribution of IVBA data from site soils. A total of 26 samples were collected in March 2015 for IVBA and electron microprobe analysis.

2.4 Conceptual Site Model

A conceptual site model (CSM) was developed in the SCR (Golder 2011), and updated in the SSSRL Report (Golder 2015a), that shows the relationships between waste sources, release mechanisms, affected media, pathways, exposure routes, and receptors at the site (Figure 2-5). RCML has selected the current and reasonably foreseeable future land use for the West Plant Site to be industrial use, in accordance with Arizona Administrative Code (AAC) R18-16-406(G). Industrial workers are present at varying levels of frequency in each land area. In the IAN and IAS, workers are present on a typical work day. Industrial workers may visit the remaining areas infrequently, at varying levels of contact.

Trespassers are most likely to visit the SKW because of the access from US Forest Service roads. They are much less likely to visit the EMF or NMF because of the rugged terrain and difficult access. Trespassers are unlikely to enter the IAN and IAS because of the active security measures in place, as detailed in the SCR (Golder 2011).

The following is a summary of the CSM:

- **Primary Sources** – Sources include mineral processing activities, including ore, tailings, slag, flue dust, and direct emissions. During operations, emissions consisted of particulate emissions from the smelter stack and fugitive emissions from tailings as well as other mineral processing activities, including crushing and concentrating. The smelter stack, however, was the largest source of emissions.
- **Secondary and Tertiary Sources and Release /Transport Mechanisms** – Particulate and fugitive emissions were transported by air and deposited on soil surrounding the source areas. The deposition of airborne particulate and fugitive emissions typically results in a higher mass of material deposited on soil closer to the source. Thus, constituent concentrations are typically highest near the source areas and decrease with increasing distance from the source areas, although this general pattern can be complicated by rugged topography. In the processing area, direct deposition of mining wastes (e.g., ore, overburden, tailings, and slag) may have occurred. These materials may have been re-suspended in air and re-deposited onto the surrounding surface soil.
- **Affected Media**
  - Soil – Particulate and fugitive emissions from the source areas are released to soil surrounding the site by airborne transport and deposition.
  - Air – A small quantity of constituents may be temporarily released into the air as respirable particles by airborne transport and as re-suspended particles from the soil. The COCs are all inorganic constituents and are not volatile.
- **Exposure Pathway** – Exposure pathways are the mechanisms by which receptors come into contact with COCs. For the West Plant Site, there are three direct exposure pathways: incidental ingestion of, dermal contact with affected soil, and inhalation of re-suspended soil particles.

- **Potential Receptors** – The potential receptors are industrial workers and illegal trespassers. The levels of use for each receptor are summarized in Figure 2-5 for each land area at the Site.

2.5 SSSRL Development

An SSSRL Report (Golder 2015a) was submitted to VRP in 2015 that provided a summary of the calculations of SSSRLs. The SSSRLs were calculated for the parameters identified in the CSM, including the potential receptors, exposure routes, frequency of use, which are each variable for each land area. The SCR (Golder 2011) identified the COCs for the SAS as arsenic, copper, and lead. The SSSRLs were calculated using a human health risk-based probabilistic methodology for the COCs in accordance with AAC R18-7-206.

Exposure pathways considered were incidental ingestion of soil, dermal contact, and inhalation of soil particulates. The potential receptors are industrial workers and trespassers, at varying levels of frequency of use for each land area (Figure 2-5). The SSSRLs calculated for each land area were based on the 5th percentile of the full distribution of calculated values. The USEPA Adult Lead Model (ALM) was used to estimate an SSSRL for lead exposures.

2.5.1 IVBA Data

The IVBA parameter is used in the probabilistic risk-based calculation of SSSRLs to represent the oral bioavailability of arsenic. During the development of SSSRLs, the ADEQ requested that the IVBA value used should be consistent with the value used in the risk assessment conducted by Exponent, Inc. (Exponent) for the Northwest Study Area in the adjacent town of Superior. However, RCML elected to develop site-specific data using IVBA as a surrogate for determining in vivo bioavailability (based on live animal studies) of arsenic in soils.

There is a USEPA-approved approach for using IVBA data as a surrogate for bioavailability of lead, however the methods for arsenic IVBA have not yet been validated by USEPA for use as a surrogate for arsenic bioavailability. A peer-reviewed published validation study developed by Yvette Lowney (Exponent) and Susan Griffin (USEPA) to determine if bioaccessibility (*in vitro*) data could provide an estimate of the relative bioavailability of arsenic as typically determined from time consuming and costly live (*in vivo*) animal feeding studies, and thus provide a validation for the use of the *in vitro* methods alone. The Griffin and Lowney (2012) report currently is under review by the USEPA Technical Review Workgroup (TRW), and a validation report on the use of IVBA for evaluating soil arsenic relative bioavailability is expected to be published in the near future.

RCML conducted a site-specific IVBA study (Golder 2015b) by collecting soils throughout the West Plant Site for IVBA analysis along with electron microprobe analysis (EMPA). The data from the IVBA study was used to construct a probability distribution for oral bioaccessibility of arsenic at the West Plant Site (Golder

2015a). The raw IVBA data were used in the determination of the arsenic SSSRLs because at the time of the calculations, the USEPA had not yet validated the model for arsenic IVBA.

2.5.2 Phased SSSRL Approach

It is understood that ADEQ has deferred approval of the site-specific IVBA data pending validation of the arsenic IVBA method by the USEPA. Therefore, SSSRLs developed using site-specific IVBA data are also pending ADEQ approval. Since the timeline of the USEPA validation of the IVBA methodology does not align with the remedial action schedule, RCML proposes to work with the following sets of SSSRLs:

- Preliminary (default IVBA value) arsenic SSSRLs: These are developed using the default relative probability distribution from the ADEQ-approved Northwest Study Area risk assessment (B&C 2009) for the initial phase of remedial actions at the West Plant Site. The areas to be remediated during the initial phases of remediation are the areas with the highest arsenic concentrations around the stack and adjacent hillsides, with concentrations above 500 mg/kg arsenic, which is within the IAS. RCML had previously determined that remediation in the stack area is inevitable, so the use of preliminary SSSRLs would have little effect on the decisions made in the initial phases of remediation.
- Interim (pre-USEPA validation) arsenic SSSRLs: These are developed using the current site-specific IVBA data, prior to the USEPA validation of the IVBA methodology. The importance of the interim SSSRLs is that they will enable RCML to determine whether remediation will be needed in the distal areas outside of the stack area, where concentrations are above the preliminary SSSRLs, but may be below the approved SSSRLs (described below). These areas may not require remediation if the approved SSSRLs are accepted by ADEQ. In addition, the interim SSSRLs will allow RCML to plan the remediation effort by having a range of potential cleanup levels to work with (e.g., high estimate and low estimate).
- Approved (post-USEPA validation, and assumed to be approved by ADEQ) SSSRLs: At the time that USEPA validates the IVBA methodology, it is expected that they will publish a report that will contain a regression equation to convert IVBA data to relative bioavailability (RBA) values. In that event, the site-specific IVBA distributions used for the interim SSSRLs will need to be revised using the published equation (which will not be known until publication) to develop RBA distributions. At this time, the interim SSSRLs will be converted to approved SSSRLs (assuming ADEQ provides approval at the time of USEPA validation) to delineate the vertical and lateral extent of remediation in the areas distal from the stack area.

The results of the SSSRL calculations are summarized in Table 2-1 for both preliminary (using default bioaccessibility values) and interim (using site-specific arsenic bioaccessibility values) SSSRLs. In all areas except for arsenic in the IAN and IAS, the calculated SSSRLs in each of the land area are higher than the 95% upper confidence limits (UCLs) for the measured COCs in soil. Therefore, no remediation will be needed in the EMF, NMF, or SKW.

As shown in Table 2-1, the 95% UCL for arsenic in the IAN is higher than the preliminary arsenic SSSRL, but lower than the interim arsenic SSSRL. Because of this, the need for remediation in the IAN is not yet known. The SSSRLs for the IAN will be recalculated upon USEPA validation of the IVBA method to determine the areas, if any, that require remediation. Once it has been determined that remediation is

needed in the IAN, a remedial action work plan will be developed for the IAN areas exceeding the revised (approved) SSSRLs.

2.6 Areas Previously Remediated, Postponed, or Excluded

Within the area bounded by the SSSRL for arsenic (i.e., 185 mg/kg), there are several areas that RCML previously remediated as part of ongoing closure activities, or that will be postponed for remediation, or that are outside of the scope of soil remediation under the VRP. As shown on Figure 2-6, these areas are:

- **Tailings Pond 3/4 Borrow Area.** This area comprises approximately 18 acres to the east of the Exclusion Zone where RCML previously obtained cover material for closure of the adjacent Tailings Pond 3/4 in 2011. RCML stripped the SAS before processing borrow material. Surface soil samples were collected form the stripped surface for external laboratory analysis to confirm that the underlying material was suitable for use as cover. Since the SSSRLs were being developed at that time, RCML adopted an internal remediation level of 100 mg/kg for arsenic for the stripped surface. Given that this internal level is less than the actual SSSRL, no additional soil remediation is proposed. The post-remediation data for this area will be included in the Completion Report.
- **Former Ore Bin Area.** This area comprises approximately 3 acres within the Exclusion Zone near the southeast perimeter. RCML previously demolished a historic ore bin structure and removed old piles of ore, including underlying soil. RCML placed cover material on this area after demolition and removal. RCML will perform confirmation sampling in this area using the same protocols as for the Exclusion Zone. These new data will be submitted with the completion report for the IAS.
- **Stack Safety Area.** This area comprises approximately 7 acres within the Exclusion Zone along the southeast perimeter. RCML has not yet decided whether the historic stack will remain. This area also includes an existing concrete water retention structure that will be used as a sediment basin for the soil removal project. Until a decision is made, however, it is unsafe to work within the 300-foot fall radius of the stack. Remediation of the soil in this area will be undertaken at a later date. Data confirming conformance with the SSSRLs will be submitted at that time.
- **Smelter Complex Area.** This area comprises approximately 3 acres to the southeast of the Exclusion Zone and contains the historic smelter buildings, roads, and other infrastructure. As such, this area does not constitute soil and is outside the scope of soil remediation under the VRP.
- **Main Channel Culverts Area.** This area comprises approximately 2 acres to the southeast of the Exclusion Zone. Culvert installation is underway as part of advancing construction of the overall stormwater control system for the West Plant Site as part of the multi-sector general permit (MSGP). There is little native soil in this previously disturbed area and mine materials are being removed and/or covered during the construction. As such, this area does not constitute soil and is outside the scope of soil remediation under the VRP.
- **Depot Pond.** This area comprises approximately 4 acres to the south of the Exclusion Zone. Depot Pond was clean closed under the Area-wide APP in 2008. As such, this area does not constitute soil and is outside the scope of soil remediation under the VRP.
- **Slag Pile.** This area comprises approximately 24 acres within the Exclusion Zone. The slag pile is exempt from closure requirements under Arizona regulations because of its age, and RCML is considering management options. As such, this area does not constitute soil and is outside the scope of soil remediation under the VRP.

- **Historic Disposal Facility.** This area comprises approximately1 acre within the Exclusion Zone on the north side of the Slag Pile. This area will be removed prior to remediation of SAS. As such, this area is outside the scope of soil remediation under the VRP.

3.0 SITE REMEDIATION

3.1 Remedial Action Objectives

Remedial objectives for the West Plant Site were developed to address the COCs, the media of concern, and the potential exposure pathways. The remedial objectives for the West Plant Site are as follows, by environmental media:

- Soil: Prevent human incidental ingestion and direct dermal contact with COCs in surface soil at concentrations that pose an excess cancer risk greater than 10^{-5} or a hazard index greater than 1.
- Soil: Prevent human inhalation of COCs resuspended from surface soil to air that pose an excess cancer risk greater than 10^{-5} or a hazard greater than 1.
- Groundwater: Ensure that upon achieving remediation levels, the remaining soil will not cause or contribute to an exceedance of aquifer water quality standards (AWQS) beyond the boundary of the facility.
- Surface water: Ensure that upon achieving remediation levels, the source will not cause or contribute to an exceedance of surface water standards or permit requirements of the Arizona Pollutant Discharge Elimination System (AZPDES) program.

3.2 Remedial Approach

The remedial approach consists of a combination of removal of SAS soils that exceed their respective SSSRLs, to be transported and placed in TP-6. The remaining areas that do not exceed their respective SSSRLs but exceed Residential SRLs will be placed under institutional control, as described in Section 3.2.1, below

3.2.1 Institutional Controls

As shown in Table 2-1, the existing concentrations in the EMF, NMF, and SKW are below their respective SSSRLs, and will not require remediation. However, these areas, as well as the IAN and IAS contain COCs above the Residential SRLs, and will be placed under institutional controls, as defined under the DEUR (Section 1.1). There are currently no native soil areas within the West Plant Site that do not exceed the Residential SRL for arsenic (10 mg/kg), which necessitates that the entire site be placed under institutional control. Several APP facilities within the West Plant Site have been closed with cover materials, and are outside of the scope of soil remediation under the VRP. Upon completion of remediation activities, RCML will implement institutional controls across the site. The following measures are proposed:

- Controlled access – Public access to the West Plant Site is illegal and restricted. Entry to the IAN and IAS is currently controlled by RCML at the two mine gates and patrolled by security 24 hours a day, 7 days a week. In the EMF and NMF, the terrain is rugged and steep and difficult to access. Access control will continue as is currently practiced.
- Signage – Signs will be placed at typical access points around the West Plant Site, as shown in Figure 1-2. The signs will inform potential trespassers that entry is illegal and restricted, and provide warning information regarding site soil containing concentrations of

constituents exceeding Residential SRLs. Signs will be inspected and maintained on an annual basis.

- Annual worker awareness training will be conducted to maintain awareness and inform new workers of the soil conditions and limitations at the site.

An annual progress report will be prepared documenting the institutional controls, inspections, and status, to be submitted to VRP (Section 3.8.3).

3.2.2 Soil Removal

The SAS removal design drawings are presented in Appendix A, and provide the detailed construction drawings and specifications for the construction and supporting facilities. The area within the IAS where soil arsenic concentrations exceed preliminary SSSRLs and are actively undergoing remediation is defined as the Exclusion Zone, as shown in Figure G-002 in Appendix A.

Within the Exclusion Zone, a series of 12 soil removal units (SRUs) have been defined based on the drainage basins within the IAS, as shown in Table 3-1 and Figure G-002. Soil removal will be conducted per each SRU. The SAS soils will be removed and transported to TP-6 for placement.

As shown in Figure C-001 in Appendix A, a staging area will be developed in the eastern central portion of the Exclusion Zone which will allow construction equipment and qualified personnel to access the area. A Decontamination Zone will be developed in the staging area where all equipment entering and then leaving the Exclusion Zone will undergo decontamination procedures. A Clean Zone will be situated outside of the Decontamination Zone which will hold construction oversight trailers, parking, and other support facilities, as needed.

An XRF analyzer laboratory will be established in a trailer within the Clean Zone, just outside the Exclusion Zone. This laboratory will be used to support soil sampling during the remediation, including soil sampling to refine boundaries of the Exclusion Zone, and confirmation sampling to verify the achievement of SSSRLs during remediation activities. Detailed sampling and analytical requirements are provided in the Sampling and Analysis Plan (SAP) presented in Appendix B.

Once active remediation begins worker personal protective equipment (PPE) and monitoring requirements will also begin for those active remediation areas, as defined in a Worker Health and Safety Plan (WHASP). The WHASP also defines the training requirements for on-site workers and personal air monitoring to be conducted to ensure ambient air concentrations of COCs are below the action levels established in the WHASP.

During construction, dust control measures will be implemented per a Dust Management and Air Monitoring Plan (DMAMP) to be implemented by RCML and their contractors. Perimeter air monitoring will be conducted to reduce the potential for off-site migration of COCs, and to monitor worker ambient air.

If ambient work zone or perimeter dust levels reach the cautionary levels established in either the WHASP or the DMAMP, the RCML environment, health and safety (EH&S) manager will be notified, and they will determine whether work modifications (e.g., more water trucks) or work stoppage may be required until air quality improves to below the action levels..

Sediment control will be conducted per the Sediment Management Plan presented in Appendix C to reduce the potential for off-site discharge. Sediment basins will be the primary measure to manage potentially-impacted sediment. These sediment basins are intended to be temporary structures that will be installed prior to beginning excavation in an area and may remain for several years until RCML determines that vegetation is sufficiently established and sediment yields diminished.

Access to the Exclusion Zone will be limited to construction vehicles and related equipment, and qualified personnel in appropriate PPE. Vehicles and personnel that are non-essential to the remediation will be excluded from entering the Exclusion Zone. Vehicles leaving the Exclusion Zone will go through the Decontamination Zone for cleaning prior to travel outside the Exclusion Zone.

The removal of the SAS from SRUs is regulated under the VRP. However, the placement of the removed soil at TP-6 is regulated under the Area-wide APP No. P-101703, specifically as part of Compliance Schedule Item (CSI) No. 13 for final design of the closure for TP-6 and the West Outslope of TP-5, and is not addressed further in the RAWP. Note that this final design was submitted to ADEQ at the end of March 2016 in compliance with CSI No. 13.

3.2.3 Access and Haulage

Construction access for the soil removal project will be via the Lone Tree Gate at the southwest corner of the West Plant Site (Drawing G-002 in Appendix A). The Main Gate on Magma Avenue will not be used for construction access. Once inside the West Plant Site, construction access to the Exclusion Zone will be via the staging area on the north side of the slag pile. Once construction equipment has entered the Exclusion Zone, a series of temporary roads will be constructed to access the SRUs and transport the soil to the access point to TP-6 at the southwest corner of TP-6. The locations and cross sections for the temporary roads will be field adjusted at the time of construction, but the roads will remain within the Exclusion Zone so that decontamination will not be required during haulage to TP-6. The temporary roads will be constructed with safety berms in accordance with regulatory guidance. Some road segments will require cut and fill. Typical cross sections are shown on Drawing C-009 in Appendix A. Fill and berms comprised of SAS will be removed when the road is no longer needed and hauled to TP-6.

3.2.4 Vegetation Clearing

Prior to soil excavation, woody vegetation will be cleared in such a way as to reduce the amount of contaminated soil mixed in with the plant material (e.g., a bulldozer with a brush rake attachment). The removed vegetation may be impacted. Therefore, removed vegetation will be chipped and placed in TP-6.

3.2.5 Soil Removal

The SAS will be excavated to a depth that removes soil with concentrations of COCs greater than the SSSRLs or to refusal, should a hard surface be encountered. Previous work at the West Plant Site has shown that strongly cemented Gila Conglomerate exists near the ground surface in some areas prevents excavation. This strongly cemented nature of the Gila Conglomerate breaks the exposure pathway and eliminates the need to continue excavation. However, it is anticipated that the design excavation depth can be achieved in most of the SRUs.

The design excavation depth for each SRU was based on arsenic concentration data from 23 test pits within the IAS completed as part of the site characterization for development of the SSSRLs. Table 3-1 summarizes the average, minimum, and maximum depths from the test pits to reach an arsenic concentration of 185 mg/kg (i.e., the SSSRL). Golder then used professional judgment to select an excavation depth for each SRU, assuming that the minimum practical excavation depth with a bulldozer in coarse soil would be 0.5 feet. Note that SRUs 1 and 12 did not have any test pits located in them, and therefore the excavation depth was based on the nearest test pits in other SRUs, isopleths of surface arsenic concentrations, and site knowledge.

The excavation depths are initial depths. Once the initial depth is reached in an SRU, confirmation sampling will be conducted to determine whether the concentrations of all COCs (i.e., arsenic, copper and lead) are below the SSSRLs, as described in Section 4.0. If so, then additional excavation will be needed until SSSRLs are achieved, or refusal. Additional excavation, if needed, would likely occur in localized areas of an SRU until confirmation sampling showed that the final surface complied with the SSSRLs.

The total volume of soil to be excavated is approximately 645,800 cubic yards based on the excavation depths in Table 3-1. This value represents the bank volume, or the volume of the soil in place rather than the bulked volume of excavated soil that will be hauled to TP-6. The total surface area to be disturbed by excavation is approximately 10,623,000 square feet or 244 acres. Drawing G-002 in Appendix A contains additional information on the soil removal volume and surface area to be disturbed.

To the extent practical, excavation within a SRU will proceed from uphill to downhill to reduce the potential for recontamination of newly excavated surfaces by runoff in the event of rain.

3.2.6 Temporary Soil Stockpiling

The excavated soil will be temporarily stockpiled in one or more locations in each SRU, pending loading and transport to TP-6. These temporary stockpiles will generally be in a downhill location that dump trucks can access, rather than on the hillsides. To the extent practical, the temporary stockpiles will be removed at the end of each work day to reduce the potential for wind or rain to erode the stockpiled materials.

3.2.7 Revegetation

To the extent practical, the final excavated surface will be revegetated as each SRU is completed. The revegetation approach will be undertaken similar to previous closure projects at the West Plant Site. As an example, the typical approach used for revegetation of the 500 Yard at the West Plant Site occurred in three steps (Golder 2007): 1) surface preparation by cross contouring, 2) an initial hydraulic application of seed and fertilizer with a trace amount of mulch and tackifier, and 3) a second application with the bulk of the mulch and tackifier. The seed mix was applied at a rate of 10 pounds per acre. The amount of hydraulic mulch (Conwed 1000) applied was 2,000 pounds per acre with 150 pounds of Tackifier (M-binder). Fertilizer (Biosol Mix 7-2-3) was added at a rate of 1,500 pounds per acre. Table 3-2 presents an example seed mix. The revegetation methods and materials may be field-adjusted at the time the work is undertaken. Some areas will be difficult to access with hydraulic application, and may require broadcast or drill seeding. The seed mix in particular will depend on availability at the time the work is undertaken.

3.3 Potential for Remaining Soil to Impact Surface Water

The final excavated soil surface with concentrations less than the SSSRLs but greater than the Residential SRLs must comply with the requirements of ARS §49-175B.3:

> The applicant demonstrates that on achieving remediation levels or controls for a source or potential source of contamination to a navigable water, the source of contamination will not cause or contribute to an exceedance of surface water quality standards, or if a permit is required pursuant to 33 US Code Section 1342 for any discharge from the source, that any discharges from the source will comply with the permit.

Runoff from SRUs 8, 9, 10, 11, and 12 reports to the Indian Ponds, part of the existing stormwater control system at the West Plant Site. Outfall 001 from the Indian Ponds to Queen Creek is regulated under an individual permit by the Arizona Pollutant Discharge Elimination System (i.e., AZPDES Permit No. AZ0020389). RCML detains runoff and sediment in the Indian Ponds, but may discharge from Outfall 001 in the event of a storm larger than the 100-year event, subject to the effluent limitations and monitoring requirements in Table 1a of the permit. The Outfall 001 effluent limitations include the COCs for the soil remediation (i.e., arsenic, copper, and lead). RCML's ongoing management of stormwater in the Indian Ponds under their existing permit will constitute the required demonstration under ARS §49-175B.3 for SRUs 8, 9, 10, 11, and 12.

Runoff from SRUs 1, 5, 6, and 7 reports to washes that cross the West Plant Site property line and ultimately report to Queen Creek. RCML manages runoff from these SRUs under their existing Stormwater Pollution Prevention Plan (SWPPP) prepared as part of their Multi-sector General Permit 2010 (WestLand 2012) AZMSG-62880. As described in the Sediment Management Plan (Appendix C), rock check dams and other best management practices (BMPs) consistent with the SWPPP will be installed to manage sediment during soil removal. At the end of soil removal in these SRUs, sediment samples will be collected from the washes downstream of the rock check dams. These samples will be analyzed for the COCs (i.e., arsenic, copper, and lead) in accordance with the SAP (Appendix B). The results will be compared to the Residential SRLs for the COCs (as provided in Table 2-1), and the findings will be included in the completion report for the soil removal. This comparison will constitute the required demonstration under ARS §49-175B.3 for SRUs 1, 5, 6, and 7.

The results from the sediment samples collected downstream of the rock check dams in SRUs 1, 5, 6, and 7 will also be compared to Arizona minimum GPLs (Table 2-1) or alternative GPLs as part of the required groundwater demonstration (Section 3.4).

3.4 Potential for Remaining Soil to Impact Groundwater

The remaining soil with concentrations less than the SSSRLs but greater than the Residential SRLs must comply with the requirements of ARS §49-175B.4:

> The applicant demonstrates that on achieving remediation levels or controls for a source or potential source of contamination to an aquifer, the source of contamination will not cause or contribute to an exceedance of AWQS beyond the boundary of the facility where the source is located.

At the completion of soil removal in each SRU, soil samples will be collected from the final excavated surface. In addition, sediment samples will be collected from the washes downstream of SRUs 1, 5, 6, and 7 (Section 5.2). These soil and sediment samples will be analyzed for the COCs (i.e., arsenic, copper, and lead) in accordance with the SAP (Appendix B). The results of the soil and sediment samples will be compared to the Arizona minimum GPLs (Table 2-1) or alternative GPLs and the findings will be included in the completion report for the soil removal. This comparison will constitute the required demonstration under ARS §49-175B.4. At the TP-6 facility, where soils will be placed, information related to GPLs will be submitted as required by the APP.

3.5 Worker Health and Safety

A WHASP will be provided to on-site workers under separate cover. The WHASP provides recommendations for worker health and safety in the Exclusion Zone for the duration of the remedial actions, and the approaches to document the process and procedures for protecting worker health and

safety during remedial activities. The WHASP identifies safety measures to protect workers from identified hazards associated with SAS to protect the health of the workers in the Exclusion Zone from exposures to fugitive COCs originating from remedial activities performed at the West Plant Site. The WHASP provides information about dust and other potential airborne exposures to workers in the Exclusion Zone, and describes monitoring systems that will be used in timely manner to modify procedures to protect workers.

The primary objectives of the WHASP are to:

- Define site roles and responsibilities
- Develop site-specific Action Levels for air quality
- Provide a plan for reducing potential worker exposures to COCs during remedial activities
- Evaluate the adequacy of dust control measures applied during remedial activities

The main working components of the WHASP are:

- Provide near real-time, particulate concentrations for particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) and wind data to determine if modifications to engineering controls and PPE are necessary for maintenance of a safe on-Site working environment
- Characterize potential exposures of personnel to the identified COCs
- Define Action Levels and a notification process in the event any Action Level is being approached
- Assess effectiveness of emission controls
- Communicate ambient and personnel monitoring data throughout the project as part of a coordinated review and quality control process

The work area and personnel monitoring will be highly interactive. The work area and personnel monitoring will inform remediation operations of the effectiveness of control activities to reduce on-site personnel exposures to COCs.

3.5.1 Worker Safety Contamination Areas

Within the Exclusion Zone, there are three levels of arsenic contamination areas, defined with respect to worker safety. They are the lower contamination area (arsenic concentrations below 1,600 mg/kg, but above the SSSRLs), and two high arsenic contamination areas: Zone A (arsenic concentrations above 1,600 mg/kg and below 3,200 mg/kg) and Zone B (arsenic concentrations greater than 3,200 mg/kg).

A zoned approach to the safe work practices is proposed wherein different actions are required at different thresholds of soil arsenic concentrations and air monitoring measurements.

3.6 Project Administration

Figure 3-1 presents an organizational chart for the major activities to be conducted during the remediation. The ADEQ VRP has regulatory oversight for the remediation of SAS at the West Plant Site. As the sole owner of the West Plant Site, RCML will administer the soil remediation project. As such, RCML will be responsible for conducting the remediation and overseeing the contractors and consultants responsible for the remedial operations.

RCML has the overall authority to ensure that remedial activities are conducted per this RAWP, provide progress reports to VRP, and ensure that all on-site activities are Mining Safety and Health Administration (MSHA) compliant. RCML will be responsible for subcontracting a construction contractor for remediation activities, and a consultant for oversight activities.

RCML will assign an EH&S manager to the project. That manager will be responsible for the required worker trainings, as described in the WHASP (under separate cover), as well as day-to-day operational EH&S. Each contractor and consultant will assign an EH&S officer from their field team that will be responsible for their team's EH&S, and will report to the RCML EH&S manager.

Air monitoring will be conducted in the worker zones to ensure that worker exposures are below the action levels established in the WHASP. Perimeter air monitoring will be conducted by RCML and their contractors to minimize off-site migration COCs in air during construction. Both air monitoring plans provide their own air quality action levels, which will be used for decision-making if the levels are being approached or exceeded. The RCML EH&S manager will coordinate with an air monitoring specialist to ensure that the monitoring is being conducted per the WHASP and the DMAMP, and then make decisions on work modification or work stoppage as needed in the event that air quality exceeds action levels.

RCML will be responsible for developing and implementing a community relations plan for the project to ensure that the adjacent community will be notified and educated on the remedial objectives, schedule for remediation, and consequences of the activities (Section 6.0).

RCML will subcontract with a construction contractor for earth-moving and construction activities. The contractor will provide the equipment and personnel to conduct the excavation, loading, hauling, and placement of soils, as well as any accessory activities such as traffic control, spotting, and access control. RCML will also contract with a surveyor and a revegetation contractor.

The contractor will assign an EH&S officer responsible for ensuring they are compliant with the WHASP (or their own HASP), and reporting to the RCML EH&S manager. The contractor EH&S officer will ensure that their personnel are trained per the requirements of the WHASP, and will maintain records of safety training, tailgate EH&S talks, and other EH&S events.

RCML will subcontract with Golder for remediation oversight services. Similar to the contractor, Golder will assign an EH&S officer that reports to the RCML EH&S manager. These activities include:

- Boundary soil sampling
- Confirmation soil sampling
- XRF sample preparation and analysis
- Coordination of sampling efforts with the contractor (i.e., during periods when equipment is not operating in a specific region)
- Coordination and shipment of samples to the selected laboratory
- Data management and reporting

RCML will subcontract with an Arizona Department of Health Services (ADHS) certified laboratory. The laboratory will report using the Arizona Data Qualifiers, as can be found in this location: http://www.azdhs.gov/lab/documents/license/resources/resources/data-qualifiers-rev4.pdf.

3.7 Project Schedule

Figure 3-2 presents the approximate soil remediation schedule in terms of years and quarters. Assuming work will begin in the second quarter of 2015, the total project duration is estimated at six quarters with completion reporting finished in the third quarter of 2017. This schedule may be adjusted as work advances; any such adjustments will be discussed in the quarterly progress reports submitted to the VRP. The schedule is limited to the IAS, as discussed in the introduction to the RAWP (Section 1.0).

Mobilization includes activities that must be completed before any ground-breaking construction starts where dust might be generated and workers or others might be exposed. Mobilization includes activities such as establishing the on-site XRF laboratory, initiating medical surveillance, training contractors, establishing the worker monitoring program in accordance with the WHASP, and establishing perimeter monitoring in accordance with the DMAMP. The exact location of the Exclusion Zone boundary will be confirmed via XRF sampling as part of mobilization.

The Exclusion Zone must be prepared before actual vegetation clearing and soil removal begins. These preparations include construction of the staging area, installation of the perimeter fencing and/or signage, construction of the sediment basins and BMPs in accordance with the Sediment Management Plan (Appendix C), and construction of the haul roads. The key haul roads leading to TP-6 will be built at this time, although other roads interior to each SRU may be built as work advances.

Soil removal includes vegetation clearing, soil removal, temporary stockpiling, loading soil, hauling soil to TP-6, and revegetating the final excavated surface, as previously described in Section 3.2. Confirmation sampling also takes place during soil removal (Appendix B). Soil removal will take place as practical from uphill to downhill.

The Exclusion Zone will be decommissioned when soil removal is finished. This includes removal and revegetation of any haul roads not already addressed as the work advanced, as well as removal of the decontamination pad and other facilities at the staging area. The sediment basins will be cleaned out at this time, but will remain in place until RMCL determines that revegetation is sufficiently established and sediment yields have diminished (Appendix C). Fencing and signage will be removed, unless RCML determines that it should remain as part of institutional controls (Section 3.2.1).

Demobilization includes activities that cannot be undertaken until all ground-breaking activities are finished. It includes final medical surveillance, removal of the perimeter monitoring system, and removal of the on-site XRF laboratory.

Quarterly progress reporting to the VRP will start with ground breaking activities (i.e., preparation of the Exclusion Zone) and will end when ground breaking activities are complete (i.e., when the Exclusion Zone is decommissioned).

Remediation completion reporting for the IAS is scheduled to take six months and take place in the latter half of 2017.

RCML will implement the community involvement plan (Appendix D) throughout the soil remediation project.

3.8 Reporting

3.8.1 Progress Reporting

RCML will submit quarterly progress reports to the VRP in accordance with §49-175A.4. The progress reports will be brief (several pages with some figures and tables), have a standard, semi-automated format and will provide the following information:

- Work completed (acreages remediated and confirmed, volumes hauled, etc.)
- Field modifications to the plans, if any
- Schedule adjustments, if any
- Other items as needed

3.8.2 Completion Reporting

RCML will submit a final completion report approximately 6 months after the remediation is finished. The completion report will summarize the remediation activities and will provide a summary of the following:

- A brief overview of site characteristics and rationale for the remediation
- A brief overview of the remedial action objectives

- The methods and approaches used for soil remediation, sample collection, decontamination methods, and approaches used for the protection of surrounding environmental media during the remediation
- Community involvement activities related to the remediation
- The results of the confirmation sampling
- An evaluation on the achievement of the remedial action objectives
- Summary and conclusions

A figure will be prepared to show the remaining soils that area above the Residential SRLs that require institutional controls. A plan for implementing institutional controls will be prepared. The DEUR will be prepared in parallel with the completion reporting.

3.8.3 DEUR Application and Reporting

At the completion of remedial activities at the West Plant Site, RCML will submit a DEUR application to report the status of the institutional controls, in accordance with ARS §49-152K. The DEUR application will include the following:

- A certified copy of the deed or title for the property
- A vicinity map illustrating the property's general location
- A legal description of the restricted area(s) as determined from a survey conducted by an Arizona licensed surveyor
- A map of the restricted area(s) created from the dimensions and bearings obtained from the survey
- A contaminant information page citing the contaminant(s) of concern and their respective concentration(s)
- Environmental contaminant information, including a description of the environmental contaminants subject to remediation, and the remaining contaminant concentrations after remediation
- Institutional control information, including the restrictions to limit the use of the property, and maintenance requirements for the controls

RCML will submit an annual status report for the institutional controls established at the site, as cited in the DEUR. ADEQ requires an annual status report once per calendar year, and has established September 1 as the annual reporting deadline. ADEQ will provide a site-specific annual report form to responsible property owners' of record prior to the reporting deadline. RCML will report the status of the institutional control and return the completed form to ADEQ by September 1. ADEQ will review all annual reports for completeness and will periodically conduct site visits to ensure that the institutional control and DEUR provisions are being adequately maintained.

4.0 SAMPLING AND ANALYSIS

The SAP for soil sampling is presented in Appendix B. Soil sampling and analysis will be conducted on-site to allow for quick turnaround times that will allow the contractor to keep equipment operating. An on-site XRF laboratory will be established in the Clean Zone outside the Exclusion Zone to support soil sampling activities. It is anticipated that turnaround times for soil analyses with the XRF would be one-half day to one day, depending on the rate of excavation activities.

The purpose of the SAP is to present the tasks and methodology for collecting soil samples to characterize arsenic, copper, and lead in soil to confirm that remedial action objectives outlined in this RAWP have been met, as follows:

- **Boundary Refinement Soil Sampling** – Soil sampling and XRF analysis will be conducted to further refine the boundaries of the SRUs more accurately than previously defined by historical sampling events.
- **SSSRL Verification Soil Sampling** – Verification sampling will be conducted at the post-excavation soil surface to verify that the concentrations of arsenic, copper, and lead in the remaining soil are below their respective SSSRLs.
- **Confirmation Laboratory Analysis** – XRF samples will be shipped to an Arizona accredited laboratory for confirmation sampling at a rate of one per 20 XRF samples used for remediation decisions. Soil samples will be analyzed at the laboratory for the three COCs.

4.1 Sampling Approach

4.1.1 Boundary Refinement Soil Sampling

Soil samples will be collected and analyzed with an XRF prior to excavation in the areas where there is no physical (i.e., roads or site facilities) or property boundary in order to refine the outer boundaries of the Exclusion Zone. These areas include the eastern side of SRU 1, and the northern sides of SRUs 5a and 5b, as shown in the Appendix A drawing C-002.

The surface soil arsenic isopleth map (Figure 2-2) was developed based on a sample grid with roughly 500-foot spacing in the IAS. The boundaries of SRUs 1, 5a, and 5b will be refined by following the existing boundary using a global positioning system (GPS), and at intervals of 250 feet, collecting soil samples for XRF analysis in transects perpendicular to the boundary line (both within and outside of the SRU) to determine where the boundary line occurs for soils exceeding SSSRLs.

4.1.2 SSSRL Verification Soil Sampling

SSSRL verification soil sampling and XRF analysis will be conducted in support of the excavation activities in the SRUs to verify that the post-excavation surface soil (i.e., remaining surface) is below the SSSRLs. Soil samplers will communicate with the contractor throughout the excavation activities to determine when a sizable portion of an SRU has been excavated and the equipment is no longer operating in the vicinity.

For the safety of the sampler, soil sampling will only occur when equipment operations are ceased in the immediate vicinity of the sample areas.

Post excavation soils will be sampled and analyzed with an XRF using a sampling grid with 100-foot spacing, as shown in Figure B-1. This grid will be overlain over the entire IAS Exclusion Zone, and a soil sample will be collected at the newly excavated surface of each grid node. The sample grid size is 5-times denser than the previous soil sampling grid used to characterize the COCs within the IAS. It is estimated that this grid spacing will result in approximately about 1,000 sample locations within the Exclusion Zone, excluding samples from localized areas requiring additional excavation. The grid spacing may be increased as needed due to field conditions, at the discretion of the sampler. For instance, or non-soil feature that cannot be sampled may fall within one of the grid nodes, and the sample location may be moved to a better location. Also, in the event that several XRF results in an area are sporadically high, the field sampler may elect to collect additional soil samples at a tighter grid density in order to characterize that particular anomaly.

Verification sampling will be conducted using the following decision criteria:

- If XRF analytical results for arsenic, copper, and lead are below the SSSRLs, the area will be released for revegetation activities. If not, further excavation will be conducted in the areas where exceedances occur.
- If further excavation is needed, verification sampling and XRF analysis will be conducted as needed to monitor progress toward achieving the SSSRLs. Sampling and XRF analysis will be conducted in approximately the same locations as the initial verification samples. Excavation will be considered complete when the XRF results indicate that the SSSRLs have been achieved.
- Excavation will continue until SSSRLs have been achieved, or until refusal (e.g., cemented Gila Conglomerate).

Samples with concentrations below the SSSRLs will be considered the final footprint samples for completion reporting purposes. In the event that a grid node falls in an area that is inaccessible, or there is no discernable soil, the sample location will be moved to a nearby areas where soil occurs. In the event that an area representing a grid node has no discernable soil, then no sample will be collected at that grid node. A GPS reading will mark the locations.

4.2 Confirmation Laboratory Analysis

The soil samples measured by XRF will be split at a rate of one per 20 XRF samples used for decisions, and shipped to an ADHS certified laboratory. Soil samples will be analyzed at the laboratory for the three COCs. The laboratory must report using the Arizona Data Qualifiers, as can be found in this location: http://www.azdhs.gov/lab/documents/license/resources/resources/data-qualifiers-rev4.pdf.

4.3 Quality Assurance and Quality Control Samples

For this project, Quality Assurance / Quality Control (QA/QC) samples will include field duplicates for XRF analysis, and decontamination rinsate blanks for laboratory analysis. The field duplicate samples will be collected at a frequency of one per 20 XRF analyses used for remediation decisions. Decontamination rinse blank samples will collected at a frequency of once per week from re-usable decontaminated equipment. If disposal sampling equipment is used, the decontamination rinse blanks will be eliminated. Rinsate blanks will be submitted for laboratory analysis to determine the presence of arsenic, copper, and lead using USEPA Method 6010, ICP/AES.

4.4 On-Site XRF Laboratory

An XRF laboratory will be established on-site for the duration of the remedial action. This laboratory will be used to prepare samples (sieve, dry, and store in XRF cups), conduct XRF analyses on soil samples, and store samples. At least one field scientist will staff the laboratory and conduct the field sampling and analysis. Staffing will be increased if needed to keep up with the pace of the contractor, and will be re-evaluated once remediation commences.

XRF analyses will follow USEPA Method 6200 "Field Portable XRF Spectrometry.

- The XRF will be calibrated using at a minimum site-specific calibration standards and NIST blank standards as specified in Appendix B.
- Approximately 5% of samples relevant to decision making will be sent to a certified laboratory for confirmatory analysis.

4.5 Data Verification

Laboratory data will be verified to evaluate whether they are suitable for their intended use. Data verification is a screening evaluation of laboratory data quality. If verification indicates that there are potential issues, then the data may be validated in accordance with the following USEPA guidance:

- USEPA Contract Laboratory Program National Functional Guidelines (NFG) for Inorganic Superfund Data Review, EPA 540/R-10-1011 (NFG: USEPA 2010)

XRF data will be qualitatively evaluated by review of the calibration standards. In addition, data will be compared to laboratory split samples and evaluated for precision and accuracy.

5.0 MONITORING POTENTIAL ENVIRONMENTAL IMPACTS

This section summarizes the measures to be used to reduce the potential for environmental impacts related to perimeter dust, off-site sediment transport, vehicle/equipment decontamination, and post-completion inspections and monitoring. Detailed plans for dust and air monitoring, and vehicle and equipment decontamination will be implemented by RCML and their contractors. The Sediment Management Plan is provided in Appendix C.

5.1 Dust Management and Air Monitoring

Off-site DMAMP will be implemented by RCML and their contractors to reduce the potential for off-site migration of dust related to on-site remediation activities. The primary components of the DMAMP are:

- Monitor the concentrations of airborne particulates at the property perimeter to ensure that fugitive dusts associated with the remediation work are maintained below predetermined Perimeter Action Levels. In the event that a Perimeter Action Level is exceeded, the RCML EH&S manager will be notified so that appropriate controls can be implemented.
- Collect particulate matter samples on a time-weighted basis and analyze for the COCs associated with dust from remediation activities at the West Plant Site.
- Compare measured concentrations of lead and arsenic to the Perimeter Action Levels established in this DMAMP. In the event that measured concentrations exceed the Perimeter Action Levels, the RCML EH&S manager will be notified so that appropriate controls can be implemented.

5.2 Sediment Management

The West Plant Site is located in an arid area with limited rainfall, nonetheless sediment generated during storms from the Exclusion Zone has the potential to be impacted. The plan presented in Appendix C provides the approach for reducing the potential for impacted sediment to leave the Exclusion Zone and impact off-site drainages.

The sediment management measures in this plan are consistent with the:

- AZPDES Permit No. AZ0020389, an individual permit issued under the Arizona Pollutant Discharge Elimination System that includes Outfall 001 at the existing Indian Ponds
- Stormwater Pollution Prevention Plan (SWPPP) for the West Plant Site under AZPDES Stormwater Multisector General Permit (MSGP-2010 Number AZMSG-62880 (Westland Resources 2012)

The runoff routes for SRUs 8B, 9, 10, 11A, 11B, and 12 flow into Indian Ponds, which is controlled by RCMLs stormwater management system under AZPDES Permit No. AZ0020389, an individual permit issued under the Arizona Pollutant Discharge Elimination System that includes Outfall 001 at the existing Indian Ponds.

For the other SRUs where runoff may leave the West Plant Site (SRUs 1, 5A, 5B, 6, 7, and 8A), sediment basins will be the primary measure to manage potentially-impacted sediment. The sediment basins are intended to be temporary structures that will be installed prior to beginning excavation in an area and may remain for several years until RCML determines that vegetation is sufficiently established and sediment yields diminished. These sediment basins will be operated in that sediment will be cleaned out periodically. Secondary measures to manage potentially-impacted sediment will include silt fences, straw bale barriers, swales, vee-ditches, and other BMPs.

The sediment basins will be located based on an evaluation of the watersheds and flow paths within the SRUs. The sediment basins will be located at the concentration point for the watershed. In most cases, the boundaries of the SRUs were delineated to match the topographic watersheds.

RCML has selected the 2-year, 24-hour storm as the design storm for estimating the volume of runoff to be received by a sediment basin. This selection is based on a reasonable risk of receiving a given magnitude storm within the design life of the basin (Hann, Barfield, and Hayes 1994). Assuming a given sediment basin will be in use for approximately 2 years, then the probability of receiving at least one 2-year event in two consecutive years is approximately 75%.

Sediment basins will be inspected weekly during the summer or winter rainy seasons, or within one day of a 0.5-inch or greater rainfall depth. The inspection frequency may be decreased to approximately every two weeks during the dry season. The inspection checklist is provided in Appendix C.

Sediment basins will be maintained in a timely manner as indicated by the inspections. Sediment will be cleaned out of the basins periodically and transported to TP-6 for placement along with SAS, during the remediation activities and after the remediation is complete.

5.3 Post-completion Inspections and Monitoring

Upon completion of the remediation of SAS in the IAS, RCML will conduct post-completion inspections and monitoring.

Temporary inspections will include:

- Vegetation monitoring will be conducted on a twice yearly basis for the first year after remediation to qualitatively determine if any reseeding is needed.
- Sediment monitoring at the sediment basins. Monthly inspections will be conducted for the first year after remediation to watch sediment accumulation in the basins and determine the need for cleanout, hauling, and placement on TP-6.

At the completion of the remediation, institutional controls will be established, as described in Section 3.2.1. Once institutional controls are in place, permanent inspections and monitoring will be required, which will include:

- Annual inspection of signage and fencing
- Documentation of site patrol activities
- Documentation of worker training related to institutional controls

6.0 COMMUNITY INVOLVEMENT

In accordance with §49-176, RCML will provide to the community of Superior, Arizona reasonable notice and information regarding the remediation effort. RCML's community relations plan is presented in Appendix D.

7.0 CLOSING

This report was prepared by Golder on behalf of RCML for submittal to the ADEQ VRP. If there are any questions and comments, they may be directed to Casey McKeon, Environmental Manager at RCML (520-689-3254), or to the signatories below at Golder (520-888-8818 or 425-883-0777, respectively).

GOLDER ASSOCIATES INC.

Kent R. Johnejack, PE
Senior Consultant/Principal

Diane Crawford
Senior Consultant/Associate

8.0 REFERENCES

Arizona Department of Environmental Quality. (ADEQ). 2013. Letter to Jonathan Cherry, Resolution Copper Mining LLC providing approval of Site Characterization Report. June 25.

_____. 2015. Letter to Jonathan Cherry, Resolution Copper Mining LLC providing approval of SSSRL Report. December 22.

Brown & Caldwell. (B&C). 1998. Draft Remediation Action Plan, BHP Superior Operations, Prepared for BHP Copper, Superior Operations, Superior, Arizona. November 2.

_____.. 2009. Phase IV Human Health Risk Assessment; Northwest Study Area, Superior, Arizona. Prepared for BHP Copper Inc. March 23.

Golder Associates Inc. 2007. Closure Completion Report for the 500 Yard, West Plant Site, Superior, Arizona. Prepared for Resolution Copper Mining LLC, Superior, Arizona. August 2007.

_____. 2011. SCR for the West Plant Site, Superior AZ. Submitted to Arizona Department of Environmental Quality. January 2011.

_____. 2015a. Development of Site-Specific Soil Remediation Levels For the West Plant Site, Superior, Arizona. VRP Site Code: 502878-11. Submitted to Arizona Department of Environmental Quality. December.

_____. 2015b. In Vitro Bioaccessibility Study Report for the West Plant Site, Superior, Arizona. VRP Site Code: 502878-11. Submitted to Arizona Department of Environmental Quality. July.

Griffin, S. and Y. Lowney. 2012. Final Report: Validation of an In Vitro Bioaccessibility Test Method for Estimation of Bioavailability of Arsenic from Soil and Sediment. ESTCP Project ER-200916.

Haan, C.T., Barfield, B.J., and Hayes, J.C. 1994. Design Hydrology and Sedimentology for Small Catchments. Academic Press, San Diego, California.

United States Environmental Protection Agency (USEPA). 2010. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, Office of Superfund Remediation and Technology Innovation (OSRTI), US Environmental Protection Agency, Washington, DC. OSWER 9240.1-51. USEPA-540-R-10-011. January.

WestLand Resources Inc. 2012. MSGP-2010 Stormwater Pollution Prevention Plan (SWPPP), West Plant Operations. Prepared for Resolution Copper Mining LLC. September 2012.

TABLES

Table 2-1: Site-Specific Soil Remediation Levels

Land Area	Arsenic			Copper		Lead	
	95% UCL	Preliminary SSSRL	Interim SSSRL	95% UCL	SSSRL	95% UCL	SSSRL
Residential SRL	10			NA		400	
Non-Residential SRL	10			41,000		800	
Arizona Minimum GPLs	290			NA		290	
EMF	220	2,772	2,387	3,195	> 1,000,000	891	3,819
IAN	225	183	262	2,082	51,932	280 [1]	390
IAS (Excluding Stack Zone)	237	185	144	6,938	50,547	330 [1]	380
NMF	150	2,714	2,314	1,722	> 1,000,000	357	4,177
SKW	97	1,099	1,213	937	339,181	107	1,766

Notes:

UCL = Upper confidence limit

Shading indicates 95% UCL exceeds at least one SSSRL (IAN and IAS only)

[1] a 95% UCL could not be calculated due to low sample size. Value shown is a maximum.

All concentrtaions are in mg/kg

SRL = soil remediation level

GPL = groundwater protection levels

Table 3-1: Excavation Depth by Soil Removal Unit (SRU)

SRU	Approximate Surface Area (feet^2)	Average (feet)	Minimum (feet)	Maximum (feet)	Excavation Depth* (feet)
1	506,000	---	---	---	1
5	1,023,300	0.2	0.2	0.2	0.5
6	801,300	0.2	0.2	0.2	0.5
7	3,065,800	1.3	0.2	3	2
8	1,601,900	1.1	0.2	3	2
9	681,700	2.7	2	3	3
10	801,900	2.5	1	4	3
11	1,153,400	1.5	1	2	1.5
12	987,700	---	---	---	0.5
Total	**10,623,000**				

Notes:

* Minimum practical excavation depth with a bulldozer in the coarse soil is assumed to be 0.5 feet

Units are in feet

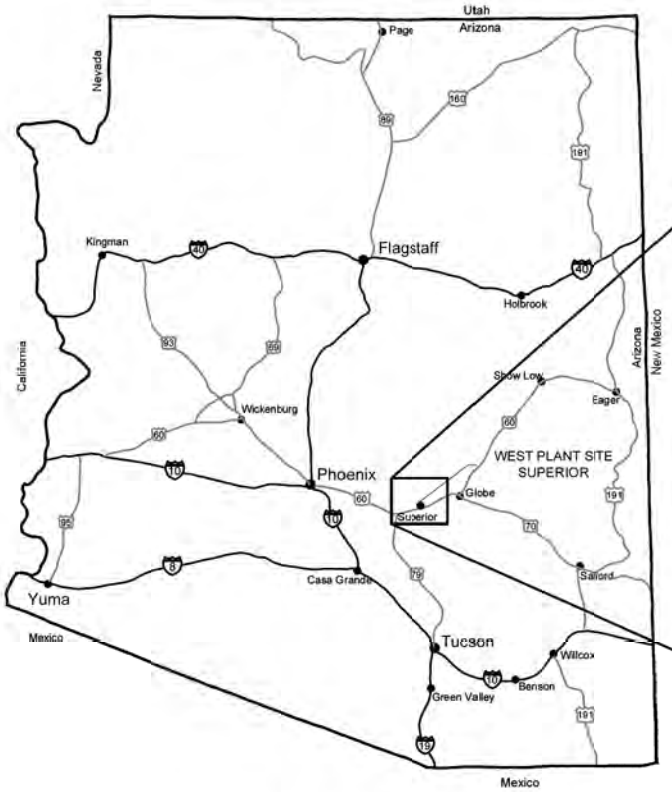
Table 3-2: Seed Mix and Application Rates

Tentative Species – Common Name	Approximate Pure Live Seed (pounds per acre *)
Purple Three-Awn	0.5
Needle Grama Grass	0.5
Sideoats Grama	0.5
Sand Dropseed	1
Desert Marigold	1
Coves' Cassia	0.2
Mexican Gold Poppy	0.5
Desert Indianwheat	0.3
Desert Globemallow	0.5
Fourwing Saltbrush	1.5
Brittlebrush	1.5
Triangle Bursage	2

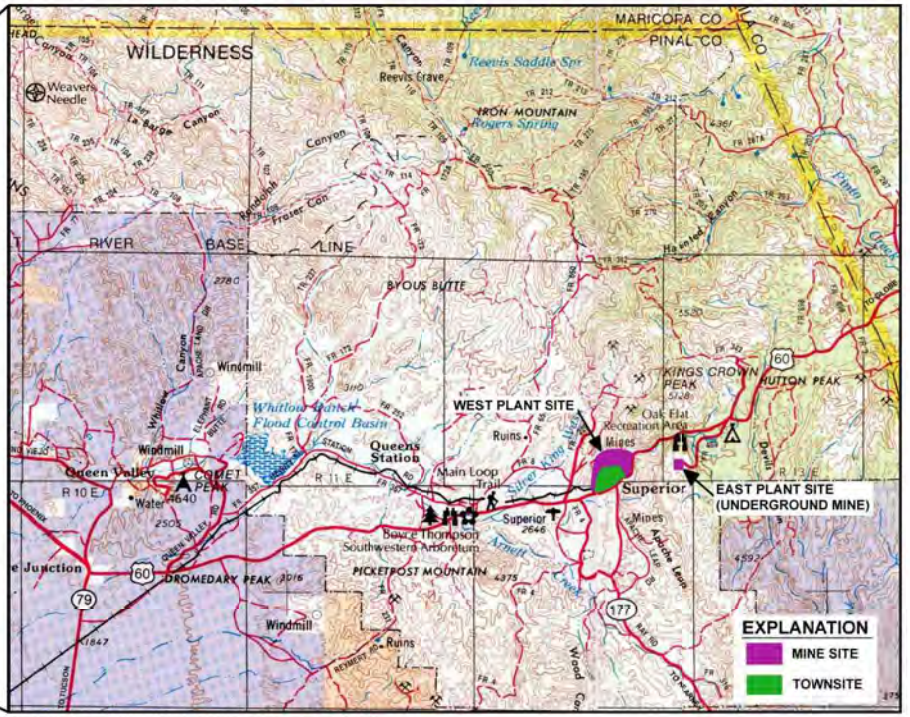
Note:
*Approximate values; actual values will be determined by seed availability at the time of revegetation and will vary from those shown

FIGURES

Path: \\tucson\cad\RCM\Superior\99_PROJECTS\073925191S_SSSRL\1001_Development\02_PRODUCTION\DWG\ | File Name: 073925191S_1001_FIG_1-1.dwg



STATE OF ARIZONA
NOT TO SCALE



REFERENCE: ARIZONA ATLAS & GAZETTEER (1993).

LOCATION MAP
NCT TO SCALE

CLIENT
Resolution Copper Mining

PROJECT
REMEDIAL ACTION WORKPLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

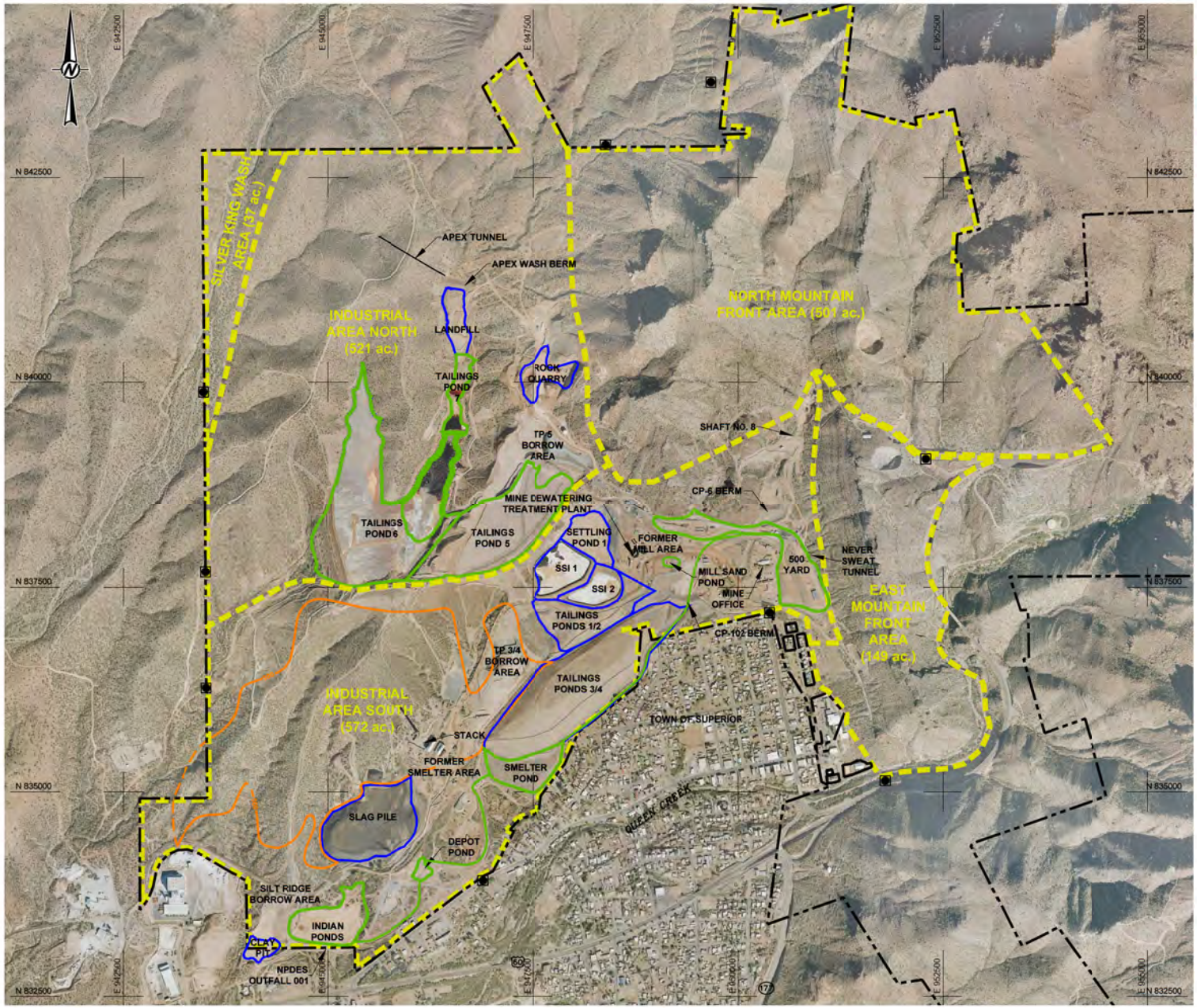
TITLE
SITE LOCATION MAP

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-12-01
DESIGNED	OM
PREPARED	NIL
REVIEWED	OM
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
073-92519-15	1001	B	1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in



LEGEND

- PROPERTY LINE
- APP FACILITIES
- OTHER FACILITIES
- LAND AREA BOUNDARY
- 500 — STACK ZONE
- ACCESS POINTS

NOTES

1. SSI = SLUDGE STORAGE IMPOUNDMENT.

REFERENCES

1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202).

0 600 1200
1" = 1200' FEET

CLIENT: Resolution Copper Mining

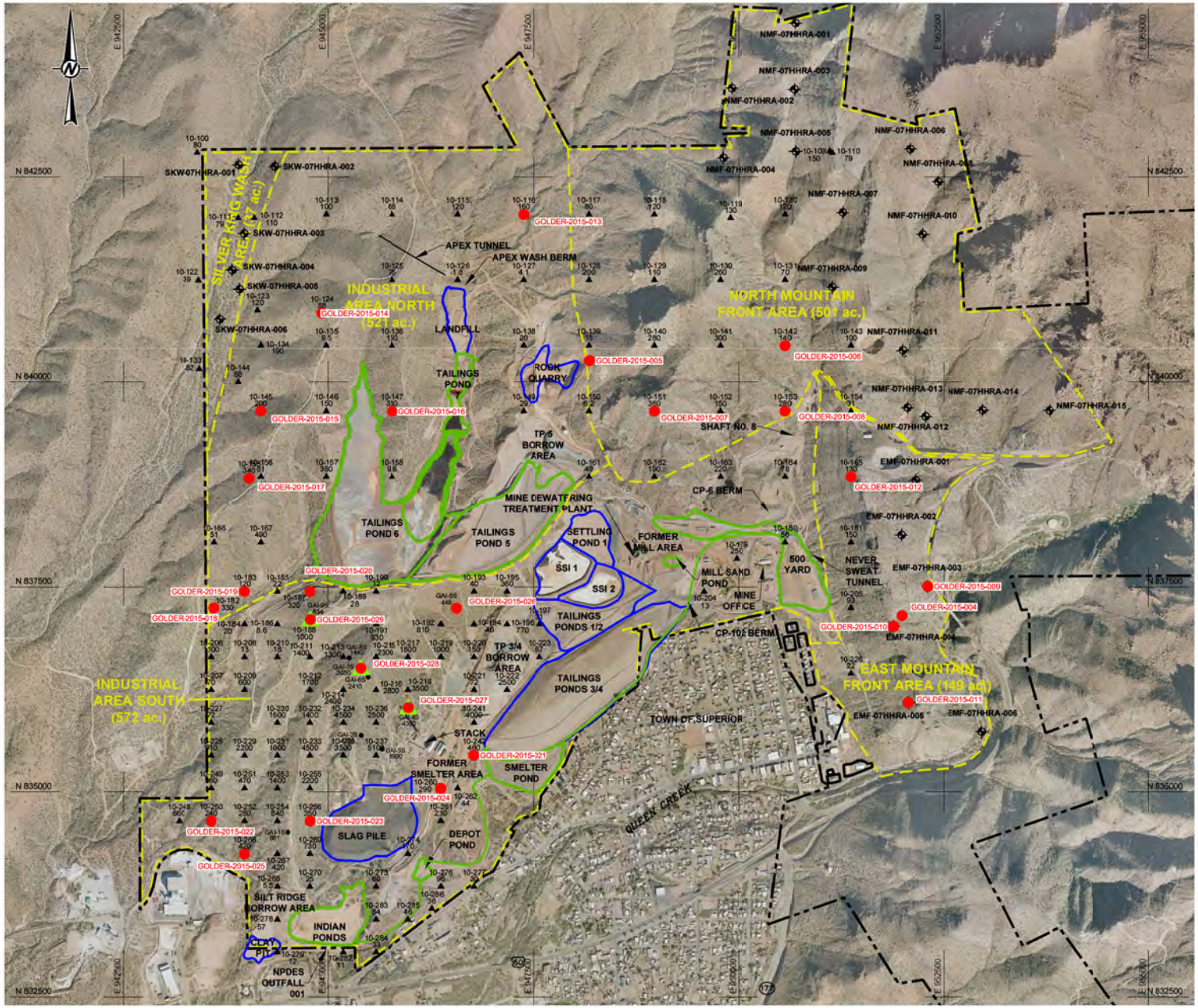
PROJECT
REMEDIAL ACTION WORKPLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

TITLE
GEOGRAPHIC SCOPE OF THE WEST PLANT SITE

CONSULTANT: Golder Associates

YYYY-MM-DD	2015-12-01
DESIGNED	OM
PREPARED	NIL
REVIEWED	OM
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
073-92519-15	1001	B	1-2



LEGEND

- PROPERTY LINE
- APP FACILITIES
- OTHER FACILITIES
- LAND AREA BOUNDARY
- NMF-07HHRA-001 — 2008 SAMPLES
- GAI-1S — 2001 SAMPLES
- 10-278 — 10 SERIES SAMPLES
- ARSENIC BIOACCESSIBILITY SAMPLE LOCATION
- UNDERLYING BROWN LAYER SAMPLE
- GOLDER-2015-010 — SAMPLE ID (GOLDER 2015)

NOTES

1. 2001 AND 2008 SAMPLES COLLECTED BY GOLDER. ALL OTHER SAMPLES COLLECTED BY B & C (1998).

REFERENCES

1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202).

0 600 1200
1" = 1200' FEET

CLIENT: Resolution Copper Mining

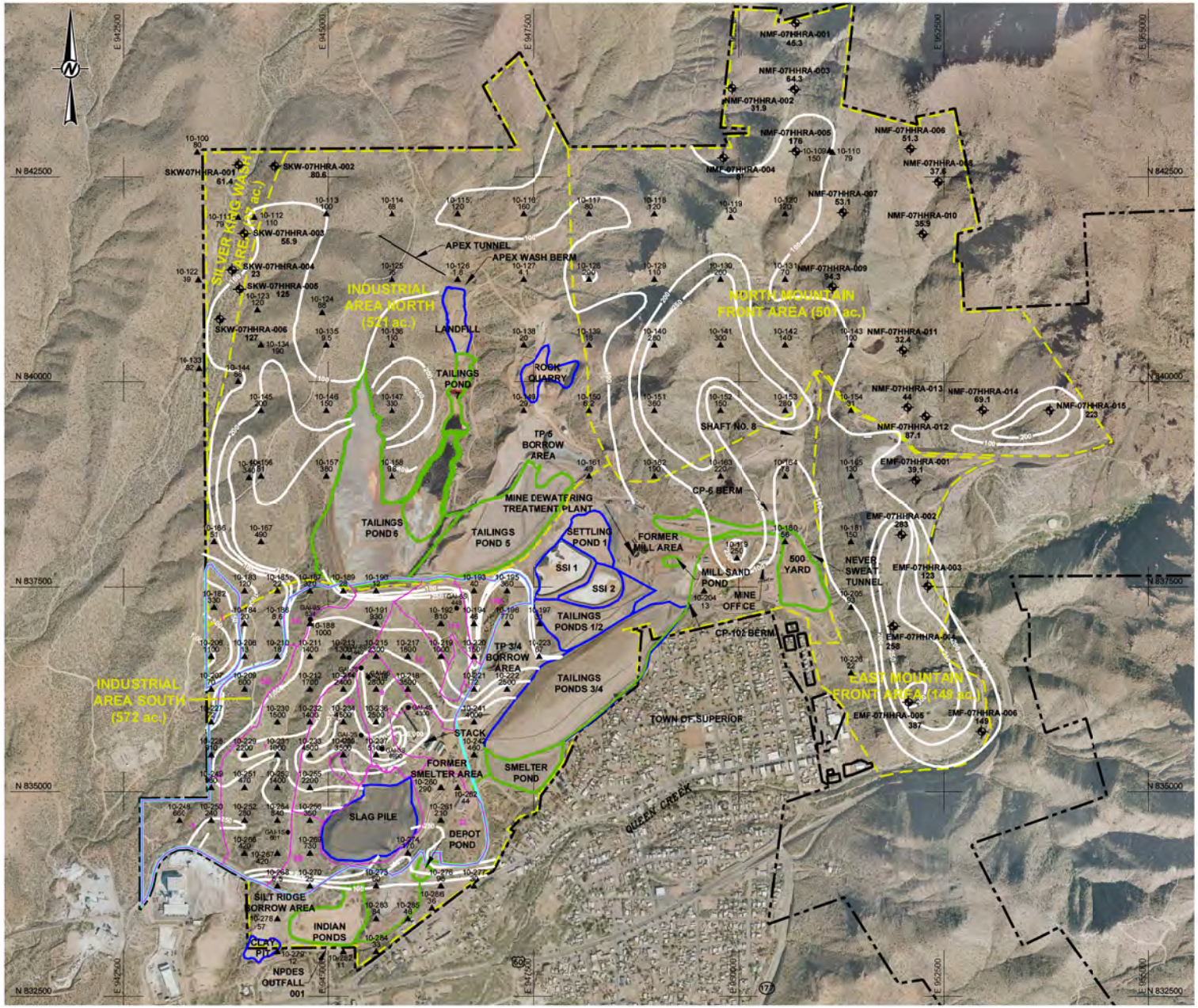
PROJECT
REMEDIAL ACTION WORKPLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

TITLE
SITE CHARACTERIZATION SURFACE SOIL SAMPLE LOCATIONS

CONSULTANT: Golder Associates

YYYY-MM-DD	2015-12-01
DESIGNED	OM
PREPARED	NIL
REVIEWED	OM
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
073-92519-15	1001	B	2-1



LEGEND

- PROPERTY LINE
- APP FACILITIES
- OTHER FACILITIES
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- LAND AREA BOUNDARY
- 9 — SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- NMF-07HHRA-001 — 2008 SAMPLES
- GAI-1S — 2001 SAMPLES
- 10-278 — 10 SERIES SAMPLES
- 500 — ARSENIC CONCENTRATION (mg/Kg)
- 1,000 — ARSENIC ISOPLETH IN mg/Kg (DASHED WHERE INFERRED)

NOTES

1. 2001 AND 2008 SAMPLES COLLECTED BY GOLDER. ALL OTHER SAMPLES COLLECTED BY B & C (1998).
2. SAMPLES FROM WASTE MATERIALS (E.G. SLAG, TAILINGS) NOT USED TO DEVELOP ISOPLETHS.
3. SURFACE SAMPLES USED TO DEVELOP ISOPLETHS.
4. SSI = SLUDGE STORAGE IMPOUNDMENT.

REFERENCES

1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202).

0 600 1200
1" = 1200' FEET

CLIENT: Resolution Copper Mining

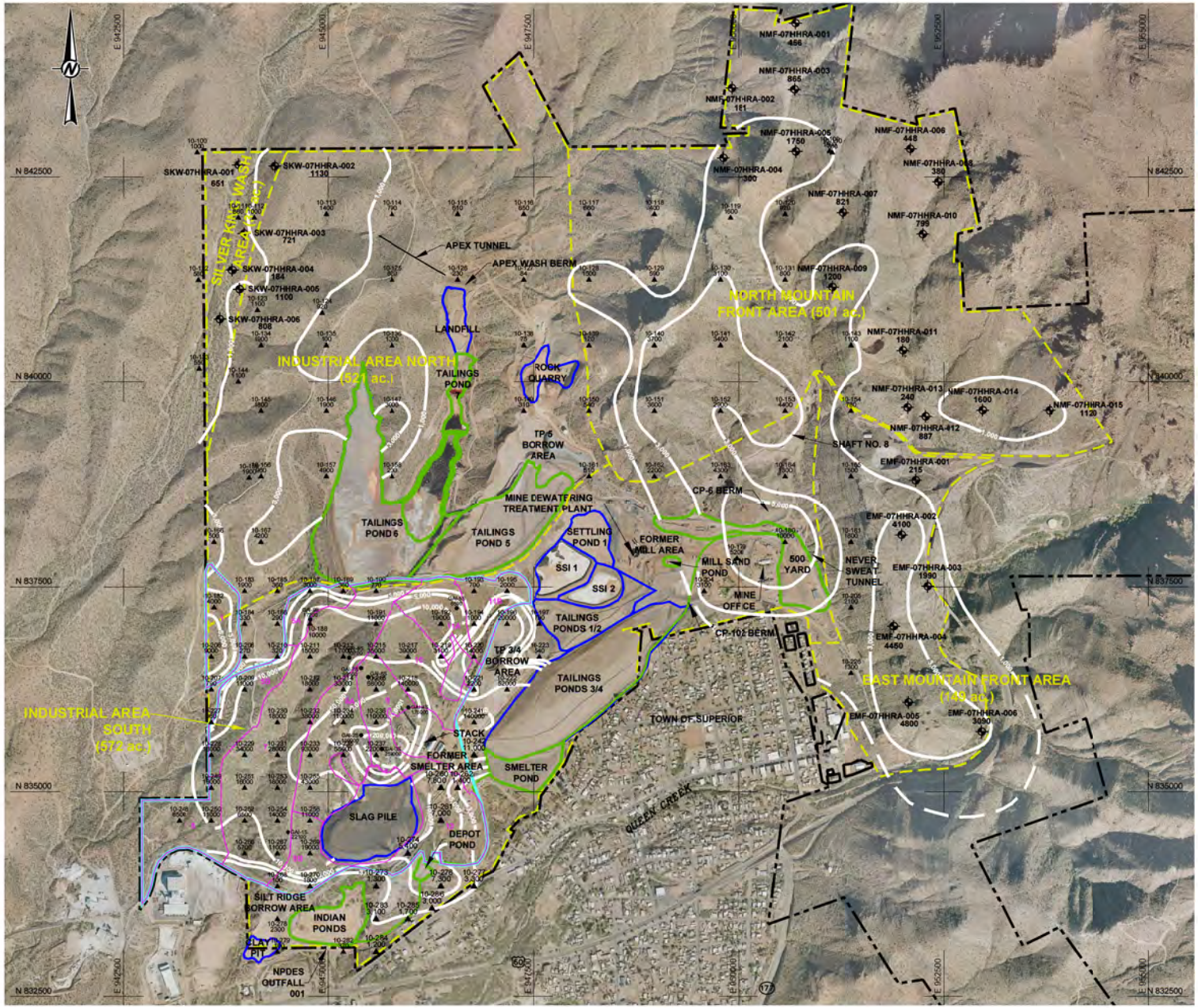
PROJECT
REMEDIAL ACTION WORKPLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

TITLE
ARSENIC ISOPLETHS FOR SOIL

CONSULTANT: Golder Associates

YYYY-MM-DD	2015-12-01
DESIGNED	OM
PREPARED	NIL
REVIEWED	OM
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
073-92519-15	1001	B	2-2



LEGEND

- PROPERTY LINE
- APP FACILITIES
- OTHER FACILITIES
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- LAND AREA BOUNDARY
- 9 — SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- NMF-07HHRA-001 — 2008 SAMPLES
- GAI-1S — 2001 SAMPLES
- 10-278 — 10 SERIES SAMPLES
- 500 — COPPER CONCENTRATION (mg/Kg)
- 1,000 — COPPER ISOPLETH IN mg/Kg (DASHED WHERE INFERRED)

NOTES

1. 2001 AND 2008 SMPLES COLLECTED BY GOLDER; ALL OTHER SAMPLES COLLECTED BY B & C (1998).
2. SAMPLES FROM WASTE MATERIALS (E.G. SLAG, TAILINGS) NOT USED TO DEYELOP ISOPLETHS
3. SSI – SLUDGE STORAGE IMPOUNDMENT

REFERENCES

1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202).

0 600 1200
1" = 1200' FEET

CLIENT: Resolution Copper Mining

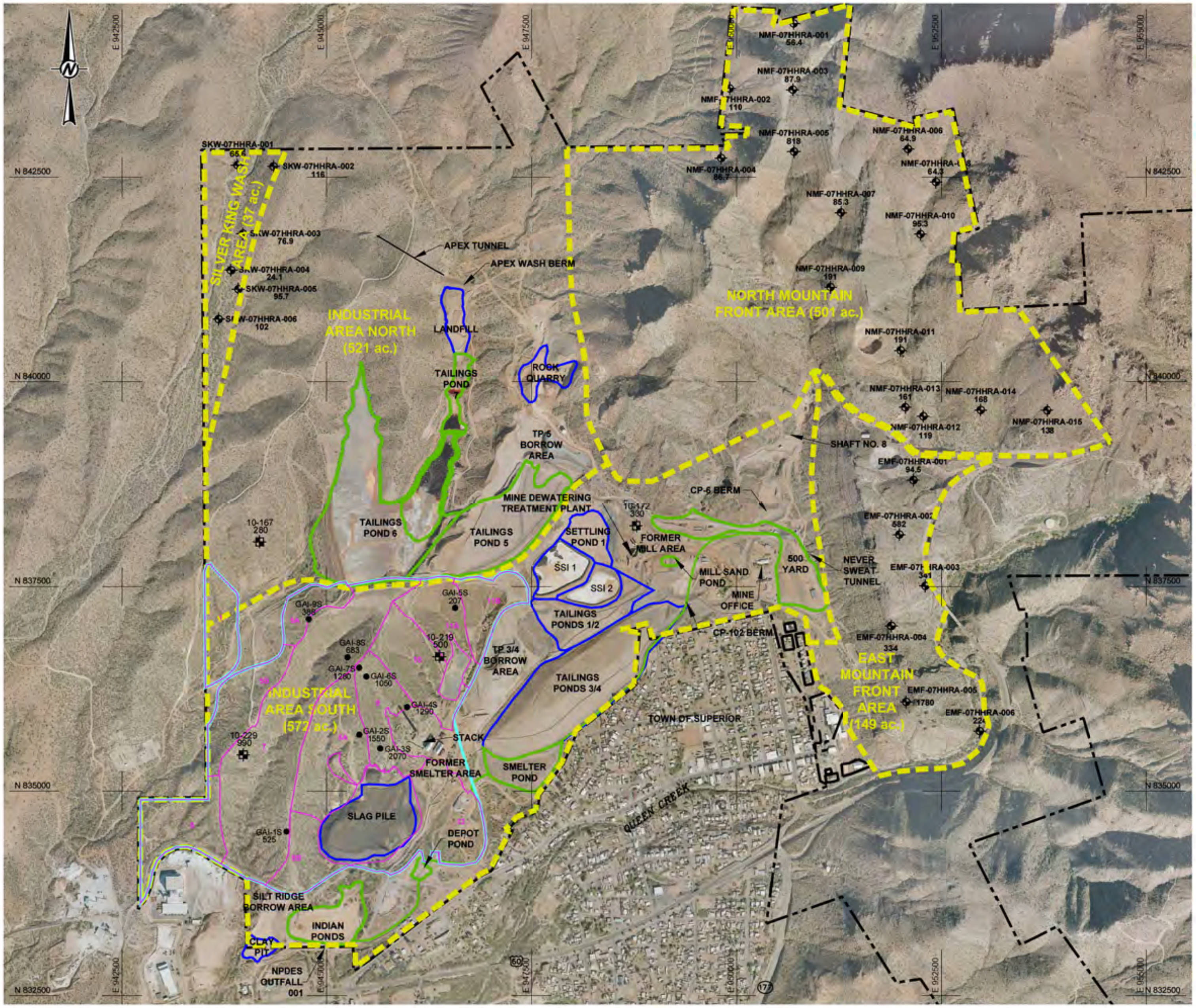
PROJECT
REMEDIAL ACTION WORKPLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

TITLE
COPPER ISOPLETHS FOR SOIL

CONSULTANT: Golder Associates

YYYY-MM-DD	2015-12-01
DESIGNED	OM
PREPARED	NIL
REVIEWED	OM
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
073-92519-15	1001	B	2-3



LEGEND

- PROPERTY LINE
- APP FACILITIES
- OTHER FACILITIES
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- LAND AREA BOUNDARY
- SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- NMF-07HHRA-015 138 — 2008 SAMPLES
- GAI-1S — 2001 SAMPLES
- 500 — LEAD CONCENTRATION (mg/Kg)
- 10-167 280 — 1998 SAMPLES (B&C)

NOTES
1. 2001 AND 2008 SAMPLES COLLECTED BY GOLDER.
2. 1998 SAMPLES COLLECTED BY B&C.
3. SSI = SLUDGE STORAGE IMPOUNDMENT.

REFERENCES
1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202).

0 600 1200
1" = 1200' FEET

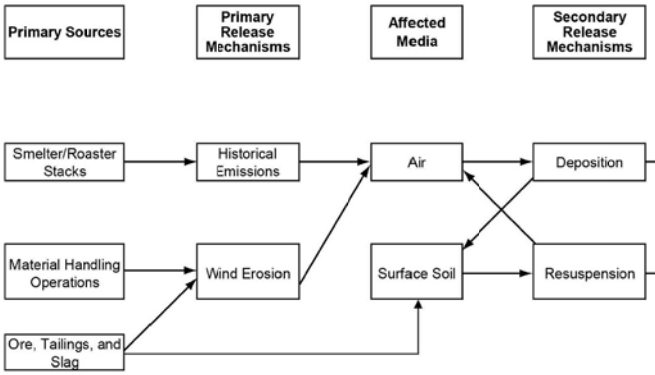
CLIENT
Resolution Copper Mining

PROJECT
REMEDIAL ACTION WORKPLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

TITLE
LEAD CONCENTRATIONS IN SOIL

CONSULTANT	YYYY-MM-DD	2015-12-01
Golder Associates	DESIGNED	OM
	PREPARED	NIL
	REVIEWED	OM
	APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
073-92519-15	1001	B	2-4



Receptors											
Exposure Media	Site Area	East Mountain Front		Industrial Area North		Industrial Area South		North Mountain Front		Silver King Wash	
	Exposure Scenario	Trespassers	Industrial Workers	Trespassers	Industrial Workers	Trespassers	Industrial Workers	Rugged Terrain Trespassers	Industrial Workers	Trespassers	Industrial Workers
	Frequency of Use	Low-Level	Low-Level	Low-Level	Workshift	Low-Level	Workshift	Infrequent	Infrequent	Low-Level	Low-Level
Soil	Ingestion	●	●	●	●	●	●	●	●	●	●
Soil	Dermal Contact	●	●	●	●	●	●	●	●	●	●
Air	Inhalation	●	●	●	●	●	●	●	●	●	●

Receptors by Land Use Area										
Age Groups	East Mt. Front		Industrial Area North		Industrial Area South		North Mt. Front		Silver King Wash	
	Trespassers	Industrial Workers	Trespassers	Industrial Workers	Trespassers	Industrial Workers	Rugged Terrain Trespassers	Industrial Workers	Trespassers	Industrial Workers
Preteens (6-13 years)	○	○	○	○	○	○	○	○	●	○
Teens (13-18 years)	●	○	●	○	●	○	●	○	●	○
Adults (> 18 years)	●	●	●	●	●	●	●	●	●	●

LEGEND

●	Receptor/Pathway included in SSSRL
○	Receptor/Pathway not included in SSSRL

CLIENT: Resolution Copper Mining

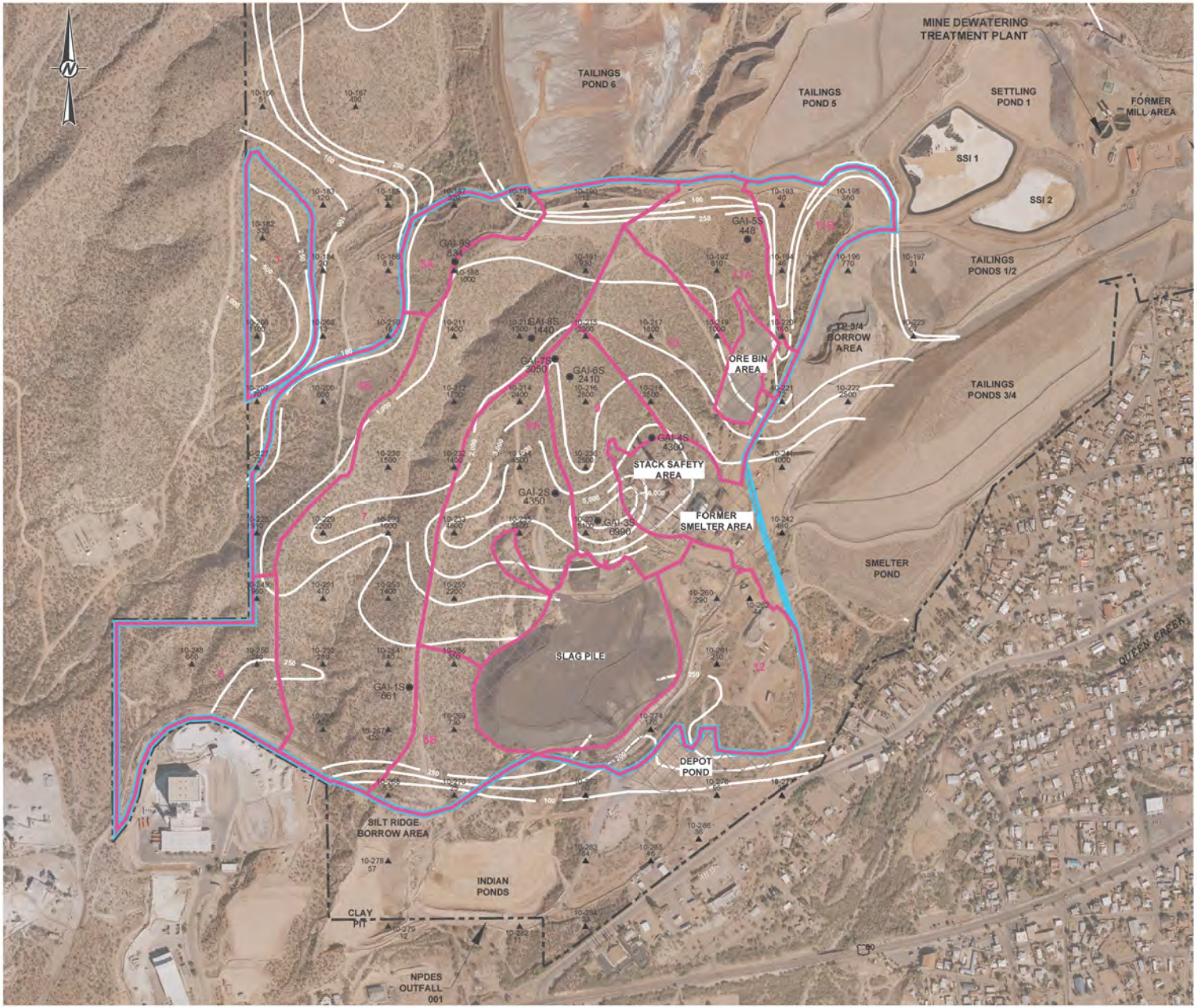
PROJECT:
REMEDIAL ACTICN WORK PLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

TITLE:
CONCEPTUAL SITE MODEL FOR SOIL
WEST PLANT SITE

CONSULTANT: Golder Associates

YYYY-MM-DD	2015-06-12
DESIGNED	DC
PREPARED	JHR
REVIEWED	JC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
073-92519-15	1001	B	2-5



LEGEND

- PROPERTY LINE
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- 9 — SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- NMF-07HHRA-001 — 2008 SAMPLES
- GAI-1S — 2001 SAMPLES
- 10-278 — 10 SERIES SAMPLES
- 500 — ARSENIC CONCENTRATION (mg/Kg)
- AREAS NOT TO BE REMEDIATED
- 1,000 — ARSENIC ISOPLETH IN mg/Kg (DASHED WHERE INFERRED)

NOTES

1. 2001 AND 2008 SAMPLES COLLECTED BY GOLDER. ALL OTHER SAMPLES COLLECTED BY B & C (1998).
2. SAMPLES FROM WASTE MATERIALS (E.G. SLAG, TAILINGS) NOT USED TO DEVELOP ISOPLETHS.
3. SURFACE SAMPLES USED TO DEVELOP ISOPLETHS.
4. SSI = SLUDGE STORAGE IMPOUNDMENT.

REFERENCES

1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202)

0 300 600
1" = 600' FEET

CLIENT: Resolution Copper Mining

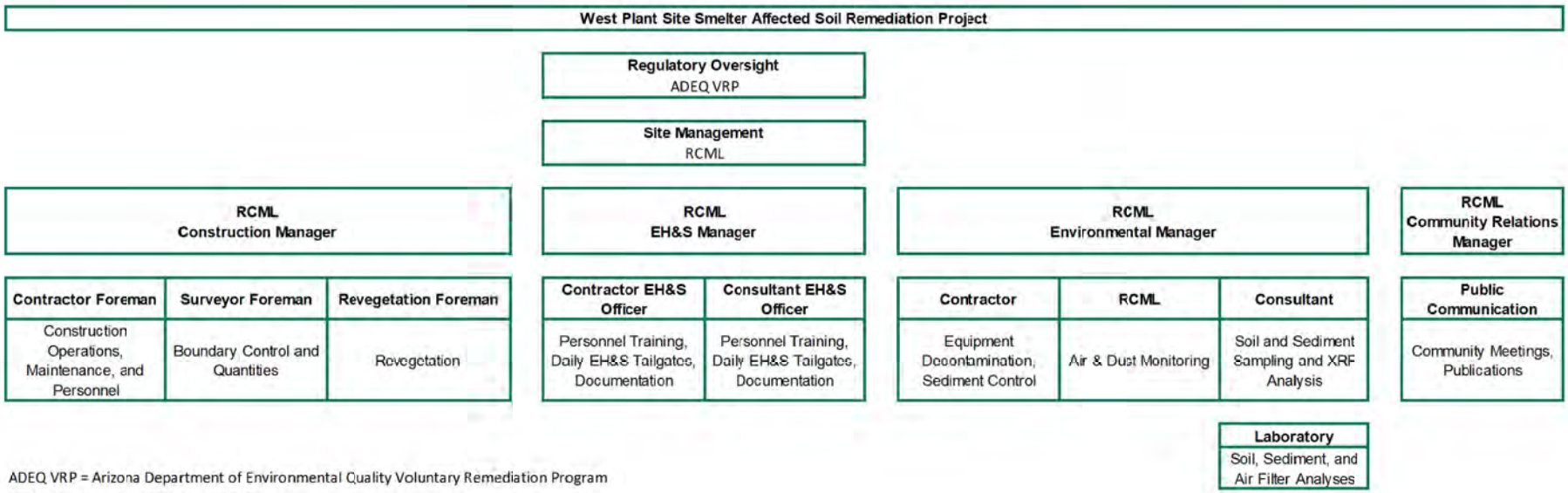
PROJECT
REMEDIAL ACTION WORK PLAN
WEST PLANT SITE, SUPERIOR, ARIZONA

TITLE
AREAS PREVIOUSLY REMEDIATED, POSTPONED, OR EXCLUDED

CONSULTANT: Golder Associates

YYYY-MM-DD	2016-03-10
DESIGNED	OM
PREPARED	JHR
REVIEWED	OM
APPROVED	DC

PROJECT NO: 073-92519-15 | CONTROL: 1001 | REV: A | FIGURE: 2-6



ADEQ VRP = Arizona Department of Environmental Quality Voluntary Remediation Program
EH&S = Environment, Health, and Safety
RCML = Resolution Copper Mining LLC
QA/QC = Quality Assurance/Quality control
XRF = X-Ray Fluorescence

CLIENT: Resolution Copper Mining

PROJECT
REMEDIAL ACTICN WORK PLAN
WEST PLANT SITE, SUPERIOR ARIZONA

TITLE
ORGANIZATIONAL CHART

CONSULTANT: Golder Associates

YYYY-MM-DD	2016-03-14
DESIGNED	DC
PREPARED	JHR
REVIEWED	DC
APPROVED	KJ

PROJECT NO.	CONTROL	REV.	FIGURE
1527097	0002	A	3-1

Type of Activity	Activity	2016			2017		
		Q2	Q3	Q4	Q1	Q2	Q3
Mobilization	Establish Onsite XRF laboratory						
	Refine Exclusion Area Boundary with Additional XRF Measurements						
	Initiate Contractor Medical Surveillance						
	Train Contractors on Site- and Project- Specific H&S Protocols						
	Establish Worker Monitoring Program						
	Establish Perimeter Monitoring System						
Exclusion Area Preparation	Construct Staging Area						
	Construct Sediment Controls						
	Construct Haul Roads						
	Install Fencing and Signage						
Soil Removal	Spil Removal Units 1, 5, 6, and 7						
	Soil Removal Units 8,9,10,and 11						
	Soil Removal Unit 12						
Exclusion Area Decommissioning	Remove Haul Roads						
	Decommission Sediment Controls						
	Remove Staging Area						
	Remove Fercing and Signage						
Demobilization	Terminate Contractor Medical Surveillance						
	Remove Perimeter Monitoring System						
	Remove Onsite XRF Laboratory						
Progress Reporting	Submit Quarterly Progress Reports to VRP						
Completion Reporting	Prepare and Submit Completion Report						
Community Involvement	Implement Community Involvement Plant Throughout Project						
Annual Progress Report	1st Annual Progress Report						

CLIENT Resolution Copper Mining

PROJECT
REMEDIAL ACTICN WORK PLAN
WEST PLANT SITE, SUPERIOR ARIZONA

TITLE
APPROXIMATE SCHEDULE FOR SOIL REMOVAL IN THE IAS

CONSULTANT Golder Associates

YYYY-MM-DD	2016-03-14
DESIGNED	DC
PREPARED	JHR
REVIEWED	DC
APPROVED	KJ

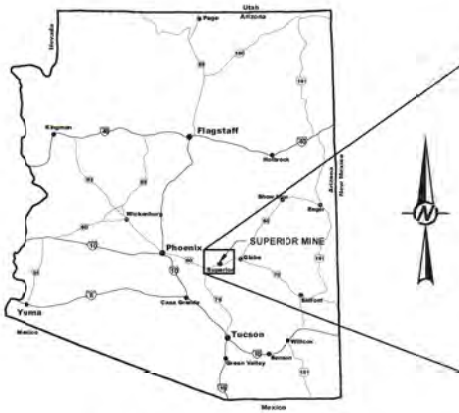
PROJECT NO.	CONTROL	REV.	FIGURE
152709704	0002	A	3-2

APPENDIX A
SMELTER-AFFECTED SOIL REMOVAL DESIGN DRAWINGS

Resolution Copper Mining

SUPERIOR, ARIZONA

SMELTER-AFFECTED SOIL REMOVAL DESIGN
WEST PLANT SITE
SUPERIOR MINE, SUPERIOR, ARIZONA
MARCH 2016



STATE OF ARIZONA
NOT TO SCALE

LOCATION MAP
NOT TO SCALE

LIST OF DRAWINGS

DWG. No.	Sheet Title
G-001	TITLE SHEET
G-002	GENERAL ARRANGEMENT PLAN
C-001	STAGING AREA PLAN
C-002	STAGING AREA DETAILS AND SECTIONS
C-003	SOIL REMOVAL UNITS 1, 5, 6, AND 7
C-004	SOIL REMOVAL UNITS 8, 9, 10, AND 11
C-005	SOIL REMOVAL UNIT 12
C-006	SEDIMENT CONTROLS PLAN
C-007	SEDIMENT CONTROLS - DETAILS AND SECTIONS (1 OF 2)
C-008	SEDIMENT CONTROLS - DETAILS AND SECTIONS (2 OF 2)
C-009	TYPICAL HAUL ROAD SECTIONS
C-010	FENCING AND SIGNAGE PLAN

ABBREVIATIONS

mg/kg	MILLIGRAMS PER KILOGRAM
ft-bgs	FEET BELOW GROUND SURFACE
ft²	SQUARE FEET
ft	FEET
in	INCHES
cy	CUBIC YARDS
As	ARSENIC
oz	OUNCES
mmhos/cm	MILLIMHOS PER CENTIMETER
TP-6	TAILINGS POND 6
BMPs	BEST MANAGEMENT PRACTICES
SRU	SOIL REMOVAL UNIT
gal	GALLON
C.C.F.	COMPACTED COMMON FILL

GENERAL NOTE(S)

1. CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONSTRUCTION PROCESS AND THE SAFETY OF THE WORKERS. THIS INCLUDES, BUT IS NOT LIMITED TO, THE CONSTRUCTION SEQUENCE, ACCESS, TRAFFIC CONTROL, BARRIERS, LIFTING OF MATERIALS/EQUIPMENT, TEMPORARY SHORING, AND STABILITY OF TEMPORARY CUT SLOPES AND/OR STOCKPILES.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND MANAGING SANITARY FACILITIES.
3. CONTRACTOR WILL BE RESPONSIBLE FOR DISPOSING DECONTAMINATION WATER AT THE RCML MINE WATER TREATMENT PLANT.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING EXISTING UTILITIES AND MINE INFRASTRUCE (e.g. PIPING).
5. RCML WILL BE RESPONSIBLE FOR PROVIDING WATER FOR DUST CONTROL, AND DECONTAMINATION.
6. RCML WILL BE RESPONSIBLE FOR PROVIDING POWER.
7. RCML (OR THEIR DESIGNEE) WILL BE RESPONSIBLE FOR REVEGETATION.
8. ADDITIONAL DETAILS REGARDING THE SOIL REMOVAL PROJECT CAN BE FOUND IN THE "REMEDIAL ACTION WORK PLAN" (GOLDER ASSOCIATES, 2016).

GENERAL REFERENCE(S)

1. THE EXISTING GROUND SURFACE WAS DEVELOPED BY GOLDER ASSOCIATES BASED ON:
   a. FOUR (4) FOOT CONTOUR INTERVAL TOPOGRAPHY PROVIDED BY RESOLUTION COPPER MINING (RCML), BASED ON A 2010 AERIAL SURVEY, AND CONVERTED TO ARIZONA STATE PLANE CENTRAL ZONE NAD83 (NA2011) COORDINATE SYSTEM AND THE NAVD88 VERTICAL DATUM.
   b. ACTUAL GROUND SURFACE ELEVATIONS IN THE PROJECT CAN BE EXPECTED TO VARY PLUS OR MINUS TWO (2) FEET FROM THOSE INDICATED ON THE DRAWINGS. ACTUAL GROUND SURFACE SHOULD BE VERIFIED BY TOPOGRAPHIC SURVEY BY CONTRACTOR AS NEEDED (AS DETERMINED BY CONTRACTOR) PRIOR TO CONSTRUCTION.
2. AERIAL PHOTOGRAPHY PROVIDED BY RCML.

TRAFFIC CONTROL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR TRAFFIC CONTROL, SUCH AS SIGNAGE AND FLAGGERS (IF NEEDED), AND SAFE OPERATION OF THE CONSTRUCTION EQUIPMENT.
2. ONE-WAY AND TWO-WAY ROADS ARE TENTATIVELY SHOWN ON THE DRAWINGS, SUBJECT TO RCML INSTRUCTIONS.
3. PARKING AREAS AND READY LINE TO BE CONSTRUCTED WITH WHEEL DITCHES AND CLEARLY DESIGNATED PARKING LIMITS.
4. ALL CONSTRUCTION ACCESS THOUGH THE LONE TREE ENTRANCE TO THE WEST PLANT SITE.

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

APPROVED FOR RESOLUTION COPPER MINING, LLC:
PROJECT MANAGER — DATE:
CONSTRUCTION MANAGER — DATE:
SAFETY MANAGER — DATE:
EPCM MANAGER — DATE:
ENGINEERING MANAGER — DATE:
SITE ENGINEER (MECH & ELEC) — DATE:
SITE ENGINEER (MINING) — DATE:
GEOTECHNICAL ENGINEER — DATE:
ENVIRONMENTAL ENGINEER — DATE:
PACKAGE MANAGER — DATE:

APPROVED FOR GOLDER
PROJECT MANAGER
K. SONNEJAE
DATE: 2016-02-05
ENGINEERING MANAGER — DATE:
PACKAGE MANAGER — DATE:
CIVIL ENGINEER — DATE:
STRUCTURAL ENGINEER — DATE:
MECHANICAL ENGINEER — DATE:
ELECTRICAL ENGINEER — DATE:
INSTRUMENTATION ENGINEER — DATE:
REFRIGERATION ENGINEER — DATE:
VENTILATION ENGINEER — DATE:
PIPING ENGINEER — DATE:
SECTION LEADER — DATE:
CHECKER
K. KNUDSON
DATE: 2016-02-05
DESIGNER
K. KNUDSON
DATE: 2016-01-29

REV	REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C			C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHR	WK	KRJ
			B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
			A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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DRAWN BY: ANV — DATE: 2016-01-19

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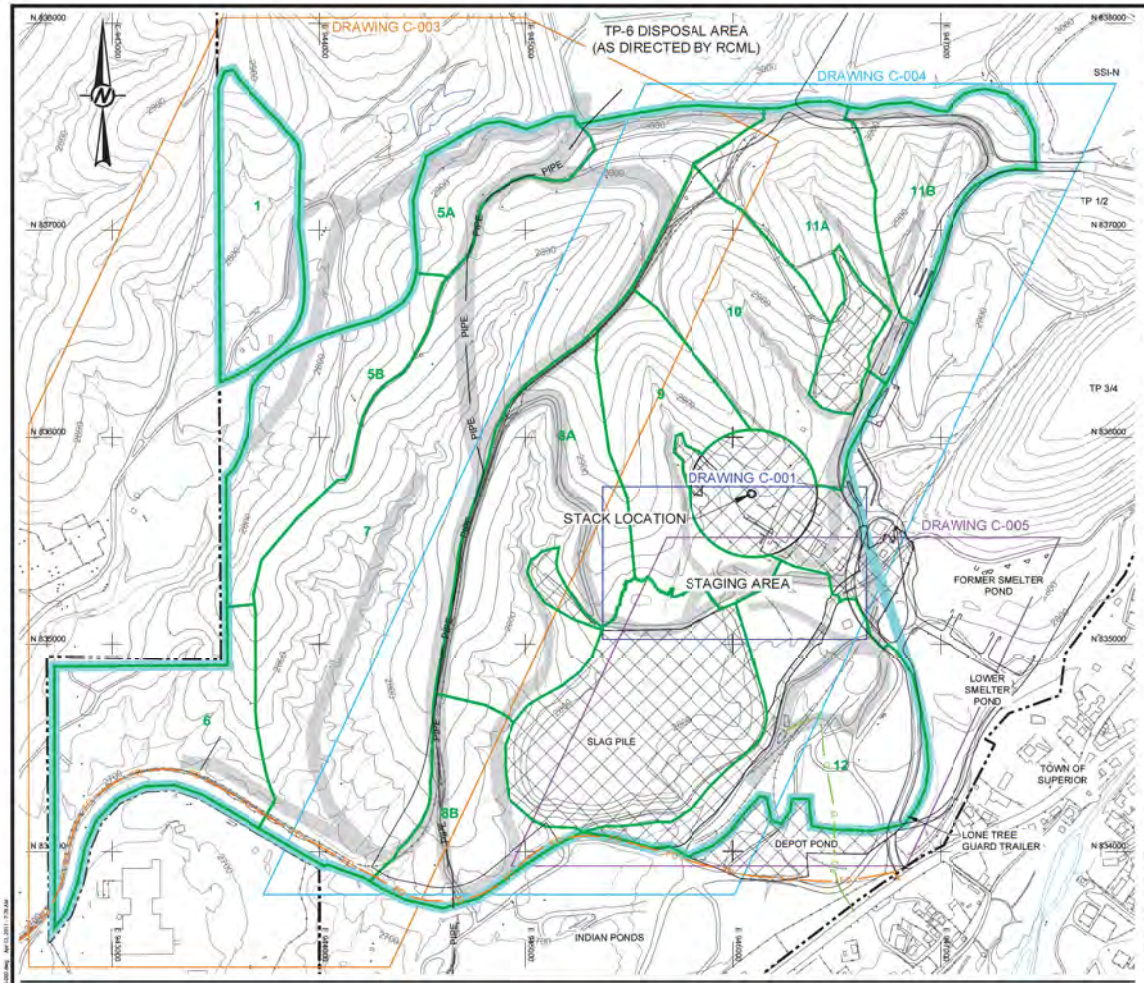
Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: TITLE SHEET
SCALE: AS SHOWN
GOLDER FILE No.: 1527091-002-G-001
G-001 C



GENERAL LEGEND

- EXISTING GROUND CONTCUR (ft -MSL)
- EXISTING ROADS
- EXISTING DRAINAGE
- EXISTING FENCELINE
- EXISTING POWER POLE OR POST
- EXISTING RAILROAD TRACKS
- EXISTING PIPELINE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- PROPERTY BOUNDARY
- AREAS NOT TO BE REMEDIATED
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- HAULAGE ROUTES
- SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- DETAIL CALLOUT — DETAIL ID, DRAWING SHEET LOCATION
- CROSS-SECTION CALLOUT — SECTION ID, DRAWING SHEET LOCATION

WORKER SAFETY NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THEIR WORKERS WITH HEALTH AND SAFETY TRAINING AS REQUIRED BY RCML.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR MEDICAL SURVEILLANCE FOR THEIR WORKERS AS REQUIRED BY RCML.
3. CONTRACTOR SHALL SUPPLY EQUIPMENT WITH ENCLOSED CABS WITH CABIN AIR FILTRATION USING HEPA FILTERS.
4. RCML (OR THEIR DESIGNEE) WILL MONITOR THE EFFECTIVENESS OF WORKER SAFETY MEASURES.
5. CONTRACTOR SHALL SUPPLY PERSONAL PROTECTIVE EQUIPMENT FOR EACH SOIL REMOVAL UNIT AS SHOWN IN THE TABLE BELOW.
6. WORKERS SHALL DON PERSONAL PROTECTIVE EQUIPMENT BEFORE ENTERING THE EXCLUSION ZONE.
7. WORKERS SHALL EAT, DRINK, SMOKE, CHEW GUM, CHEW TOBACCO, AND USE CELL PHONES (OR OTHER ACTIVITIES WITH THE POTENTIAL FOR HAND TO MOUTH CONTAMINATION) ONLY IN AREAS DESIGNATED BY RCML AND ONLY AFTER WASHING THEIR HANDS AND FACE (WITH THE EXCEPTION OF EQUIPMENT OPERATORS INSIDE ENCLOSED CABS).
8. WORKERS OUTSIDE ENCLOSED CABS MAY HAVE THEIR ACTIVITIES CURTAILED OR SUSPENDED DEPENDING ON WIND SPEED, WIND DIRECTION, AND CONTAMINANT CONCENTRATIONS.
9. WORKERS SHALL NOT EXIT THE EXCLUSION ZONE WITHOUT UNDERGOING DECONTAMINATION.
10. USED PERSONAL PROTECTIVE EQUIPMENT SHALL BE DISPOSED ONLY IN DESIGNATED RECEPTACLES.

DUST CONTROL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR DUST CONTROL.
2. RCML (OR THEIR DESIGNEE) WILL BE RESPONSIBLE FOR MONITORING THE EFFECTIVENESS OF DUST CONTROLS.
3. DUST SHALL BE CONTROLLED BY WATERING DURING EXCAVATION, STOCKPILING, LOADING, HAULING, AND SPREADING BY APPLYING WATER TO LIMIT VISIBLE EMISSIONS WITHOUT GENERATING RUNOFF.
4. DUST FROM LOADED TRUCKS SHALL BE CONTROLLED DURING HAULING BY:
   a. LIMITING TRUCK SPEED TO LESS THAN 15 MILES PER HOUR.
   b. COVERING LOADS WHEN WIND SPEED IS GREATER THAN 7.5 METERS PER SECOND (17 MILES PER HOUR).
5. OPERATIONS MAY BE CURTAILED OR SUSPENDED AS DETERMINED BY RCML (OR THEIR DESIGNEE) DURING HIGH WIND CONDITIONS TO REDUCE THE POTENTIAL FOR WIND TRANSPORT OF CONTAMINATED DUST.

SOIL REMOVAL VOLUMES (ACTUAL VOLUMES WILL DEPEND ON MEETING CLEANUP LEVEL OF 185 mg/kg ARSENIC) (SEE NOTE 6 SOIL REMOVAL NOTES)

Soil Removal Unit	Initial Excavation Depth (ft-bgs)	Approximate Surface Area (ft^2)	Approximate Bank Volume (cy)
1	1.0	366,000	18,600
5	0.5	1,023,200	19,000
6	0.5	801,300	14,900
7	2.0	1,065,800	227,100
8	2.0	1,901,900	118,700
9	3.0	681,700	75,800
10	3.0	801,900	89,100
11	1.5	1,153,400	64,100
12	0.5	987,700	16,300
	TOTAL	10,623,000	645,800

SOIL REMOVAL PPE REQUIREMENTS

Soil Removal Unit	Worker Safety Zone	PPE Level
1	Low Contamination Zone C	Standard D
5	Low Contamination Zone C	Standard D
6	Low Contamination Zone C	Standard D
7	High Contamination Zone B	Modified D
8	High Contamination Zone A	Standard C
9	High Contamination Zone A	Standard C
10	High Contamination Zone A	Standard C
11	Low Contamination Zone C	Standard D
12	Low Contamination Zone C	Standard D

SOIL REMOVAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR VEGETATION REMOVAL AND SOIL EXCAVATION, STOCKPILING, LOADING, HAULING, PLACING, AND SPREADING.
2. RCML (OR THEIR DESIGNEE) WILL BE RESPONSIBLE FOR MONITORING THE EFFECTIVENESS OF THE SOIL EXCAVATION AND DETERMINING WHEN EXCAVATION IS COMPLETE.
3. EXCAVATION SHALL BE COMPLETE WHEN THE FOLLOWING CONCENTRATIONS ARE ACHIEVED IN THE <250 MICROMETER (-µm) FRACTION OF THE SOIL IN THE EXCAVATED SURFACE:
   a. ARSENIC: 185 mg/kg
   b. COPPER: 50,547 mg/kg
   c. LEAD: 380 mg/kg
4. VEGETATION, INCLUDING ROOTS, SHALL BE REMOVED IN SUCH A WAY AS TO MINIMIZE THE AMOUNT OF CONTAMINATED SOIL MIXED IN WITH THE REMOVED VEGETATION (FOR EXAMPLE, DOZER WITH BRUSH RAKE ATTACHMENT).
5. REMOVED VEGETATION SHALL BE CHIPPED AND DISPOSED IN TAILINGS POND 6.
6. REMOVAL OF CONTAMINATED SOIL SHALL OCCUR BY SOIL REMOVAL UNITS AS SHOWN ON THE DRAWINGS:
   a. THE SOIL REMOVAL UNITS SHALL BE EXCAVATED IN SEQUENCE FROM WEST TO EAST (THE PREVAILING WIND DIRECTION) TO REDUCE THE POTENTIAL FOR RECONTAMINATION OF NEWLY EXCAVATED SURFACES IN THE EVENT OF HIGH WINDS.
   b. WITHIN A SOIL REMOVAL UNIT, CONTAMINATED SOIL SHALL BE REMOVED FROM UPHILL TO DOWNHILL SO AS TO REDUCE THE POTENTIAL FOR RECONTAMINATION OF NEWLY EXCAVATED SURFACES IN THE EVENT OF RAIN.
   c. CONTAMINATED SOIL SHALL BE REMOVED TO THE DEPTHS SHOWN ON THE DRAWINGS
   d. RCML (OR THEIR DESIGNEE) SHALL MEASURE CONTAMINANT CONCENTRATIONS IN THE NEWLY EXCAVATED SURFACE TO DETERMINE WHETHER ADDITIONAL EXCAVATION IS NEEDED.
7. EXCAVATED SOIL SHALL BE HAULED TO TAILINGS POND 6 FOR PLACEMENT. THE PLACEMENT LOCATIONS WILL BE DETERMINED BY RCML (OR THEIR DESIGNEE).

SEDIMENT MANAGEMENT NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTING AND/OR INSTALLING SEDIMENT CONTROLS AS SHOWN ON THE DRAWINGS.
2. CONSTRUCT SEDIMENT BMPs (e.g. SMALL CHECK DAMS OR STRAW BALES) ALONG WATERCOURSES WITHIN AN SRU EVERY 500 FEET (APPROXIMATE) OR AS DIRECTED BY RCML (OR THEIR DESIGNEE).
3. RCML (OR THEIR DESIGNEE) WILL BE RESPONSIBLE FOR MONITORING THE EFFECTIVENESS OF THE SEDIMENT CONTROLS.
4. CONTRACTOR SHALL REMOVE ACCUMULATED SEDIMENT FROM SEDIMENT BASINS AS DIRECTED BY RMCL (OR THEIR DESIGNEE) FOR LOADING, HAULING, AND PLACING AT TAILINGS POND 6.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING SEDIMENT CONTROLS IN GOOD WORKING CONDITION.

NOT FOR CONSTRUCTION

0 300 600
1" = 300' FEET

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

APPROVED FOR RESOLUTION COPPER MINING, LLC:
PROJECT MANAGER — DATE
CONSTRUCTION MANAGER — DATE
SAFETY MANAGER — DATE
EPCM MANAGER — DATE
ENGINEERING MANAGER — DATE
SITE ENGINEER (MECH' & ELEC') — DATE
SITE ENGINEER (MINING) — DATE
GEOTECHNICAL ENGINEER — DATE
ENVIRONMENTAL ENGINEER — DATE
PACKAGE MANAGER — DATE

APPROVED FOR GOLDER
PROJECT MANAGER: K. JOHNCAKE — DATE: 2016-03-07
ENGINEERING MANAGER — DATE
PACKAGE MANAGER — DATE
CIVIL ENGINEER — DATE
STRUCTURAL ENGINEER — DATE
MECHANICAL ENGINEER — DATE
ELECTRICAL ENGINEER — DATE
INSTRUMENTATION ENGINEER — DATE
REFRIGERATION ENGINEER — DATE
VENTILATION ENGINEER — DATE
PIPING ENGINEER — DATE
SECTION LEADER — DATE
CHECKER: W. KNUDSON — DATE: 2016-02-23
DESIGNER: W. KNUDSON — DATE: 2016-01-29

REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHR	WK	KRJ
B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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REF DWG NO | REFERENCE DRAWING TITLE

WBS CODE: DESIGNAE
WBS NO: G-002

THIS DRAWING PRODUCED BY: Golder Associates

APPROVED BY PR ENG / PR SCI ENG
NAME
SIGNATURE
REG. No.
ORIGINAL DATE
REVISION DATE

DRAWN BY: ANV — DATE: 2016-01-19

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Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: GENERAL ARRANGEMENT PLAN

SCALE: AS SHOWN
GOLDER FILE No: 1527091-002-G-002

G-002 C

STAGING AREA NOTES

1. RCML WILL REMOVE EXISTING DEBRIS FROM THE STAGING AREA PRIOR TO CONTRACTOR MOBILIZATION.
2. CONTRACTOR SHALL GRADE THE STAGING AREA TO CREATE A UNIFORM AND DRAINING SURFACE.
3. CONTRACTOR SHALL PLACE A THREE-INCH (3 in) THICK LAYER OF COMPACTED COMMON FILL TO CREATE A CLEAN WORKING SURFACE IN THE STAGING AREA.
4. CONTRACTOR SHALL PROVIDE ALL STAGING AREA COMPONENTS (WATER TOWERS, SHOWER/WASHING TRAILER, OVERSIGHT TRAILERS, PORTABLE TOILETS, AND JERSEY BARRIERS).
5. STAGING AREA QUANTITIES (APPROXIMATE):
   a. SURFACE AREA TO BE GRADED = 56,000 ft^2
   b. VOLUME OF COMPACTED COMMON FILL TO BE PLACED = 520 cy

STAGING AREA EQUIPMENT AND SUPPLIES (TO BE SUPPLIED BY CONTRACTOR)

- LONG-HANDLED SCRAPERS AND BRUSHERS
- WASH AND RINSE BUCKETS
- PRESSURE WASHER (e.g., GAS POWERED)
- PORTABLE WATER SUPPLY (e.g., WATER TRAILER OR WATER BUFFALO)
- PHOSPHATE-FREE DETERGENT (e.g., ALCONOX)
- SHOP VACUUMS
- SHORT-HANDLED BRUSHES
- SPRAY BOTTLES
- DRY OR WET WIPES AND/OR PAPER TOWELS
- SHED(S) OR BIN(S) FOR STORING DECON EQUIPMENT AND SUPPLIES
- DISPOSAL RECEPTACLES

NOT FOR CONSTRUCTION

0 50 100
1" = 50' FEET

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-03-09

DATE: 2016-03-09
CHECKER: W. KNUDSON
DATE: 2016-02-05
DESIGNER: W. KNUDSON
DATE: 2016-01-29

APPROVED FOR RESOLUTION COPPER MINING, LLC:

PROJECT MANAGER — DATE
CONSTRUCTION MANAGER — DATE
SAFETY MANAGER — DATE
ESTIM MANAGER — DATE
ENGINEERING MANAGER — DATE
SITE ENGINEER (MECH & ELEC) — DATE
SITE ENGINEER (MINING) — DATE
GEOTECHNICAL ENGINEER — DATE
ENVIRONMENTAL ENGINEER — DATE
HSQ MGR MANAGER — DATE

APPROVED FOR GOLDER

PROJECT MANAGER
K. JOHNSON
DATE: 2016-03-09
ENGINEERING MANAGER — DATE
PUBLIC MANAGER — DATE
CIVIL ENGINEER — DATE
STRUCTURAL ENGINEER — DATE
MECHANICAL ENGINEER — DATE
ELECTRICAL ENGINEER — DATE
INSTRUMENTATION ENGINEER — DATE
REFRIGERATION ENGINEER — DATE
VENTILATION ENGINEER — DATE
PRINC ENGINEER — DATE
SECTION LEADER — DATE

REV							
C							
			A	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHR	WK	KRJ
			A	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
			A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ
	REF DWG NO	REFERENCE DRAWING TITLE	REV	DESCRIPTION — THIS DRAWING IS NOT VALID UNLESS THE LAST REVISION IS HAND SIGNED	DATE	BY	DES	PROJ MGR

WBS CODE: DOSPHASE: DWG No: C-001

THIS DRAWING PRODUCED BY: Golder Associates

APPROVED BY PR ENG / PR TECH ENG
NAME
SIGNATURE
REG No
ORIGINAL DATE
REVISION DATE

DRAWN BY: ANV
DATE: 2016-01-19

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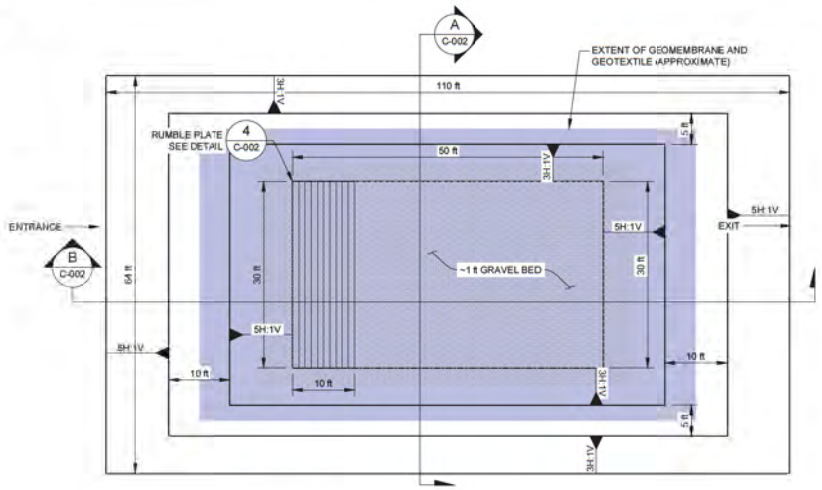
Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: STAGING AREA PLAN

SCALE: AS SHOWN
GOLDER FILE No: 1527097-002-C-001
C-001 C



SCALE: 1" = 10' 1 C-002 DECON PAD DETAIL

SPECIFICATION(S)

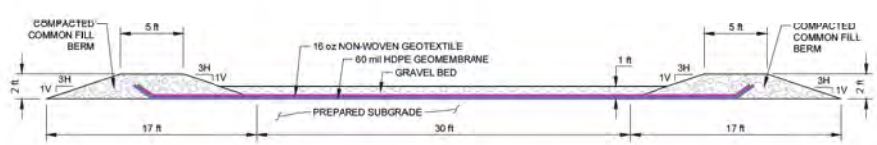
1. GRAVEL SHALL CONSIST OF COARSE, DURABLE STONE, ANGULAR IN SHAPE AND RESISTANT TO WEATHERING. ROUNDED STONE WILL NOT BE ACCEPTED AS GRAVEL MATERIAL. THE STONE SHALL HAVE A SPECIFIC GRAVITY OF AT LEAST 2.6, AND A GRADATION OF 3 TO 6 INCHES. THE RAYMER" QUARRY IS AN ACCEPTABLE SOURCE. OTHER SOURCES WILL REQUIRE APPROVAL BY THE RCML REPRESENTATIVE.
2. GEOTEX"ILE SHALL BE SIXTEEN (16) OUNCE PER SQUARE YARD NON-WOVEN GEOTEXTILE. SEAMS SHALL BE SOWN OR OVERLAPPED EIGHTEEN (18) INCHES.
3. THE GEOMEMBRANE SHALL BE 60 mil, SMOOTH, HIGH DENSITY POLYETHYLENE (HDPE) AND SHALL BE MANUFACTURED FROM NEW, FIRST-QUALITY RESIN PRODUCED IN THE UNITED STATES. GEOMEMBRANE SHALL BE CERTIFIED UV RESISTANT. GEOMEMBRANE MUST CONFORM TO THE MANUFACTURERS QUALITY CONTROL PRODUCT INFORMATION SPECIFICATIONS. A QUALITY CONTROL MANUAL AND QUALITY CONTROL CERTIFICATES SHALL BE PROVIDED FOR ALL GEOMEMBRANE INSTALLED.
4. THE GEOMEMBRANE SHALL BE HANDLED AND PLACED IN A MANNER TO ENSURE THAT THE GEOMEMBRANE IS NOT DAMAGED. THE GEOMEMBRANE CONTRACTOR MUST PROVIDE ANC FOLLOW QUALITY CONTROL PROCEDURES FOR INSTALLATION OF THE GEOMEMBRANE. A QUALITY CONTROL CERTIFICATION REPORT MUST BE PROVIDED TO THE ENGINEER AT THE COMPLE"ION OF CONSTRUCTION.
5. COMPACTED COMMON FILL SHALL CONSIST OF CLEAN SOIL AND ROCK MATERIALS EXCAVATED FROM SCURCE APPROVED BY THE RCML REPRESENTATIVE WITH PASTE PH GREATER THAN APPROXIMATELY 5.5, PASTE ELECTRICAL CONDUCTIVITY LESS THAN APPROXIMATELY 4 MMHOS/CM, WITHOUT VISIBLE SULFIDE MINERALIZATION, WITH LESS THAN 25 PERCENT CLAY, WITH A MAXIMUM PARTICLE SIZE OF SIX (6) INCHES IN DIAMETEF. ANY MATERIAL GREATER THAN THE ALLOWABLE PARTICLE SIZE SHALL BE BROKEN DOWN OR REMOVED. COMPACTED COMMON FILL SHALL BE PLACED IN ONE (1) ft LIFTS AND COMPACTED BY TRACKING IN WITH EQUIPMENT WITH AT LEAST THREE (3) PASSES.
6. RUMBLE PLATE SHALL HAVE A TRACK LENGTH OF 30 ft AND 10 ft WIDE FOR EQUIPMENT. CONSTRUCTION SHALL CONSIST OF ¼ INCH THICKWALL STEEL FOR DURABILITY, 1 OR ⅞ INCH SOLID STEEL BASE PLATE, 2 ½" x 2 ½" x 10' ANGLE AND LIFTING RINGS.
7. ALL SHARP EDGES OF RUMBLE PLATE SHALL BE COVERED OR ROUNDED TO PREVENT TIRE DAMAGE.

NOTE(S)

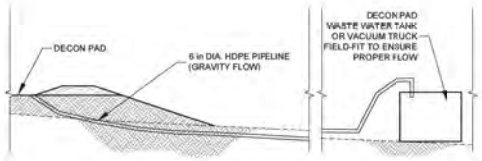
1. TEMPORARY DECONTAMINATION PAD TO BE REMOVED AFTER REMEDIATION IS COMPLETE.
2. DESIGNED FOR UP TO A D10 BULLDOZER, 988 LOADER, OR 775D HAUL TRUCK.
3. DIMENSIONS MAY BE MODIFIED AT THE TIME OF CONSTRUCTION BASED ON ACTUAL CONTRACTOR EQUIPMENT.

VEHICLE AND EQUIPMENT DECONTAMINATION NOTE(S)

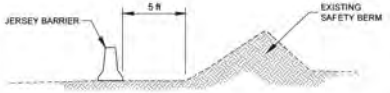
1. CONTRACTOR SHALL BE RESPONSIBLE FOR VEHICLE AND EQUIPMENT DECONTAMINATION, INCLUDING THE CONSTRUCTION OF THE DECONTAMINATION PAD AND THE PROVISION OF DECONTAMINATION EQUIPMENT AND SUPPLIES.
2. RCML (OR THEIR DESIGNEE) SHALL BE RESPONSIBLE FOR MONITORING THE EFFECTIVENESS OF DECONTAMINATION MEASURES.
3. CONTRACTOR SHALL ACCESS THE SOIL REMOVAL UNITS ONLY WHERE SHOWN ON THE DRAWINGS.
4. SUPPORT VEHICLES, PERSONAL VEHICLES, OR OTHER EQUIPMENT NOT NEEDED FOR USE IN A SPECIFIC REMEDIATION ACTIVITY SHALL HAVE MINIMAL ENTRY INTO THE EXCLUSION ZONE.
5. CONTRACTOR SHALL LIMIT THE NUMBER OF TIMES EQUIPMENT EXIT THE EXCLUSION ZONE TO REDUCE THE POTENTIAL FOR TRACKING OUT CONTAMINANTS:
   a. CONTRACTOR READY LINE FOR EXCAVATION EQUIPMENT SHALL BE LOCATED WITHIN THE EXCLUSION ZONE AS SHOWN ON THE DRAWINGS.
   b. SERVICE VEHICLES MAY ENTER THE EXCLUSION ZONE.
6. VEHICLES AND EQUIPMENT SHALL NOT EXIT THE EXCLUSION ZONE WITHOUT UNDERGOING DECONTAMINATION AT THE DECONTAMINATION PAD.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE DECONTAMINATION PAD AND ASSOCIATED DECONTAMINATION EQUIPMENT.



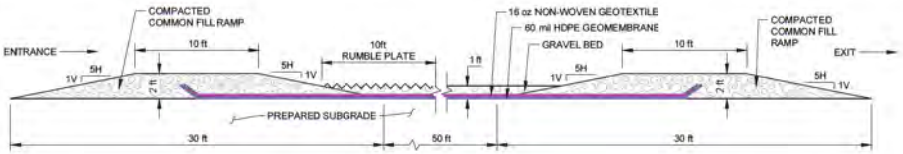
SCALE: 1" = 5' A C-002 CROSS-SECTION A



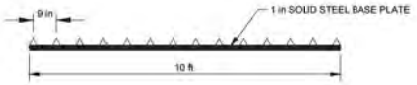
NOT TO SCALE 3 C-002 DECON WATER TANK DETAIL



NOT TO SCALE 2 C-002 PEDESTRIAN WALKWAY DETAIL



SCALE: 1" = 5' B C-002 CROSS-SECTION B



NOT TO SCALE 4 C-002 RUMBLE PLATE DETAIL

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

APPROVED FOR RESOLUTION COPPER MINING, LLC:

PROJECT MANAGER
DATE:
CONSTRUCTION MANAGER
DATE:
SAFETY MANAGER
DATE:
EPCM MANAGER
DATE:
ENGINEERING MANAGER
DATE:
SITE ENGINEER (MECH' & ELEC')
DATE:
SITE ENGINEER (MINING)
DATE:
GEOTECHNICAL ENGINEER
DATE:
ENVIRONMENTAL ENGINEER
DATE:
PACKAGE MANAGER
DATE:

APPROVED FOR GOLDER

PROJECT MANAGER
K. JOHNSAGE
DATE: 2016-03-09
ENGINEERING MANAGER
DATE:
PACKAGE MANAGER
DATE:
CIVIL ENGINEER
DATE:
STRUCTURAL ENGINEER
DATE:
MECHANICAL ENGINEER
DATE:
ELECTRICAL ENGINEER
DATE:
INSTUMENTATION ENGINEER
DATE:
REFRIGERATION ENGINEER
DATE:
VENTILATION ENGINEER
DATE:
PIPING ENGINEER
DATE:
SECTION LEADER
DATE:
CHECKER
K. KNUDSON
DATE: 2016-02-05
DESIGNER
K. KNUDSON
DATE: 2016-01-29

REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHB	WK	KRJ
B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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REF DWG NO | REFERENCE DRAWING TITLE

THIS DRAWING PRODUCED BY: Golder Associates

APPROVED BY PR ENG / PR TECH ENG
NAME
SIGNATURE
REG. NO.
ORIGINAL DATE
REVISION DATE

DRAWN BY: ANV | DATE: 2016-01-19

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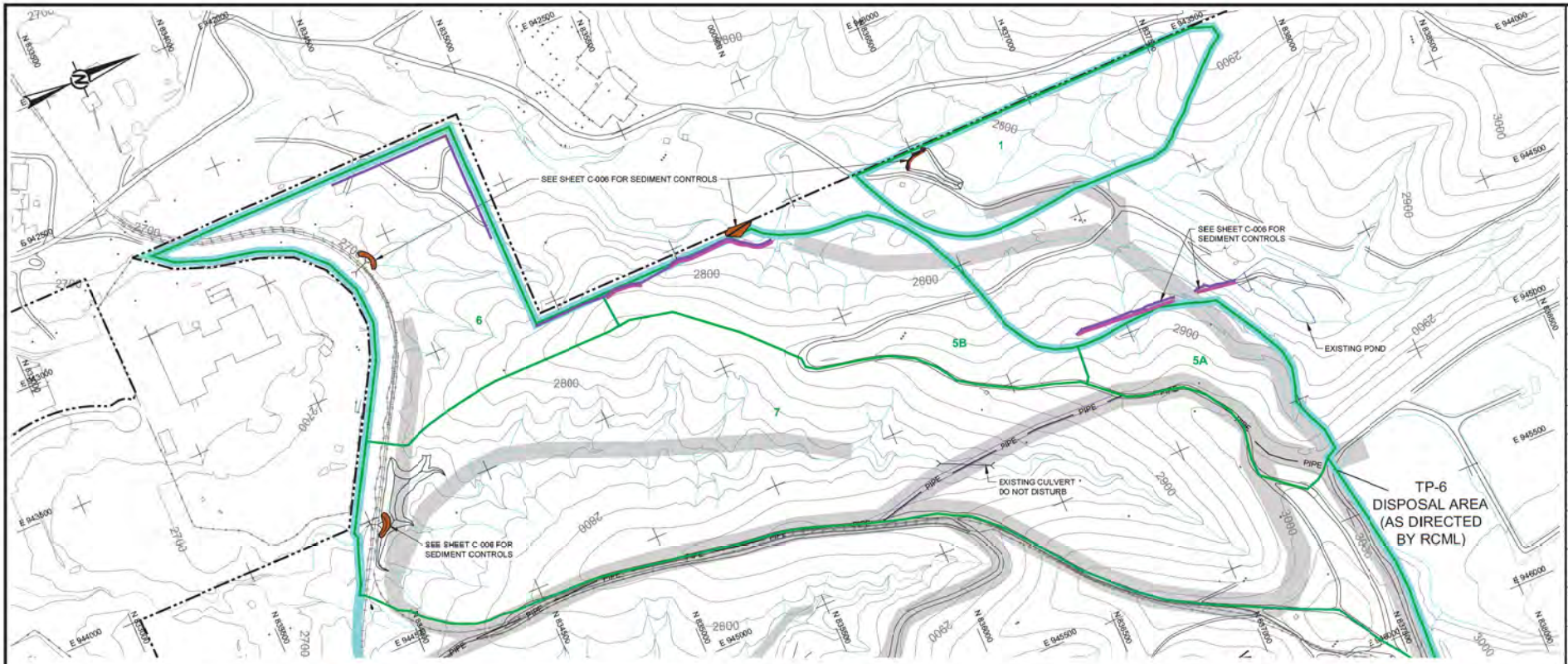
Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: STAGING AREA DETAILS AND SECTIONS

SCALE: AS SHOWN
GOLDER FILE No. 1527097-D02-C-002

C-002 C

ARS CODE: C-002
DISCIPLINE:
DWG NO:
REV C



LEGEND

- EXISTING GROUND CONTOUR (ft -MSL)
- EXISTING ROADS
- EXISTING DRAINAGE
- EXISTING FENCELINE
- EXISTING POWER PCLE OR POST
- EXISTING RAILROAD TRACKS
- PIPE — EXISTING PIPELINE
- G — EXISTING GAS LINE
- FO — EXISTING FIBER OPTC LINE
- PROPERTY BOUNDARY
- WATTLES
- VEE-DITCH
- AREAS NOT TO BE REMEDIATED
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- SEDIMENT CONTROL STRUCTURE
- 9 — SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- HAULAGE ROUTES
- 1 / C-004 — DETAIL CALLOUT: DETAIL ID, DRAWING SHEET LOCATION
- A / C-004A — CROSS-SECTION CALLOUT: SECTION ID, DRAWING SHEET LOCATION

0 200 400 FEET
1" = 200'

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

APPROVED FOR RESOLUTION COPPER MINING, LLC.

PROJECT MANAGER — DATE
CONSTRUCTION MANAGER — DATE
SAFETY MANAGER — DATE
EPCM MANAGER — DATE
ENGINEERING MANAGER — DATE
SITE ENGINEER (MECH & ELEC) — DATE
SITE ENGINEER (MINING) — DATE
GEOTECHNICAL ENGINEER — DATE
ENVIRONMENTAL ENGINEER — DATE
PACKAGE MANAGER — DATE

APPROVED FOR GOLDER

PROJECT MANAGER
K. JOHNDAHL
DATE: 2016-03-07
ENGINEERING MANAGER — DATE
PACKAGE MANAGER — DATE
CIVIL ENGINEER — DATE
STRUCTURAL ENGINEER — DATE
MECHANICAL ENGINEER — DATE
ELECTRICAL ENGINEER — DATE
INSTRUMENTATION ENGINEER — DATE
REFRIGERATION ENGINEER — DATE
VENTILATION ENGINEER — DATE
PIPING ENGINEER — DATE
SECTION LEADER — DATE
CHECKER
W. KNUDSON
DATE: 2016-02-05
DESIGNER
W. KNUDSON
DATE: 2016-01-29

REV	REF DWG NO	REFERENCE DRAWING TITLE	REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C			C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHR	WK	KRJ
			B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
			A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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WBS CODE: DSDP.DE
DWG NO: C-003

THIS DRAWING PRODUCED BY: Golder Associates

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NAME
SIGNATURE
REG No.
ORIGINAL DATE
REVISION DATE

DRAWN BY: ANV
DATE: 2016-01-19

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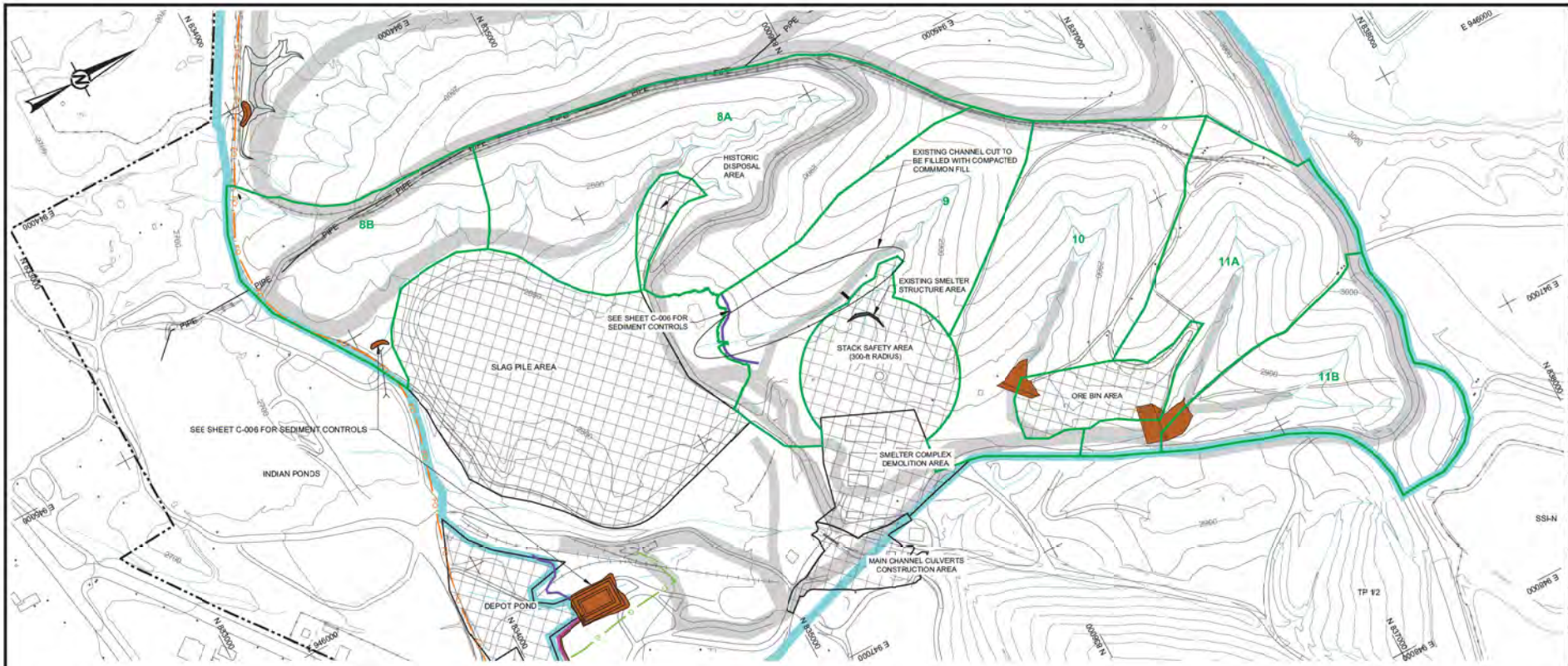
Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: SOIL REMOVAL UNITS 1, 5, 6, AND 7

SCALE: AS SHOWN
GOLDER FILE No: 1527091-d002-C-003

C-003 C



LEGEND

- EXISTING GROUND CONTOUR (ft -MSL)
- EXISTING ROADS
- EXISTING DRAINAGE
- EXISTING FENCELINE
- EXISTING POWER PCLE OR POST
- EXISTING RAILROAD TRACKS
- EXISTING PIPELINE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- PROPERTY BOUNDARY
- AREAS NOT TO BE REMEDIATED
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- SEDIMENT CONTROL STRUCTURE
- SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- WATTLES
- VEE-DITCH
- HAULAGE ROUTES
- DETAIL CALLOUT: DETAIL ID, DRAWING SHEET LOCATION
- CROSS-SECTION CALLOUT: SECTION ID, DRAWING SHEET LOCATION

0 200 400
1" = 200' FEET

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

APPROVED FOR RESOLUTION COPPER MINING, LLC.

PROJECT MANAGER — DATE:
CONSTRUCTION MANAGER — DATE:
SAFETY MANAGER — DATE:
EPCM MANAGER — DATE:
ENGINEERING MANAGER — DATE:
SITE ENGINEER (MECH & ELEC) — DATE:
SITE ENGINEER (MINING) — DATE:
GEOTECHNICAL ENGINEER — DATE:
ENVIRONMENTAL ENGINEER — DATE:
PACKAGE MANAGER — DATE:

APPROVED FOR GOLDER

PROJECT MANAGER: K. JONCJICH — DATE: 2016-03-07
ENGINEERING MANAGER — DATE:
PACKAGE MANAGER — DATE:
CIVIL ENGINEER — DATE:
STRUCTURAL ENGINEER — DATE:
MECHANICAL ENGINEER — DATE:
ELECTRICAL ENGINEER — DATE:
INSTRUMENTATION ENGINEER — DATE:
METROLOGIST ENGINEER — DATE:
VENTILATION ENGINEER — DATE:
PIPING ENGINEER — DATE:
SECTION LEADER — DATE:
CHECKER: K. KNUDSON — DATE: 2016-02-05
DESIGNER: K. KNUDSON — DATE: 2016-01-29

REV	REF DWG NO	REFERENCE DRAWING TITLE	REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C			C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHR	WK	KRJ
			B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
			A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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WBS CODE: DISPHAE
DWG No: C-004

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NAME
SIGNATURE
REG No.
ORIGINAL DATE
REVISION DATE

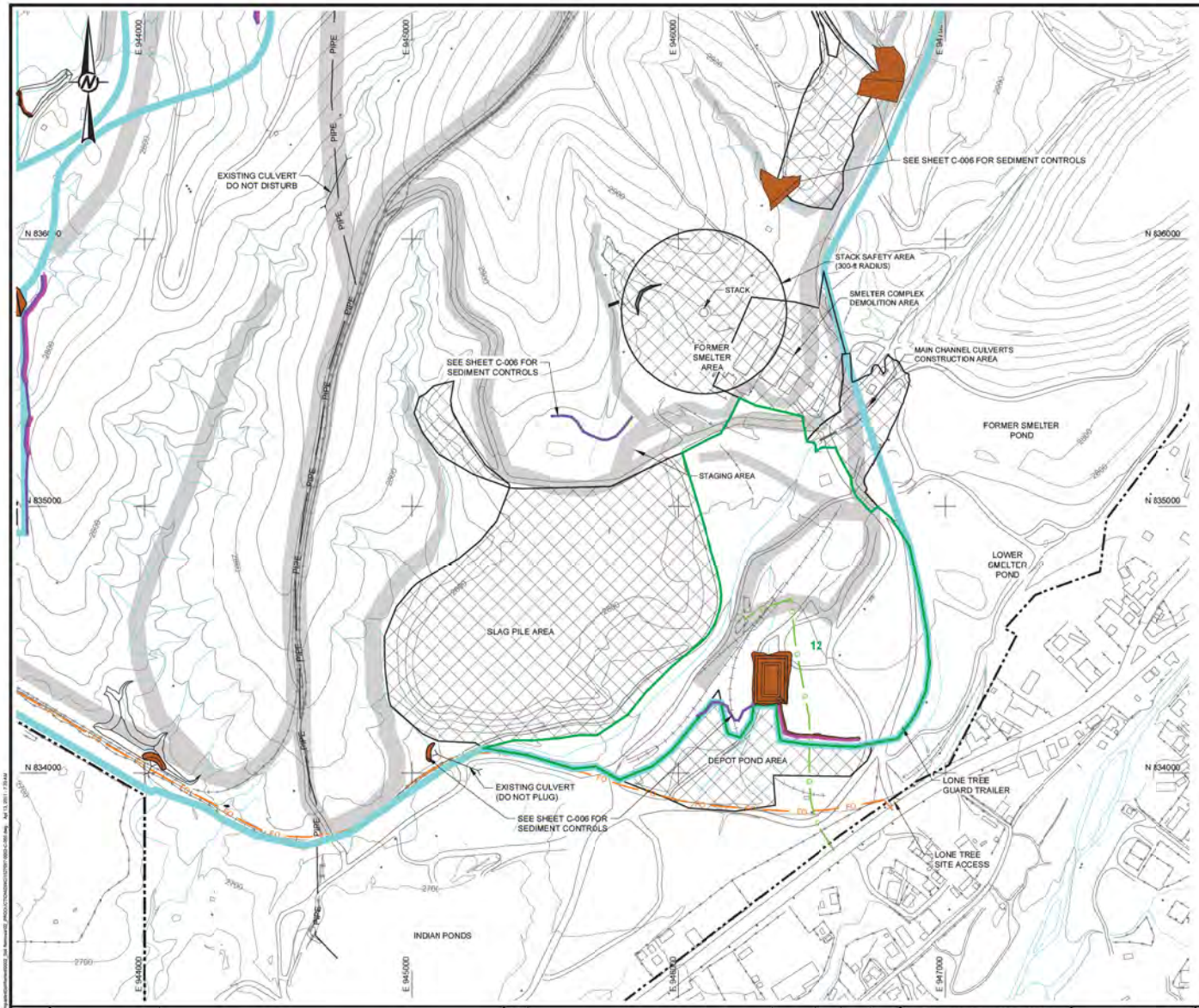
DRAWN BY: ANV — DATE: 2016-01-19

Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: SOIL REMOVAL UNITS 8, 9, 10, AND 11

SCALE: AS SHOWN
GOLDER FILE No: 1527091-D002-C-004

C-004 C



LEGEND

- EXISTING GROUND CONTOUR (ft-MSL)
- EXISTING ROADS
- EXISTING DRAINAGE
- EXISTING FENCELINE
- EXISTING POWER POLE OR POST
- EXISTING RAILROAD TRACKS
- EXISTING PIPELINE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- PROPERTY BOUNDARY
- AREAS NOT TO BE REMEDIATED
- EXCLUSION ZONE BOUNDARY ARSENIC 185 mg/kg ISOPLETH
- SEDIMENT CONTROL STRUCTURE
- SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- WATTLES
- VEE-DITCH
- HAULAGE ROUTES
- DETAIL CALLOUT — DETAIL ID — DRAWING SHEET LOCATION
- CROSS-SECTION CALLOUT — SECTION ID — DRAWING SHEET LOCATION

APPROVED FOR RESOLUTION COPPER MINING, LLC.

PROJECT MANAGER — DATE:
CONSTRUCTION MANAGER — DATE:
SAFETY MANAGER — DATE:
ENVIRONMENTAL MANAGER — DATE:
SITE ENGINEER (MECH & ELEC) — DATE:
SITE ENGINEER (MINING) — DATE:
GEOTECHNICAL ENGINEER — DATE:
ENVIRONMENTAL ENGINEER — DATE:
PACKAGE MANAGER — DATE:

APPROVED FOR GOLDER

PROJECT MANAGER
T. DONCASTER
DATE: 2016-03-07
ENGINEERING MANAGER — DATE:
PACKAGE MANAGER — DATE:
CIVIL ENGINEER — DATE:
STRUCTURAL ENGINEER — DATE:
MECHANICAL ENGINEER — DATE:
ELECTRICAL ENGINEER — DATE:
INSTRUMENTATION ENGINEER — DATE:
METALLURGICAL ENGINEER — DATE:
VENTILATION ENGINEER — DATE:
PIPING ENGINEER — DATE:
SECTION LEADER — DATE:
CHECKER
K. KNUDSON
DATE: 2016-02-05
DESIGNER
K. KNUDSON
DATE: 2016-01-29

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

REV	REF DWG NO	REFERENCE DRAWING TITLE
C		

REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHE	WK	KRJ
B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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WBS CODE: DOSPHASE: DWG No: C-005

THIS DRAWING PRODUCED BY
Golder Associates

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NAME
SIGNATURE
REG No.
ORIGINAL DATE
REVISION DATE

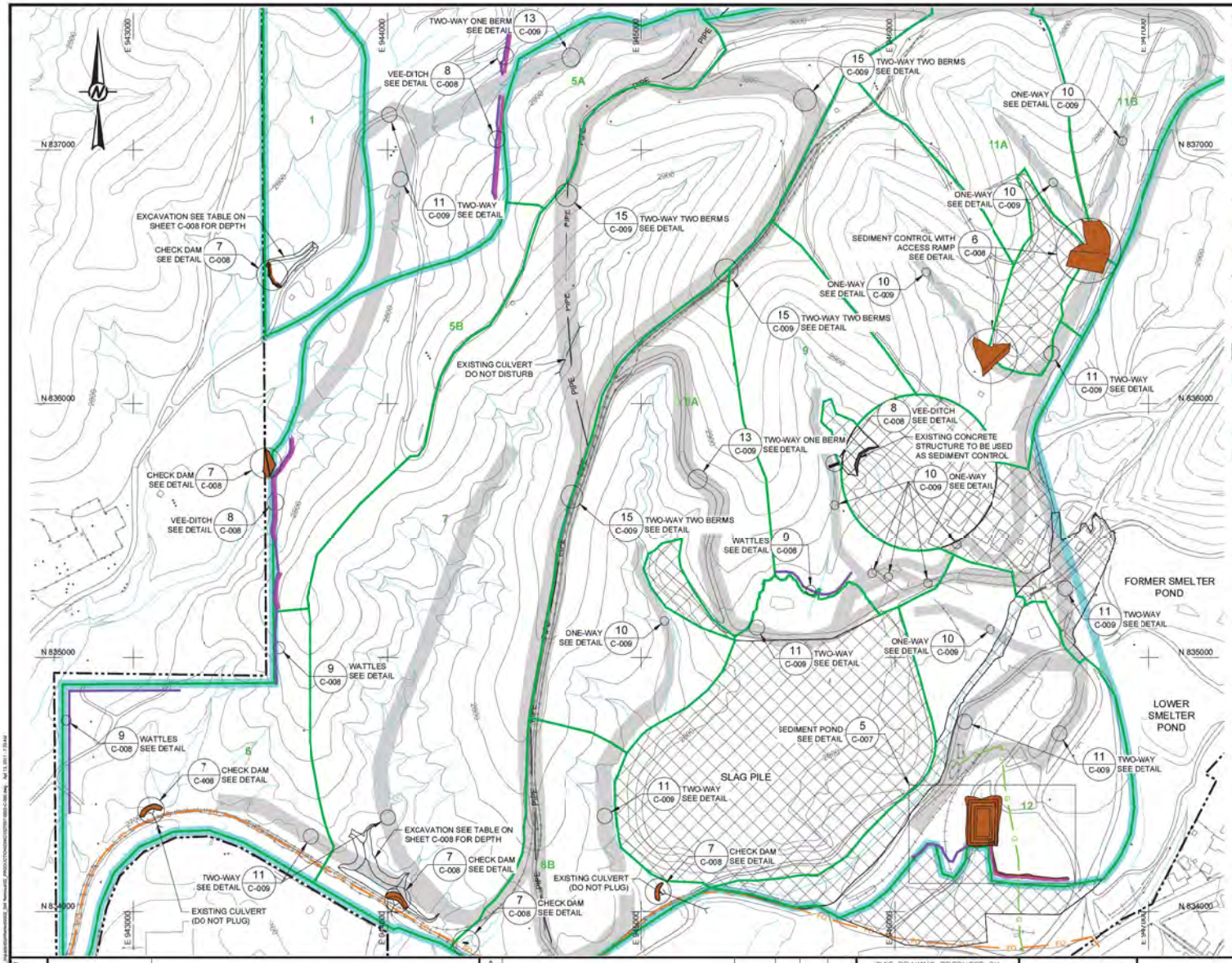
DRAWN BY: ANV
DATE: 2016-01-19

Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: SOIL REMOVAL UNIT 12

SCALE: AS SHOWN
GOLDER FILE No: 1527097-d002-C-005

C-005 C



GENERAL LEGEND

- EXISTING GROUND CONTOUR (ft AMSL)
- EXISTING ROADS
- EXISTING DRAINAGE
- EXISTING FENCELINE
- EXISTING POWER POLE OR POST
- EXISTING RAILROAD TRACKS
- EXISTING PIPELINE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- PROPERTY BOUNDARY
- WATTLES
- VEE-DITCH
- AREAS NOT TO BE REMEDIATED
- ARSENIC 185 mg/kg ISOPLETH OR REMEDIATION BOUNDARY
- SEDIMENT CONTROL STRUCTURE
- 9 — SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- HAULAGE ROUTES
- HOLD — TO BE COMPLETED
- 1 / C-004 — DETAIL CALLOUT: DETAIL ID, DRAWING SHEET LOCATION
- A / C-004A — CROSS-SECTION CALLOUT: SECTION ID, DRAWING SHEET LOCATION

SEDIMENT MANAGEMENT NOTES

1. CONSTRUCT SEDIMENT STRUCTURES ALONG WATERCOURSES EVERY 500 FEET (APPROXIMATE) OR DIRECTED BY RCML (OR THEIR DESIGNER).

0 200 400
1" = 200' FEET

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

APPROVED FOR RESOLUTION COPPER MINING, LLC.

PROJECT MANAGER — DATE:
CONSTRUCTION MANAGER — DATE:
SAFETY MANAGER — DATE:
EPCM MANAGER — DATE:
ENGINEERING MANAGER — DATE:
SITE ENGINEER (MECH & ELEC) — DATE:
SITE ENGINEER (MINING) — DATE:
GEOTECHNICAL ENGINEER — DATE:
ENVIRONMENTAL ENGINEER — DATE:
PACKAGE MANAGER — DATE:

APPROVED FOR GOLDER

PROJECT MANAGER
K. JONCAS
DATE: 2016-03-07
ENGINEERING MANAGER — DATE:
PACKAGE MANAGER — DATE:
CIVIL ENGINEER — DATE:
STRUCTURAL ENGINEER — DATE:
MECHANICAL ENGINEER — DATE:
ELECTRICAL ENGINEER — DATE:
INSTRUMENTATION ENGINEER — DATE:
REFRIGERATION ENGINEER — DATE:
VENTILATION ENGINEER — DATE:
PIPING ENGINEER — DATE:
SECTION LEADER — DATE:
CHECKER
W. KNUDSON
DATE: 2016-02-05
DESIGNER
W. KNUDSON
DATE: 2016-01-29

REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHR	WK	KRJ
B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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REF DWG NO | REFERENCE DRAWING TITLE

THIS DRAWING PRODUCED BY: Golder Associates

APPROVED BY PR ENG / PR TECH ENG
NAME
SIGNATURE
REG. No.
ORIGINAL DATE
REVISION DATE

DRAWN BY: ANV | DATE: 2016-01-19

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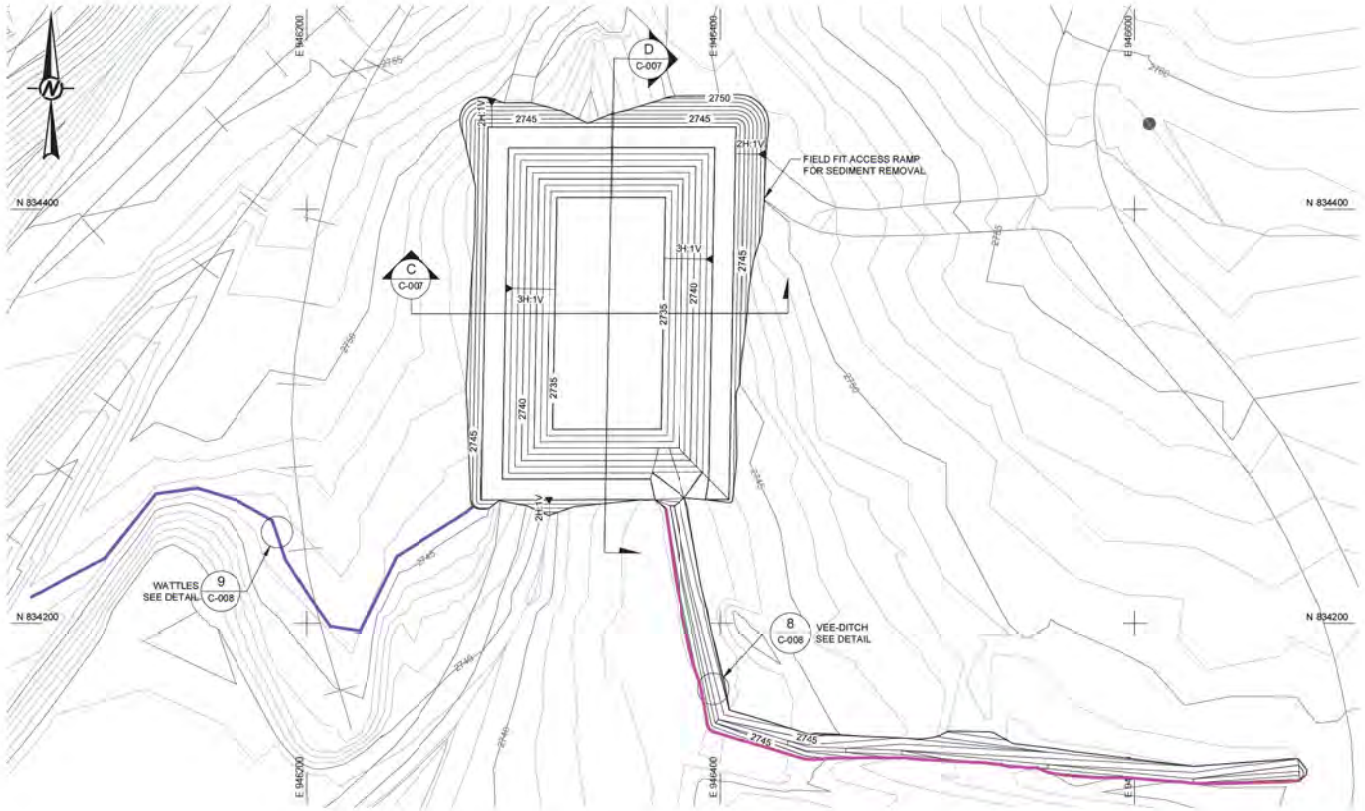
Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: SEDIMENT CONTROLS PLAN

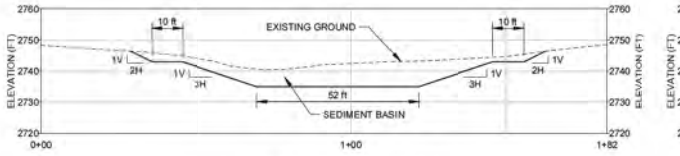
SCALE: AS SHOWN
GOLDER FILE No: 1527091-D002-C-006

C-006 C

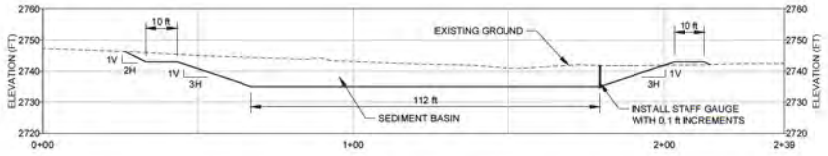
WBS CODE: DSGP.DAE
DWG No: C-006
REV C



SCALE: 1" = 30' 5 C-007 SEDIMENT BASIN DETAIL



SCALE: 1" = 20' C C-007 CROSS-SECTION C



SCALE: 1" = 20' D C-007 CROSS-SECTION D

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

CHECKED: W. KNUDSON DATE: 2016-02-05
DESIGNED: W. KNUDSON DATE: 2016-01-29

APPROVED FOR RESOLUTION COPPER MINING, LLC.

PROJECT MANAGER DATE:
CONSTRUCTION MANAGER DATE:
SAFETY MANAGER DATE:
EPCM MANAGER DATE:
ENGINEERING MANAGER DATE:
SITE ENGINEER (MECH & ELEC) DATE:
SITE ENGINEER (MINING) DATE:
GEOTECHNICAL ENGINEER DATE:
ENVIRONMENTAL ENGINEER DATE:
PACKAGE MANAGER DATE:

APPROVED FOR GOLDER

PROJECT MANAGER
K. DONCAS
DATE: 2016-03-05
ENGINEERING MANAGER DATE:
PACKAGE MANAGER DATE:
CIVIL ENGINEER DATE:
STRUCTURAL ENGINEER DATE:
MECHANICAL ENGINEER DATE:
ELECTRICAL ENGINEER DATE:
INSTRUMENTATION ENGINEER DATE:
REFRIGERATION ENGINEER DATE:
VENTILATION ENGINEER DATE:
PIPING ENGINEER DATE:
SECTION LEADER DATE:

REV							
C							
			A	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHB	WK	KRJ
			A	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
			A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ
REF DWG NO		REFERENCE DRAWING TITLE	REV	DESCRIPTION THIS DRAWING IS NOT VALID UNLESS THE LAST REVISION IS HAND SIGNED	DATE	BY	DES	PROJ MGR

WBS CODE: DSGPLNE
DWG NO: C-007

THIS DRAWING PRODUCED BY
Golder Associates

APPROVED BY PR ENG / PE TECH ENG
NAME
SIGNATURE
REG. No.
ORIGINAL DATE
REVISION DATE

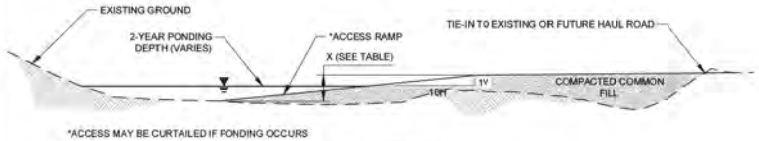
DRAWN BY: ANV DATE: 2016-01-19

Resolution Copper Mining

CLIENT Resolution Copper Mining
PROJECT SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION SUPERIOR MINE, SUPERIOR, ARIZONA
AREA WEST PLANT SITE
SUB-AREA INDUSTRIAL AREA SOUTH
TITLE SEDIMENT CONTROLS - DETAILS AND SECTIONS (1 OF 2)

SCALE: AS SHOWN
GOLDER FILE No. 1527091-d002-C-007

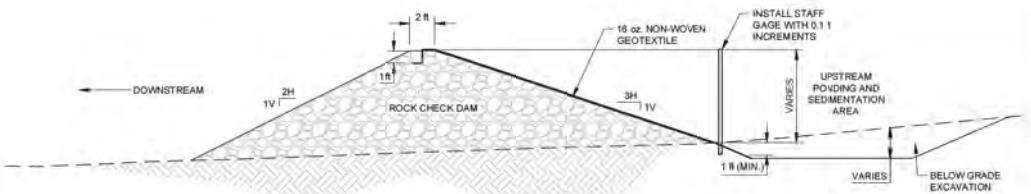
C-007 C



*ACCESS MAY BE CURTAILED IF PONDING OCCURS

SOIL REMOVAL UNIT	X (ft)
10	12
11A, 11B	10.5

NOT TO SCALE 6 C-008 TYPICAL SEDIMENT CONTROL WITH ACCESS RAMP

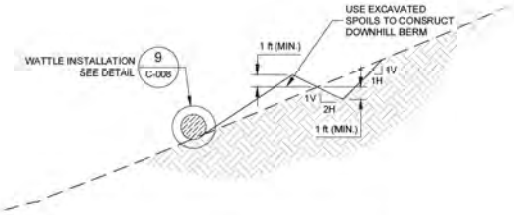


ROCK CHECK DAMS NOTES/ SPECIFICATIONS

1. ROCK CHECK DAMS SHALL BE CONSTRUCTED OF COARSE, DURABLE STONE, ANGULAR IN SHAPE AND RESISTANT TO WEATHERING. ROUNDED STONE WILL NOT BE ACCEPTED AS ROCK MATERIAL. THE STONE SHALL HAVE A SPECIFIC GRAVITY OF AT LEAST 2.6. A MINIMUM PARTICLE SIZE OF 8 INCHES AND A MAXIMUM PARTICLE SIZE OF 12 INCHES. THE RAYMERT QUARRY IS AN ACCEPTABLE SOURCE. OTHER SOURCES WILL REQUIRE APPROVAL BY THE RCML REPRESENTATIVE.
2. ROCK SHALL BE PLACED INDIVIDUALLY BY HAND OR BY MECHANICAL METHODS (NO DUMPING OF ROCK) TO ACHIEVE COMPLETE COVERAGE.
3. INSPECT CHECK DAMS AFTER EACH SIGNIFICANT RAINFALL EVENT. REPAIR DAMAGE AS NEEDED OR AS REQUIRED BY THE RCML REPRESENTATIVE.
4. REMOVE ACCUMULATED SEDIMENT WHEN DEPTH REACHES ONE-THIRD OF THE CHECK DAM HEIGHT.

SOIL REMOVAL UNIT	ROCK CHECK DAMS				BELOW GRADE EXCAVATION	
	APPROXIMATE HEIGHT (ft)	APPROXIMATE LENGTH (ft)	GEOTEXTILE (APPROXIMATE) (ft^2)	ROCK VOLUME (APPROXIMATE) (cy)	APPROXIMATE DEPTH (ft)	APPROXIMATE EXCAVATION VOLUME (cy)
1	2	120	320	42	5	2,000
5B	10	230	1,850	470	0	0
6	5	60	1,260	115	0	0
7	6	90	1,880	255	5	2,800
8B	5	75	810	64	0	0
12	4	40	410	24	8	3,200
TOTAL	NA	NA	6,550	972	NA	7,800

NOT TO SCALE 7 C-008 TYPICAL ROCK CHECK DAM DETAIL



NOT TO SCALE 8 C-008 TYPICAL VEE-DITCH WITH BERM DETAIL

NOT TO SCALE 9 C-008 TYPICAL WATTLE INSTALLATION DETAIL

SEDIMENT MANAGEMENT NOTES

1. WATTLES SHALL BE A STRAW-FILLED TUBE OF FLEXIBLE NETTING MATERIAL EXHIBITING THE FOLLOWING PROPERTIES. IT SHALLBE 12-INCHES OR GREATER IN DIAMETER. IT SHALL BE A MACHINE-PRODUCED TUBE OF COMPACTED RICE STRAW THAT IS CERTIFIED WEED FREE BY A MANUFACTURER WHOSE PRINCIPAL BUSINESS IS WATTLE MANUFACTURING. THE NETTING SHALL CONSIST OF SEAMLESS, HIGH-DENSITY POLYETHYLENE AND ETHYL VINYL ACETATE AND CONTAIN ULTRA-VIOLET INHIBITORS.
2. BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" DEEP x 9" WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UP-SLOPE FROM THE ANCHOR TRENCH.
3. PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UPHILL SIDE. ADJACENT WATTLES SHOULD OVERLAP 24" - SHINGLE IN DIRECTION OF FLOW.
4. SECURE THE WATTLE WITH 18-24" STAKES EVERY 3-4' AND WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE WATTLE LEAVING AT LEAST 2-3" OF STAKE EXTENDING ABOVE THE WATTLE. STAKE SHOULD BE DRIVEN PERPENDICULAR TO SLOPE FACE.
5. CONTAMINATED SEDIMENT BEHIND WATTLES TO BE REMOVED AT THE END OF REMEDIATION AND DISPOSED IN TAILINGS POND 6.
6. SEDIMENT CONTROLS TO REMAIN IN PLACE AFTER REMEDIATION IS COMPLETE OR AS DIRECTED BY RCML (OR THEIR DESIGNEE).

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PROJECT MANAGER
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CONSTRUCTION MANAGER
DATE:
SAFETY MANAGER
DATE:
EPCM MANAGER
DATE:
ENGINEERING MANAGER
DATE:
SITE ENGINEER (MECH & ELEC)
DATE:
SITE ENGINEER (MINING)
DATE:
GEOTECHNICAL ENGINEER
DATE:
ENVIRONMENTAL ENGINEER
DATE:
PACKAGE MANAGER
DATE:

APPROVED FOR GOLDER
PROJECT MANAGER
T. JOHNCAK
DATE: 2016-03-07
ENGINEERING MANAGER
DATE:
PACKAGE MANAGER
DATE:
CIVIL ENGINEER
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STRUCTURAL ENGINEER
DATE:
MECHANICAL ENGINEER
DATE:
ELECTRICAL ENGINEER
DATE:
INSTRUMENTATION ENGINEER
DATE:
REFRIGERATION ENGINEER
DATE:
VENTILATION ENGINEER
DATE:
PIPING ENGINEER
DATE:
SECTION LEADER
DATE:
CHECKER
B. KNUDSON
DATE: 2016-02-05
DESIGNER
B. KNUDSON
DATE: 2016-01-29

NOT FOR CONSTRUCTION

Golder Associates
ISSUED FOR DRAFT CLIENT REVIEW
ISSUE DATE: 2016-02-04

REV	DESCRIPTION	DATE	BY	CHK	PROJ MGR
C	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHB	WK	KRJ
B	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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REVISION DATE

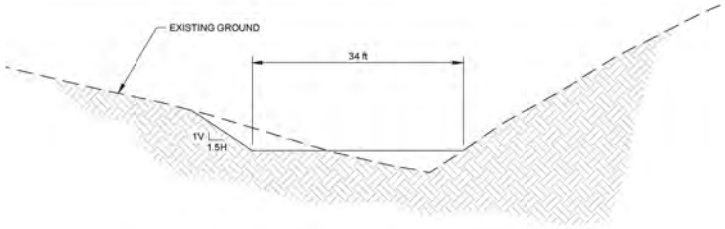
DRAWN BY: ANV | DATE: 2016-01-19

Resolution Copper Mining

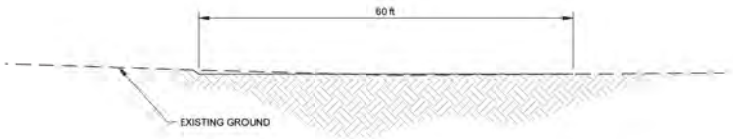
CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: SEDIMENT CONTROLS - DETAILS AND SECTIONS (2 OF 2)

SCALE: AS SHOWN
GOLDER FILE No: 1527091-d002-C-008
C-008 C

WBS CODE:
DOCPHASE:
DWG NO: C-008
REV: C



NOT TO SCALE 10 C-009 ONE-WAY TRAFFIC NO BERM DETAIL



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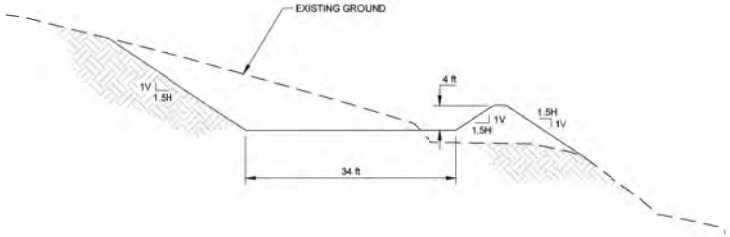
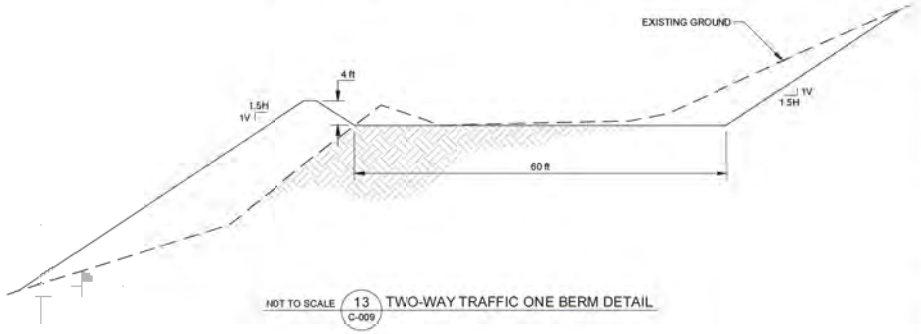
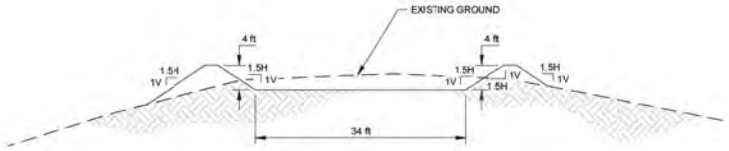


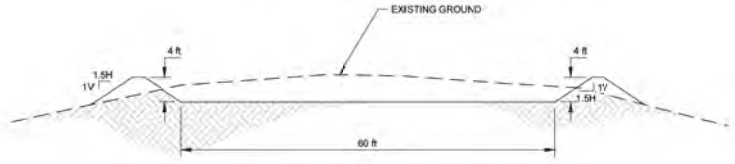
NOT TO SCALE 12 C-009 ONE-WAY TRAFFIC ONE BERM DETAIL (IF NEEDED)



NOT TO SCALE 13 C-009 TWO-WAY TRAFFIC ONE BERM DETAIL



NOT TO SCALE 14 C-009 ONE-WAY TRAFFIC TWO BERMS DETAIL (IF NEEDED)



NOT TO SCALE 15 C-009 TWO-WAY TRAFFIC TWO BERMS DETAIL

HAUL ROAD NOTES

1. HAUL ROAD TYPICAL SECTIONS TO BE CONSTRUCTED IN THE SEGMENTS SHOWN ON THE DRAWINGS BUT WITH POSSIBLE FIELD MODIFICATIONS AS DIRECTED BY RCML (OR THEIR DESIGNEE).
2. HAUL ROADS TO BE CONSTRUCTED BY LOCAL CUT-TO-FILL METHODS AND FIELD FIT AS NECESSARY.
3. FILL AREAS TO BE COMPACTED AS NEEDED TO PROVIDE A SAFE AND STABLE SURFACE.
4. SAFETY BERMS TO BE LOCATED AS DIRECTED BY RCML (OR THEIR DESIGNEE) IN ACCORDANCE WITH MSHA GUIDELINES.
5. SAFETY BERMS TO BE CONSTRUCTED IN TO ½ THE AXLE HEIGHT OF THE LARGEST VEHICLE.
6. BERM MATERIAL TO BE REMOVED AT THE END OF REMEDIATION AND DISPOSED IN TAILINGS POND 6.
7. ROAD SURFACES TO BE SAMPLED FOR CONTAMINANT CONCENTRATIONS AT THE END OF REMEDIATION AND EXCAVATED TO MEET THE CLEANUP LEVEL AS NEEDED.

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DATE:
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DATE:
SITE ENGINEER (MECH' & ELEC')
DATE:
SITE ENGINEER (MINING)
DATE:
GEOTECHNICAL ENGINEER
DATE:
ENVIRONMENTAL ENGINEER
DATE:
PACKAGE MANAGER
DATE:

APPROVED FOR GOLDER
PROJECT MANAGER
K. JOHNSJACK
DATE: 2016-03-05
ENGINEERING MANAGER
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PACKAGE MANAGER
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CIVIL ENGINEER
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STRUCTURAL ENGINEER
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MECHANICAL ENGINEER
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REFRIGERATION ENGINEER
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VENTILATION ENGINEER
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PIPING ENGINEER
DATE:
SECTION LEADER
DATE:
CHECKER
K. KNUDSON
DATE: 2016-02-05
DESIGNER
K. KNUDSON
DATE: 2016-01-29

Golder Associates
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ISSUE DATE: 2016-03-09

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RCV	REF DWG NO	REFERENCE DRAWING TITLE	REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C			A	ISSUED FOR CLIENT REVIEW IN REMEDIAL ACTION WORK PLAN	2016-03-09	JHR	WK	KRJ
			A	ISSUED FOR DRAFT CLIENT REVIEW	2016-02-04	ANV	WK	KRJ
			A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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REVISION DATE

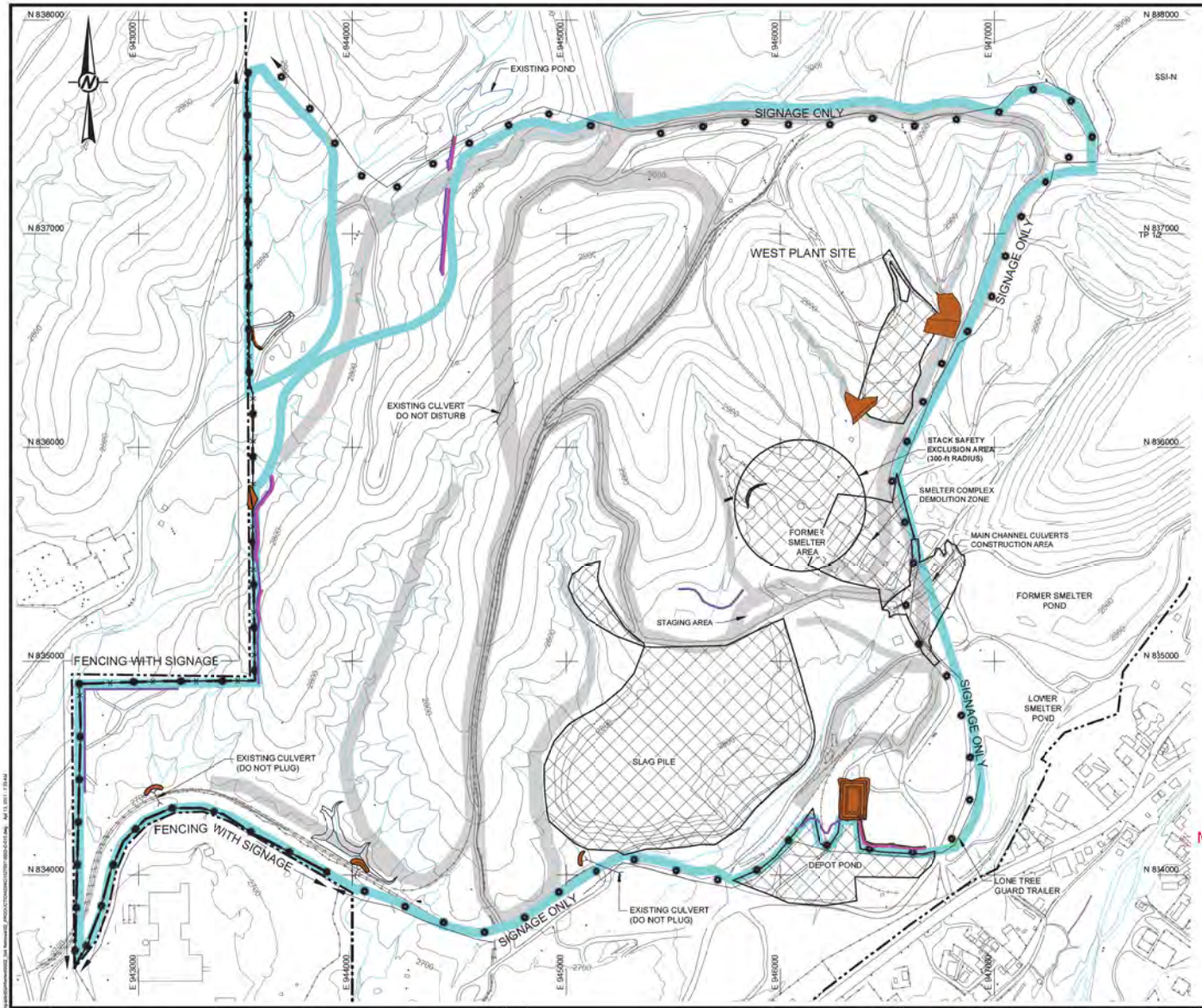
DRAWN BY: ANV
DATE: 2016-01-19

Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: TYPICAL HAUL ROAD SECTIONS

SCALE: AS SHOWN
GOLDER FILE No: 1527097-d002-C-009

C-009 C



GENERAL LEGEND

- EXISTING GROUND CONTOUR (ft-MSL)
- EXISTING ROADS
- EXISTING DRAINAGE
- EXISTING FENCELINE
- EXISTING POWER POLE OR POST
- EXISTING RAILROAD TRACKS
- EXISTING PIPELINE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- PROPERTY BOUNDARY
- WATTLES
- VEE-DITCH
- AREAS NOT TO BE REMEDIATED
- ARSENIC 185 mg/kg ISOPLETH OR REMEDIATION BOUNDARY
- FENCING WITH SIGNAGE
- SIGNAGE ONLY
- SEDIMENT CONTROL STRUCTURE
- HAULAGE ROUTES
- HOLD — TO BE COMPLETED
- 1 / C-004 — DETAIL CALLOUT, DETAIL ID, DRAWING SHEET LOCATION
- A / C-004A — CROSS-SECTION CALLOUT, SECTION ID, DRAWING SHEET LOCATION

FENCING AND SIGNAGE NOTES

1. FENCING (4-STRAND BARBED WIRE) SHALL BE INSTALLED ALONG THE PROPERTY LINE WHERE THE GENERAL PUBLIC MAY HAVE ACCESS TO THE EXCLUSION ZONE.
2. CONTAMINATED SOIL REMEDIATION WARNING SIGNS TO BE INSTALLED EVERY ONE HUNDRED TO TWO HUNDRED FEET (100-200 FT.) ALONG THE PERIMETER OF THE EXCLUSION ZONE OR AS DIRECTED BY RCML (OR THE DESIGNEE).
3. SIGN CONTENT TO BE DETERMINED BY RCML.
4. PERIMETER LENGTHS (APPROXIMATE)
   a. FENCING WITH SIGNAGE = 6,720 FT
   b. SIGNAGE ONLY = 11,490 FT

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ISSUE DATE: 2016-02-04

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DESIGNED: K. KNUDSON DATE: 2016-01-29

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EPCM MANAGER DATE:
ENGINEERING MANAGER DATE:
SITE ENGINEER (MECH & ELEC) DATE:
SITE ENGINEER (MINING) DATE:
GEOTECHNICAL ENGINEER DATE:
ENVIRONMENTAL ENGINEER DATE:
PACKAGE MANAGER DATE:

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PROJECT MANAGER
K. DONCASTER DATE: 2016-02-05
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PACKAGE MANAGER DATE:
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MECHANICAL ENGINEER DATE:
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INSTRUMENTATION ENGINEER DATE:
REFRIGERATION ENGINEER DATE:
VENTILATION ENGINEER DATE:
PIPING ENGINEER DATE:
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A	ISSUED FOR INTERNAL REVIEW	2016-02-02	ANV	WK	KRJ

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Resolution Copper Mining

CLIENT: Resolution Copper Mining
PROJECT: SMELTER-AFFECTED SOIL REMOVAL DESIGN
LOCATION: SUPERIOR MINE, SUPERIOR, ARIZONA
AREA: WEST PLANT SITE
SUB-AREA: INDUSTRIAL AREA SOUTH
TITLE: FENCING AND SIGNAGE PLAN

SCALE: AS SHOWN
GOLDER FILE No: 1527097-0002-C-010

WBS: PROJECT USE | LOCATION | PROJ PHASE | SUBAREA TASK | PROJECT TRADE | REVISION | SHT USE | DIS | DESCRIPTION NUMBER | REV

C-010 C

RES CODE: DISCIPLINE: DWG No: C-010

APPENDIX B
SAMPLING AND ANALYSIS PLAN

APPENDIX B

SAMPLING AND ANALYSIS PLAN

West Plant Site
Resolution Mine,
Superior, Arizona

PLAN

Submitted To: Resolution Copper Mining LLC
c/o Casey McKeon
102 Magma Heights
Superior AZ 85273

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

March 2016

Project No. 15-27097-04

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Golder Associates

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Attachments

1.0 INTRODUCTION

On behalf of Resolution Copper Mining LLC (RCML), Golder Associates Inc. (Golder) has prepared this Sampling and Analysis Plan (SAP) in support of remediation of smelter-affected soils (SAS) at RCML's West Plant Site. Sampling and analyses conducted will be conducted as part of the Remedial Action Work Plan (RAWP) in accordance with the Voluntary Remediation Program (VRP) administered by the Arizona Department of Environmental Quality (ADEQ). This SAP presents the overall approach to collecting and analyzing samples in support of the remediation of SAS.

The Industrial Area South (IAS) land area will be undergoing remediation, as described in the RAWP. This sampling plan applies to the IAS only. Site-specific soil remediation levels (SSSRLs) were developed and approved for use in the IAS by ADEQ (ADEQ 2015) for the constituents of concern (COCs) at the site. The COCs and their respective SSSRLs are:

- Arsenic at 185 milligrams per kilogram (mg/kg)
- Copper at 50,547 mg/kg
- Lead at 380 mg/kg

Remediation will be conducted by excavation and removal of SAS with concentrations exceeding the SSSRLs. The excavated material will be loaded, hauled, and placed at Tailings Pond 6 (TP-6) located to the north of the IAS (see RAWP Figure 2-2).

The purpose of this SAP is to present the tasks and methodology for collecting soil samples to characterize arsenic, copper, and lead in soil to confirm that remedial action objectives outlined in the RAWP have been met, as follows:

- **Boundary Refinement Soil Sampling (RCML Optional)** – Soil sampling and X-ray fluorescence (XRF) analysis will be conducted to further refine the boundaries of the removal areas more accurately than previously defined by previous sampling events.
- **SSSRL Verification Soil Sampling** – Verification sampling will be conducted at the post-excavation soil surface to verify that the concentrations of arsenic, copper, and lead in the remaining soil are below their respective SSSRLs.
- **Confirmation Laboratory Analysis** –XRF samples will be shipped to an Arizona accredited laboratory for confirmation sampling at a rate of one per 20 XRF samples used for remediation decisions. Soil samples will be analyzed at the laboratory for the three COCs.

2.0 SAMPLING APPROACH

2.1 Boundary Refinement Soil Sampling

Pre-excavation sampling will be conducted using XRF to provide a more refined delineation of the spatial extent of areas exceeding the SSSRLs. Boundary refinement sampling will only be conducted in areas where there is no physical (i.e., roads or site facilities) or property boundary. These areas include the eastern side of Soil Removal Unit (SRU) 1, and the northern sides of SRUs 5a and 5b, as shown in the Appendix A drawing C-002.

The surface soil arsenic isopleth map (RAWP Figure 2-3) was developed based on a sample grid with roughly 500-foot spacing in the IAS. The relevant boundaries of soils that are above the SSSRLs will be refined by following the existing boundary using a global positioning system (GPS), and at intervals of 250 feet, collecting soil samples in transects perpendicular to the boundary line (both within and outside of the SRU). These transects will effectively fill in the spaces between previous grid soil sample locations. Additional samples may be collected at the discernment of the field sampler.

Sample locations will be clearly marked on site plans for each SRU. Samples will be analyzed by XRF to allow for high volume sampling with quick response times. The sampling will precede excavation, and can begin during mobilization and continue during remediation activities, providing the sampling can be conducted prior to excavation of an area.

2.2 SSSRL Verification Soil Sampling

SSSRL verification sampling will be conducted to guide excavation activities to verify that the SSSRLs are achieved. The objective of confirmation sampling is to verify concentrations of arsenic, copper, and lead in the remaining soil after excavation are below the SSSRLs.

After soil has been excavated from an area, the remaining surface will be sampled using a sampling grid with 100-foot spacing. This grid will be overlain over the entire Exclusion Zone, and a surface soil sample will be collected at each grid node. The sample grid size is 5-times denser than the previous soil sampling grid used to characterize the COCs within the IAS. It is estimated that this grid spacing scheme will result in about 1,000 sample locations within the entire Exclusion Zone, excluding samples associated with additional excavation to achieve SSSRLs (when needed). The grid spacing may be increased as needed due to field conditions, at the discretion of the sampler. For instance, a non-soil feature that cannot be sampled may fall within one of the grid nodes, and the sample location may be moved to a better location. Also, in the event that several XRF results in an area are sporadically high, the field sampler may elect to collect additional soil samples at a tighter grid density in order to characterize that particular anomaly.

Samples will be collected only from the areas that were excavated. For the safety of the sampler, samples will be collected after the construction equipment has ceased its operations in the area to be sampled. Sampling may be conducted in phases for an SRU as excavation proceeds (i.e., no need to wait for the entire SRU to be excavated).

Verification sampling will be conducted using the following decision criteria:

- If concentrations of arsenic, copper, and lead are below the SSSRLs, the area will be released for revegetation activities. If not, further excavation will be conducted in the areas where exceedances occur.
- If further excavation is needed, verification sampling will be conducted as needed to monitor progress toward achieving the SSSRLs. Sampling will be conducted in approximately the same locations as the initial verification samples. Excavation will be considered complete when the sampling results indicate that the SSSRLs have been achieved.
- Excavation will continue until SSSRLs have been achieved, or until refusal (e.g., cemented Gila Conglomerate).

Samples with concentrations below the SSSRLs will be considered the final footprint samples for completion reporting purposes. In the event that a grid node falls in an area that is inaccessible, or there is no discernable soil, the sample location will be moved to a nearby area where soil occurs. A GPS reading will mark that location.

2.3 Quality Assurance and Quality Control Samples

For this project, Quality Assurance/Quality Control (QA/QC) samples will include field duplicates and decontamination rinse blanks. The field duplicate sample results will be used to evaluate laboratory precision, heterogeneity of the soil, and precision of field sampling techniques, and will be collected at a frequency of one in 20 samples. Decontamination rinse blank samples will be used to evaluate the potential for cross-contamination between samples due to inadequate decontamination of non-dedicated equipment, and will be collected at a frequency of once per week from re-used decontaminated equipment. If disposable equipment is used, the decontamination rinse blanks will be eliminated.

3.0 SOIL SAMPLING METHODS

Table B-1 provides a summary of the soil samples to be collected. Soil will be collected with a decontaminated plastic trowel, and at least 400 grams (about 2 cups) placed into double 1-gallon capacity sealable plastic bags. Sample numbers (Section 4.0) will be assigned to each sample and the sample number and sample description recorded in the field notebook.

Visible stones, cobbles and rocks and any plant roots will be removed from the soil sample in the field. Any non-targeted (discretionary) samples identified by the field sampling crew will be similarly processed. Any pre-selected locations that are determined to not be suitable for soil collection (e.g., location is dominated by large rocks, or is otherwise not accessible) will be re-located to the nearest suitable location. The revised sample location will be recorded and reported with the sample results.

3.1 Boundary Refinement Samples

The procedures for collecting boundary refinement samples are as follows:

1. Samplers will follow the existing SRU boundary with a GPS unit and measure out 250-foot spacing along that boundary.
2. Transects will be laid out perpendicular to the existing boundary, and samples will be collected for XRF analysis on each side of the existing boundary until soil concentrations are below SSSRLs.
3. Grab samples will be collected at each grid node from 0 to 3 inches. All grab samples will be scooped to ensure the complete interval is sampled.
4. A marker will be placed to denote the new boundary.
5. At least one field duplicate soil sample per every 20 samples will be collected for XRF analysis.

3.2 Verification Samples

The procedures for verification soil sampling are as follows:

- Using a GPS loaded with the 100-foot grid for verification sampling, enter the SRU to be sampled (after excavation of soil has been completed for the area to be sampled).
- Grab samples will be collected for XRF analysis at each grid node from 0 to 3 inches in depth. All grab samples will be scooped to ensure the complete interval is sampled.
- At least one field duplicate soil sample per every 20 samples will be collected for XRF analysis.

4.0 SAMPLE HANDLING

All samples will be placed in the appropriate sample containers and labeled. Soil samples will be sequentially numbered for each sampling objective, as follows:

- **Boundary Refinement Soil Sampling** – GAI-BRS-YYY, where YYY equals sample numbers 001 up to 999, which will correspond to GPS coordinates collected at each transect location.
- **SSSRL Verification Soil Sampling** – GAI-VSS-XXX-YY, where XXX equals the grid node number. The YY designation equals the sample round. For example, if the first sample round indicated that SSSRLs were not achieved, further excavation would have occurred, and a second sample round would be collected. The first and second sample rounds would have "YY" designations of "01" and "02", respectively.
- **Confirmation Laboratory Analysis** – Confirmation laboratory samples will use the same sample numbers as their parent samples, but will be designated with "CLA" at the end of the sample ID. For example, parent sample number GAI-VSS-004-01 would generate a split sample number GAI-VSS-004-01-CLA.
- **Field Duplicate Soil Samples** – Field duplicate soil samples for XRF analysis will use the same sample number as their paired sample, with a "FD" suffix.

Sample IDs will be written in permanent marker on the outside of the outermost sealable plastic bag. Information about the sample will be recorded in the sampler's field notebook, including: sample number, and grid number or GPS coordinates, date and time, and sampler ID.

4.1 Equipment Decontamination and Waste Disposal

Plastic trowels or spoons, plus any digging tools, will be decontaminated following each sample collection by first rinsing the trowel with deionized water to remove all soil, then rinsing with a solution of Alconox, followed by a final rinse with deionized water. Paper towels may be used to remove material not easily rinsed, if needed, and to dry the trowel before the next soil sample collection. Rinse water will be discarded on the ground. If disposable sampling equipment is used, then decontamination will not be needed.

Other investigation-derived waste, such as latex gloves and paper towels, will be placed in a heavy-duty garbage bag and disposed with other municipal waste.

4.2 Shipment

Chain-of-custody forms will be completed for each sample and will accompany the samples to the external analytical laboratory. Analyses required for each sample will be noted on the chain-of-custody forms.

Samples for confirmation analyses will be bagged and packed for shipment in a manner that prevents sample container breakage and secures the shipping container from opening during shipment. A custody seal will be placed on the outside of the sample shipping container prior to shipping and covered with clear tape to prevent tampering. Samples will be shipped overnight to the selected laboratory in a cooler with

sufficient ice to maintain the cooler internal temperature to approximately 4 °C. The signed custody form will be placed in a sealable plastic bag and taped to the inside lid of the cooler.

5.0 SAMPLE ANALYSIS

Soil samples will primarily be analyzed at an on-site XRF laboratory. Split samples will be analyzed at an accredited laboratory.

5.1 On-Site XRF Laboratory

Soil samples will be collected and analyzed for the presence of arsenic, copper, and lead using field-portable XRF instruments. An XRF laboratory will be established on-site for the duration of the remedial action. The XRF laboratory will be used both as a field laboratory for indoor processing and indoor XRF analysis, and to support in situ XRF analysis in the field. The XRF laboratory provides the means for processing, organizing, and analyzing samples over relatively short turnaround periods. This laboratory will be used to prepare samples (sieve, dry, and store in XRF cups), conduct XRF analyses on soil samples, and store samples. A field scientist will staff the laboratory and conduct the field sampling and analysis.

An XRF will be used to measure concentrations of the COCs in soil. The XRF measurements will be confirmed by laboratory analysis at a rate of one confirmatory sample per 20 XRF measurements.

The XRF has the ability to measure soil concentrations *in situ* or *ex situ*, and may be used in both methods. However, the preferred method for this project is ex situ, because ex situ sampling allows for samples to be dried and sieved prior to XRF analysis. These preparatory activities are preferred because:

- The 250 micron (µm) size fraction is relevant size fraction to compare to SSSRLs because the risk-based methodology used to calculate the SSSRLs used that size fraction.
- Drying the soil reduced the potential for interference effects from moisture in the soil.

5.1.1 XRF Sample Preparation

XRF sample preparation consists of homogenization, drying, and sieving to obtain the <250 µm size fraction. Following sieving, sample aliquots from each sample bag will be placed into an XRF sample container (a plastic cup with a mylar cover), labelled with the sample ID, and set aside for XRF analysis. The detailed field sample preparation procedure is provided in Attachment 1.

In the event that *in situ* samples are to be measured with the XRF, the soil is first prepared by leveling with a decontaminated tool, placing a clean plastic bag over the XRF exposure window, and measuring the material.

The required equipment for on-site sample preparation includes personal protection equipment and sample processing equipment. Personal protection equipment consists of lab gloves, safety goggles, and dusk masks. Sample processing equipment includes polypropylene sample cups, mylar film, plastic sampling spoons, drying trays, commercial grade microwave oven, handheld US Standard No. 60 sieves, decontamination brushes, and compressed air as appropriate.

5.1.2 XRF Analysis

Analyses conducted with XRF analyzers will be conducted following US Environmental Protection Agency (USEPA) Method 6200 protocol *Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment* (USEPA 2010), as described in Section 5.1.5.

The XRF instrument exposes the prepared samples to X-ray and gamma ray sources which cause fluorescence of energy shells within the elements of concern. The detector portion of the instrument receives the fluorescence, separates the energy from interferences, and provides individual element concentrations in the sample based upon the intensity of the fluorescence.

The exact model of XRF to be used is not determined at this time. The instrument will likely be similar to the Innov-X Model A-4000S. This instrument uses X-Ray tubes with silicon positive-intrinsic-detectors to provide exposure and fluorescing capabilities. The Innov-X instrument does not contain a radioactive source, and as such is not subject to any handling and health and safety procedures commonly associated with radioactive source materials.

5.1.3 XRF Laboratory Requirements

In general, there are three areas needed in an onsite XRF soil laboratory: a soil preparation area, an XRF analyzer area, and an office area. The requirements for each area are described below.

Soil Preparation Area

In the soil preparation area, samples are organized and prepared for analysis. If necessary, they may be set into a series of queues for analysis. If samples need to be dried, they are set up for overnight air-drying, or are dried in an oven (microwave or conventional). Once dried, soil samples are sieved to the appropriate size fraction (<250 µm), and an aliquot placed in XRF cups. The XRF cups are small plastic cups with a small mylar sheet snapped on top as a cover. Samples are then labeled, and set aside for analysis.

Due to the high concentrations of arsenic and other constituents in some of the soil to be processed in this area, it is recommended that a venting hood be set up in the processing area to remove the dust generated during sample processing from the work area. This would be necessary to minimize worker exposures, and also to minimize the amount of dust generated throughout the building, which otherwise may require significant decontamination upon project demobilization. There are several varieties of portable, table top, ductless models of vent hoods available to fit almost any type of work space.

It is recommended that the sample processing area be separated from the other areas in order to minimize the dust in the other clean areas, even with a vent hood in place. Plastic sheeting from ceiling to floor usually suffices.

It is recommended that a negative effects study be conducted within the onsite laboratory at the onset of the sampling and analysis phase of remedial activities. The negative effects study consists of air monitoring for about a one-week period while worker protection checks are in place (i.e., an operating vent hood). The data from the study will be reviewed to evaluate worker exposures during that period. If worker exposures are within acceptable limits, then no further worker protection would be recommended. If the exposures are not acceptable, then additional worker protection may be recommended (i.e., respirators).

XRF Analyzer Area

In the XRF analyzer area, the XRF cups are assembled, in a queue if necessary, for analysis. The XRF analyzer can be placed on a semi-permanent stand for indoor analysis. This instrument needs to be operated on a clean, level table space. Once samples are analyzed, split samples are pulled, and the remaining samples are organized on storage shelves.

Office/Computer Area

In the office and computer area, a desktop workstation is necessary for downloading the analytical data from the XRF, photographs from field cameras, and general project organization. In addition, workspace is needed for sample container labeling, mapping, and other sample documentation and coordination activities. Internet connection and phone lines are helpful for data transfer and general communication. The XRF and office areas can be combined, if necessary.

5.1.4 Calibration Standards

The sample aliquots used to compare XRF results to laboratory results can be used as calibration standards for the West Plant Site remedial activities. Prior to remediation activities, at least three samples will be selected from areas known to contain arsenic at the SSSRL (185 mg/kg), as well as arsenic concentrations above and below that level (100 mg/kg and 300 mg/kg). These standards will also be tested with the XRF for arsenic, copper and lead, and will be used as calibration standards for these elements as well. The samples will be sent to a laboratory for confirmation analysis, and then re-shipped back to the on-site XRF laboratory to be used as site-specific standards. The site-specific standards will be run on the XRF daily in accordance with USEPA Method 6200, to check the calibration of the instrument.

5.1.5 USEPA Test Method 6200

All soil analysis is to be conducted in accordance with Test Method 6200. The test method requires the following startup and calibration procedures:

1. The National Institute of Instruments and Technology (NIST) blank and the site-specific laboratory standards will be run through the XRF before analyzing soil samples for the day (Section 5.1.4).

2. The three site-specific laboratory standards must be analyzed after every 20 samples analyzed.
3. The NIST Blank and the site-specific laboratory standards will be run through the XRF before the instrument is shut down for the day.
4. Every day, one Precision Run will be done on the XRF. The Precision Run consists of analyzing the NIST blank, and then analyzing each site-specific laboratory standard for at least seven consecutive readings. If feasible, integrate the precision run into the normal QA/QC schedule, i.e. substitute the Precision run for one of the QA/QC runs.

5.2 Confirmation Laboratory Analysis

The soil samples measured by XRF will be split at a rate of one in 20, and shipped to an Arizona Department of Health Services (ADHS) certified laboratory. Soil samples will be analyzed for the three COCs. The laboratory must report using the Arizona Data Qualifiers, as can be found in this location: http://www.azdhs.gov/lab/documents/license/resources/resources/data-qualifiers-rev4.pdf.

For QA/QC, the field duplicates will be analyzed with the XRF. Decontamination rinse blanks will be and submitted for laboratory analysis to determine the presence of arsenic, copper, and lead using USEPA Method 6010, Inductively Coupled Plasma/Atomic Emission Spectrometry (ICP/AES).

Confirmation samples will be analyzed for arsenic, copper, and lead using USEPA Method 6010, ICP/AES, per the requirements listed in Table B-2. The laboratory will provide all results to Golder within 60 days of receipt.

5.3 Data Verification

Laboratory data will be verified to evaluate whether they are suitable for their intended use. Data verification is a screening evaluation of laboratory data quality. If verification indicates that there are potential issues, then the data may be validated in accordance with the following USEPA guidance:

- USEPA Contract Laboratory Program National Functional Guidelines (NFG) for Inorganic Superfund Data Review, EPA 540/R-10-1011 (NFG: USEPA 2010)

XRF data will be qualitatively evaluated by review of the calibration standards. In addition, data will be compared to laboratory split samples and evaluated for precision and accuracy.

6.0 SCHEDULE

Samples will be collected in accordance with the contractor's schedule. Samples collected for XRF analysis will be analyzed daily, where practical. In some cases, backlog may occur, particularly if more samples are collected than can be prepared and analyzed in a day. If backlog occurs, then some samples may be analyzed a few days after collection. Samples requiring laboratory analyses will be forwarded to the analytical laboratory within one week after a sample is collected.

7.0 REFERENCES

Arizona Department of Environmental Quality. (ADEQ). 2015. Letter to Jonathan Cherry, Resolution Copper Mining LLC providing approval of SSSRL Report. December 22.

United States Environmental Protection Agency (USEPA). 2010. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, Office of Superfund Remediation and Technology Innovation (OSRTI), US Environmental Protection Agency, Washington, DC. OSWER 9240.1-51. USEPA-540-R-10-011. January.

TABLES

Table B-1: Summary of Samples

Description/Notes	Media	Estimated Number of Samples [1]	Sample Type	Sample Depth	Location	XRF Analysis	Laboratory Analysis
Verification Soil Samples	**Soil**	1000	Discrete	0-3 in.	Exclusion Zone	Soil COCs	
Boundary Definition Soils	**Soil**	TBD	Discrete	0-3 in.	Boundaries	Soil COCs	
Laboratory Confirmation Soil Samples	**Soil**	50	Discrete	0-3 in.	Exclusion Zone		Soil COCs
Field duplicates	**Soil**	50	Discrete	0-3 in.	Boundaries	Soil COCs	
Rinsate blanks	**Water**	TBD	Discrete	NA	All		Soil COCs

Notes:
TBD = to be determined
[1] = These numbers are minimum estimates, the final number depends on the number of sampling rounds are needed to achieve sampling objectives
COCs = arsenic, copper, and lead

Table B-2: Analytical Requirements for Soil Samples

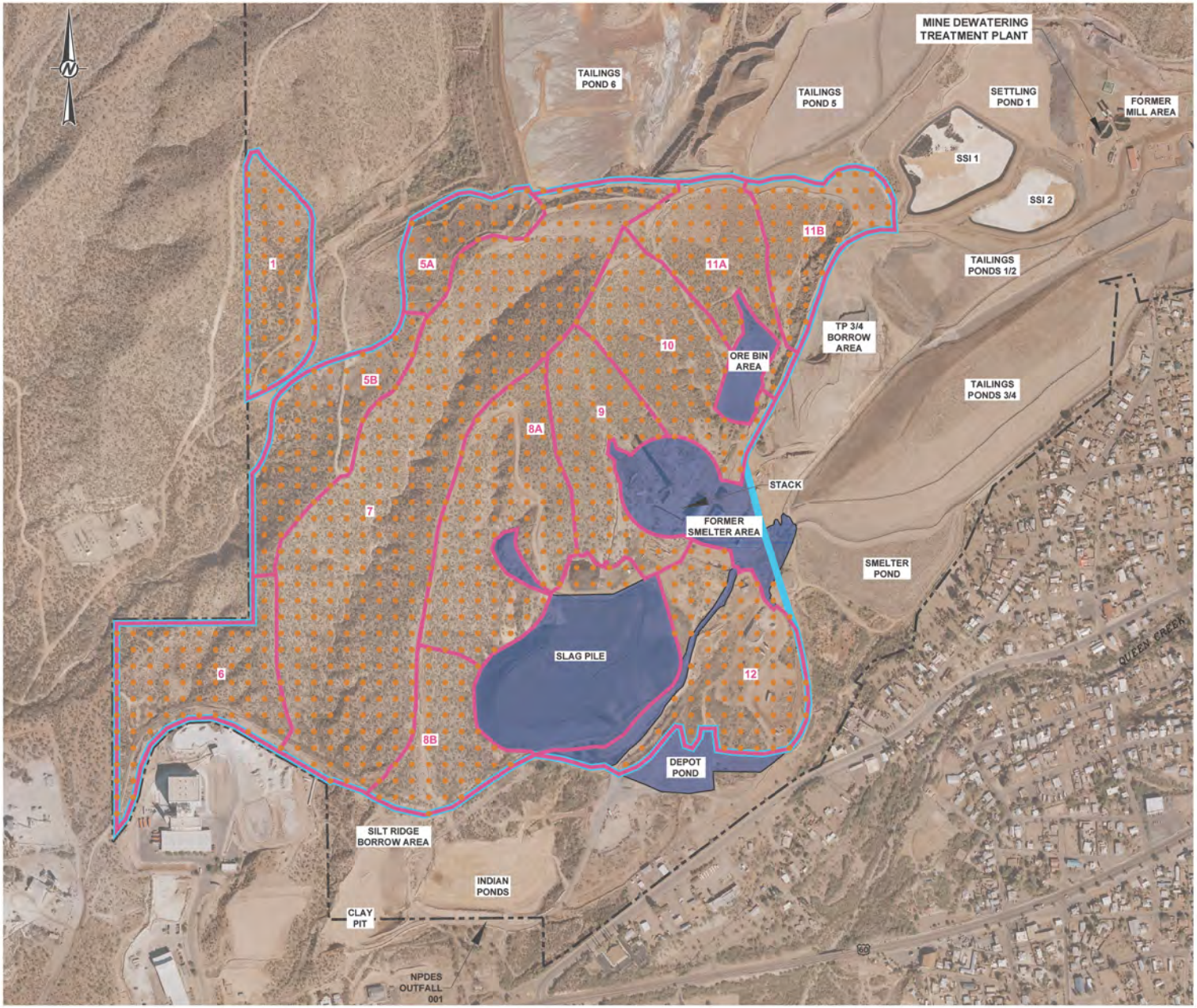
Analyte	CAS No.	Matrix	Laboratory MDL	Laboratory MRL	Units	Method	Bottle Type	Preservation	Hold Time
Arsenic	7440-38-2	Soil	0.81	2.5	mg/kg	EPA 6010C/3050B	Plastic Bags or Poly Bottles or 8 oz. Glass Jars	Cool, <6°C	180 days
Copper	7440-50-8		0.28	1					
Lead	7439-92-1		0.31	0.75					
Arsenic	7440-38-2	Rinsate Water	0.0096	0.025	mg/L	EPA 200.7	250ml or 500ml Poly Bottles	HNO3 to pH>2	180 days
Copper	7440-50-8		0.0023	0.01					
Lead	7439-92-1		0.0025	0.0075					

Notes:

mg/kg = milligrams per kilogram

mg/L = milligrams per Liter

FIGURE



LEGEND

- PROPERTY LINE
- EXCLUSION ZONE BOUNDARY ARSENIC 188 mg/kg ISOPLETH
- 9 — SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- AREAS NOT TO BE REMEDIATED
- VERIFICATION SAMPLE LOCATION

NOTES

1. 100-FOOT GRID FOR VERIFICATION SOIL SAMPLING

REFERENCES

1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202)

0 300 600
1" = 600' FEET

CLIENT: Resolution Copper Mining

PROJECT
REMEDIAL ACTION WORK PLAN
WEST PLANT SITE, SUPERIOR ARIZONA

TITLE
VERIFICATION SOIL SAMPLING GRID

CONSULTANT: Golder Associates

YYYY-MM-DD	2016-03-14
DESIGNED	DC
PREPARED	JHR
REVIEWED	DC
APPROVED	KJ

PROJECT NO.	CONTROL	REV.	FIGURE
152709704	0002	A	B-1

ATTACHMENT 1
STANDARD OPERATING PROCEDURE
FIELD LABORATORY SOIL SAMPLE PREPARATION

STANDARD OPERATING PROCEDURE

Field Laboratory Soil Sample Preparation

All soil samples will be processed at the field laboratory according to this procedure, which is based on the analytical laboratory sample preparation procedures. Soil is heterogeneous, and the preparation procedures will homogenize the sample and provide a representative aliquot for XRF and analytical laboratory analysis. The preparation procedures will also separate the soil sample into the <250 μm size fraction for analysis. One Ziploc bag of soil will be used for all samples. The procedure is as follows:

1. The bag of soil will be shaken and rolled to mix material that may have separated after sample collection.
2. The sample will be placed into dry, clean, non-metal pans; and air dried, or oven dried at 105 °C, for 24 hours. The drying pans must be placed in a location without wind or other disturbance. The drying pans need to be placed with ample room between each sample so that the disturbance of one pan does not contaminate another sample. Moisture content will not be determined.
3. All of the dried soil will be disaggregated by screening through a U.S. Standard No. 60 sieve (i.e., 250 μm). Clods, if any, will be broken by hand or crushed using a suitable mallet and protective covering cloth. The soil passing through the No. 60 sieve (i.e., the <250 μm fraction) will be labeled and processed as a sample for analysis. The >250 μm size fraction soil will not be analyzed.
4. The <250 μm size fraction soil will be placed in a clean Ziploc bag and shaken to ensure heterogeneity of the sample. The mixed sample will be split into two sub-samples. One sub-sample will be placed into a new polypropylene sample cup and covered with Mylar film to complete the sample preparation for XRF analysis. The XRF sample label will be written on a piece of masking tape and attached to the cup. The other split, consisting of at least 25 grams of material will be labeled and archived in a clean glass jar. The archive will be labeled with the sample id used for XRF analysis and the suffix "-ARCH." Any material left over after collecting the required volumes can be discarded.
5. The XRF samples will be analyzed following the protocols specified in the SAP. After the XRF analysis, the sample cup will be labeled with the analytical laboratory sample ID. The tape label, containing the XRF sample ID, will be removed from the cup. The samples will be listed on a chain of custody form and shipped to the analytical laboratory in coolers at $4^{o}C \pm 2^{o}C$.
6. Cross-contamination will be minimized by the following precautions: (1) the laboratory technician will wear a clean set of disposable polyethylene gloves for processing each sample; and (2) drying pans and sieves will be cleaned between samples as follows: (a) drying pans will be washed with detergent, rinsed with tap water, and given a final rinse with de-ionized water, and (b) sieves will be thoroughly brushed and then "blown off" with dry compressed air. (If any soil remains on the sieve after the compressed air cleansing, the sieve must be washed with soap and water and dried before reuse.)
7. Personal protection equipment will include safety glasses, NIOSH-95 dust masks, disposable lab gloves, and lab coats.

APPENDIX C
SEDIMENT MANAGEMENT PLAN

REPORT

APPENDIX C

SEDIMENT MANAGEMENT PLAN

Remedial Action Work Plan
Smelter-Impacted Soil Remediation
West Plant Site, Superior, Arizona

Submitted To: Resolution Copper Mining LLC (RCML)
102 Magma Heights
Superior, Arizona 85273 USA

Submitted By: Golder Associates Inc.
4730 N. Oracle Road, Suite 210
Tucson, AZ 85705 USA

March 2016

Project No. 1527097-04

Golder Associates

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1.0 INTRODUCTION

The purpose of this Sediment Management Plan is to describe how potentially-impacted sediment from the Soil Removal Units (SRUs) within the Exclusion Zone will be managed to reduce the potential for its hydraulic transport and deposition beyond the perimeter of the Exclusion Zone. The extent of the Exclusion Zone is defined in the body of the Remedial Action Work Plan (RAWP). Those responsible for implementing this sediment plan will also be defined in the body of the RAWP.

Sediment basins will be the primary measure to manage potentially-impacted sediment. These sediment basins are intended to be temporary structures that will be installed prior to beginning excavation in an area and may remain for several years until RCML determines that vegetation is sufficiently established and sediment yields diminished. These sediment basins will be operated in that sediment will be cleaned out periodically. Secondary measures to manage potentially-impacted sediment will include silt fences, straw bale barriers, swales, vee-ditches, and other best management practices (BMPs). For some, but not all, of the SRUs, the existing Indian Ponds will function as a secondary sediment basin to retain sediment and runoff.

The sediment management measures in this plan are consistent with the:

- AZPDES Permit No. AZ0020389, an individual permit issued under the Arizona Pollutant Discharge Elimination System that includes Outfall 001 at the existing Indian Ponds
- Stormwater Pollution Prevention Plan (SWPPP) for the West Plant Site under AZPDES Stormwater Multisector General Permit (MSGP-2010 Number AZMSG-62880 (WestLand Resources 2012)

2.0 DESIGN CRITERIA

Sediment basins can be designed to either detain or retain runoff. Detention basins, or "dry" basins, have outlet works such that the runoff is released within a period of time. Retention basins, or "wet" basins, have no or minimal outlet works such that the basin is emptied largely by evaporation of the accumulated water. Retention basins allow more settling time for sediment particles than detention basins. Retention basins will be used for the smelter-affected soil removal project to promote sediment capture. Some basins will have no mechanism for outflow whereas other basins will allow slow seepage through a rock berm covered in a filter fabric (i.e., geotextile).

The sediment basins will be located based on an evaluation of the watersheds and flow paths within the SRUs. The sediment basins will be located at the concentration point for the watershed. In most cases, the boundaries of the SRUs were delineated to match the topographic watersheds, as further discussed in Section 3.0 of this plan.

Resolution Copper Mining LLC (RCML) has selected the 2-year, 24-hour storm as the design storm for estimating the volume of runoff to be received by a sediment basin. This selection is based on a reasonable risk of receiving a given magnitude storm within the design life of the basin (Hann, Barfield, and Hayes 1994). Assuming a given sediment basin will be in use for approximately 2 years, then the probability of receiving at least one two-year event in two consecutive years is approximately 75 percent.

In addition to the capacity to return the volume of runoff from the design storm, a sediment basin also will store up to a certain volume of sediment before removal is needed (i.e., before reducing the basin volume available for runoff). The minimum sediment storage volume will be 900 cubic feet per acre of disturbed area (NRCS 2010).

The sediment basins will be designed with 1 foot of freeboard in addition to the depths needed for sediment and runoff storage.

To the extent feasible based on topography, basin depths will be between 5 and 15 feet to accommodate freeboard, sediment storage, and runoff storage. In some cases, part of the total depth will be provided by below grade excavation.

To the extent feasible based on topography, the basin shape will be designed with a length to width ratio of 2:1 (NRCS 2010).

Each sediment basin will be field fit with at least one ramp for equipment access to remove accumulated sediment. The ramp will be sized and sloped to accommodate a small backhoe or similar equipment.

3.0 SEDIMENT BASINS

The design of the sediment basins consisted of hydrology and sizing calculations, as detailed in Sections 3.1 and 3.2, respectively. Section 3.3 describes potential flow paths downstream of the sediment basins.

3.1 Hydrology

The SRUs and corresponding watersheds are shown on Figure C-1. Soil Conservation Service (SCS) curve numbers were assigned based on previous experience at the West Plant Site. The rainfall depth for the 2-year, 24-hour storm is 2.33 inches (NOAA 2006). Assuming a Type II rainfall distribution, the runoff volume was estimated with the HEC-HMS software. The results are summarized in Table C-1 and the calculations are presented in Attachment 1.

Table C-1: Runoff Volumes

Soil Removal Unit	Surface Area (acres)	Reference Watershed	SCS Curve Number	Runoff Volume (cubic feet)
1	11.3	SUP Marble-2[1]	85	42,975
5A	7.5	SUP Marble-2[1]	85	28,450
5B	14.8	SUP Marble-2[1]	85	55,943
6	17.7	SUP-Marble-1	85	67,261
7A	23.3	SUP Marble-2	85	88,192
7B	43.6	SUP Marble-2	85	165,188
8A	24.3	IP-5	85	92,285
8B	10.8	IP-4	85	41,103
9	14.9	G-1	85	56,334
10	17.5	G-2	86	70,288
11A	13.3	G-2	86	53,477
11B	11.5	G-2	86	46,329
12	13.7	SMT-2, SMT-3, DP-1	87	58,145

Note:
1. Soil removal unit is not within a previously-defined watershed. Reference watershed information is taken from the nearest adjacent watershed.

3.2 Basin Sizing and Design

Basin sizing consists of defining the required volume without freeboard and then back-calculating the height (if above grade) or depth (if below grade) of the basin based on the stage-storage relationship of the topography within the basin. Table C-2 summarizes these steps and calculations are presented in Attachment 1. The design drawings for the basins are presented in Appendix A of the RAWP.

Table C-2: Basin Sizing

Soil Removal Unit	Surface Area (acres)	Sediment Volume[1] (cubic feet)	Runoff Volume[2] (cubic feet)	Total Volume[3] (cubic feet)	Minimum Basin Height or Depth[4] (feet)
1	11.3	10,170	42,975	53,145	7
5A	7.5	6,750	28,450	35,200	---
5B	14.8	13,320	55,943	69,263	10
6	17.7	15,930	67,261	83,191	5
7	66.9	60,210	253,380	313,590	11
8A	24.3	21,870	92,285	114,155	---
8B	10.8	9,720	41,103	50,823	5
9	14.9	13,410	56,334	69,744	---
10	17.5	15,750	70,288	86,038	13
11(A&B)	24.8	22,320	99,806	122,126	13
12	13.7	12,330	58,145	70,475	12

Notes:
1. Sediment volume estimated from design criteria of 900 cubic feet per acre of disturbed area (NRCS 2010)
2. Runoff volume from Table C-1
3. Total volume is sum of sediment volume and runcff volume, but does not include volume corresponding to 1 foot of freeboard
4. Back calculated height or depth including 1 foot freeboard

The rock check dams and earthen berms that form the downstream end of the sediment basins will vary in height between 5 and 15 feet. The upstream face of the rock check dam will be 3H:1V and the downstream face will be 2H:1V. The upstream face of the rock check dam will be lined with geotextile to act as a sediment filter and slow the release of accumulated water through the berm. The pieces of rock will have a narrow range of sizes, between 8 and 12 inches, to allow for voids that will not become plugged quickly.

With the exception of SRUs 1, 7, and 12, the other basins will be constructed above grade using either rock check dams or compacted earthen berms. The sediment basins within SRUs 1, 7, and 12 will be excavated to provide the required volume and minimum depth beneath the ground surface. These basins will have 3 horizontal (H):1 vertical (V) interior side slopes. The sediment basin for SRU 12 will be excavated 8 feet below grade, 160 feet long by 1000 feet wide with and a 10-foot wide crest (Drawing C-007 in Appendix A of the RAWP). In addition to the rock check dam, the sediment basin for SRU 1 will be excavated approximately 5 feet below grade, 220 feet long and 120 feet at its widest. The sediment basin for SRU 7 will also be excavated 5 feet below grade in addition to the rock check dam, 200 feet long and 50 feet wide.

3.3 Downstream Flow Paths

The sediment basins are designed to retain runoff, although some water will slowly seep through the rock check dam and there is the potential for overtopping if a storm is larger than the selected design event.

Consequently, it is relevant to define the flow paths downstream of each sediment basin and the possibility to discharge potentially-impacted sediment (Table C-3).

Table C-3: Downstream Flow Paths

Soil Removal Unit	Type of Basin	Above or Below Grade	Potential Downstream Flow Path	Potential for Offsite Discharge
1	Rock check dam	Above and below	To former Apex Wash	Yes
5A	Existing	Below	To rock check dam for SRU 1	Yes
5B	Rock check dam	Above	To former Apex Wash	Yes
6	Rock check dam	Above	To unnamed tributary to Queen Creek	Yes
7	Rock check dam	Above and below	To unnamed tributary to Queen Creek	Yes
8A	Existing	Above (blocked by Slag Pile)	None	No
8B	Rock check dam	Above	To Indian Ponds via existing culvert	No
9	Existing	Above (blocked existing concrete structure)	To Indian Ponds via existing channel	No
10	Compacted earthen berm	Above	To Indian Ponds via existing channel	No
11A	Compacted earthen berm	Above	To Indian Ponds via existing channel	No
11B				
12	Compacted earthen berm	Above and below	To Indian Ponds via existing channel along southern property line	No

4.0 OTHER SEDIMENT CONTROLS

Other sediment controls will consist of straw wattles and vee-ditch/berm combinations (Drawing C-008 in Appendix A of the RAWP). These controls will be installed to direct runoff and sediment to the sediment basins as needed, as well as along certain segments of the property boundary to reduce the potential of offsite discharge (Drawings C-006 and C-007 in Appendix A of the RAWP). In addition, small rock check dams may be field fit along watercourses within the SRUs as intermediate sediment structures, at RCML's discretion.

5.0 INSPECTION, OPERATION, AND MAINTENANCE

The sediment basins and other sediment control measures will be inspected, operated (if applicable), maintained, and decommissioned when RCML determines that the revegetation is sufficiently established and the sediment yields have diminished.

Sediment basins will be inspected weekly during the summer or winter rainy seasons, or within one day of a 0.5-inch or greater rainfall depth. The inspection frequency may be decreased to approximately every two weeks during the dry season. The inspections will include:

- Condition of the rock check dam, geotextile, side slopes, access ramps, etc.
- Depth of water pool, if any at the time of the inspection, as indicated on a staff gage
- Depth of sediment accumulation, as indicated on a staff gage
- Estimate of available freeboard
- Presence of vegetation growing in the accumulated sediment
- Presence or signs of wildlife or trespassers
- Presence of mosquitos

Corrective actions for the sediment basins (i.e., maintenance) will be completed in a timely manner as indicated by the inspections. The only operation of the sediment basins is removal of accumulated sediment:

- As needed while the soil removal project is ongoing with a general guideline of cleanout when approximately 75 percent the sediment storage capacity is reached. This material is assumed to be impacted and will be disposed in Tailings Pond 6 along with the smelter-affected soils.
- At the end of soil removal project for the SRU reporting to the sediment basin. This sediment is also assumed to be impacted and will be disposed in Tailings Pond 6 along with the smelter-affected soils.

The other sediment control measures will also be inspected weekly or within one day of a 0.5-inch or greater rainfall depth. These inspections will document the general condition and integrity of the wattles and vee-ditches/berms, etc. Corrective actions (i.e., maintenance) will be completed as indicated by the inspections.

If excessive mosquitos are noticed due to wet/moist conditions during the summer rainy season, vector control with insecticides may be necessary, at RCML's discretion.

6.0 MONITORING

Sediment monitoring only applies to those sediment basins with the potential to discharge offsite, as indicated in Table C-3. Sediment in the washes downstream from these basins may be sampled at RCML's discretion during removal activities and analyzed for the constituents of concern at the onsite XRF laboratory. Sediment in the washes downstream of these basins will also be sampled for the purposes of completion reporting in accordance with the Sediment Management Plan and in compliance with ARS §49-175B.3 (Section 3.3 in the RAWP).

7.0 REFERENCES

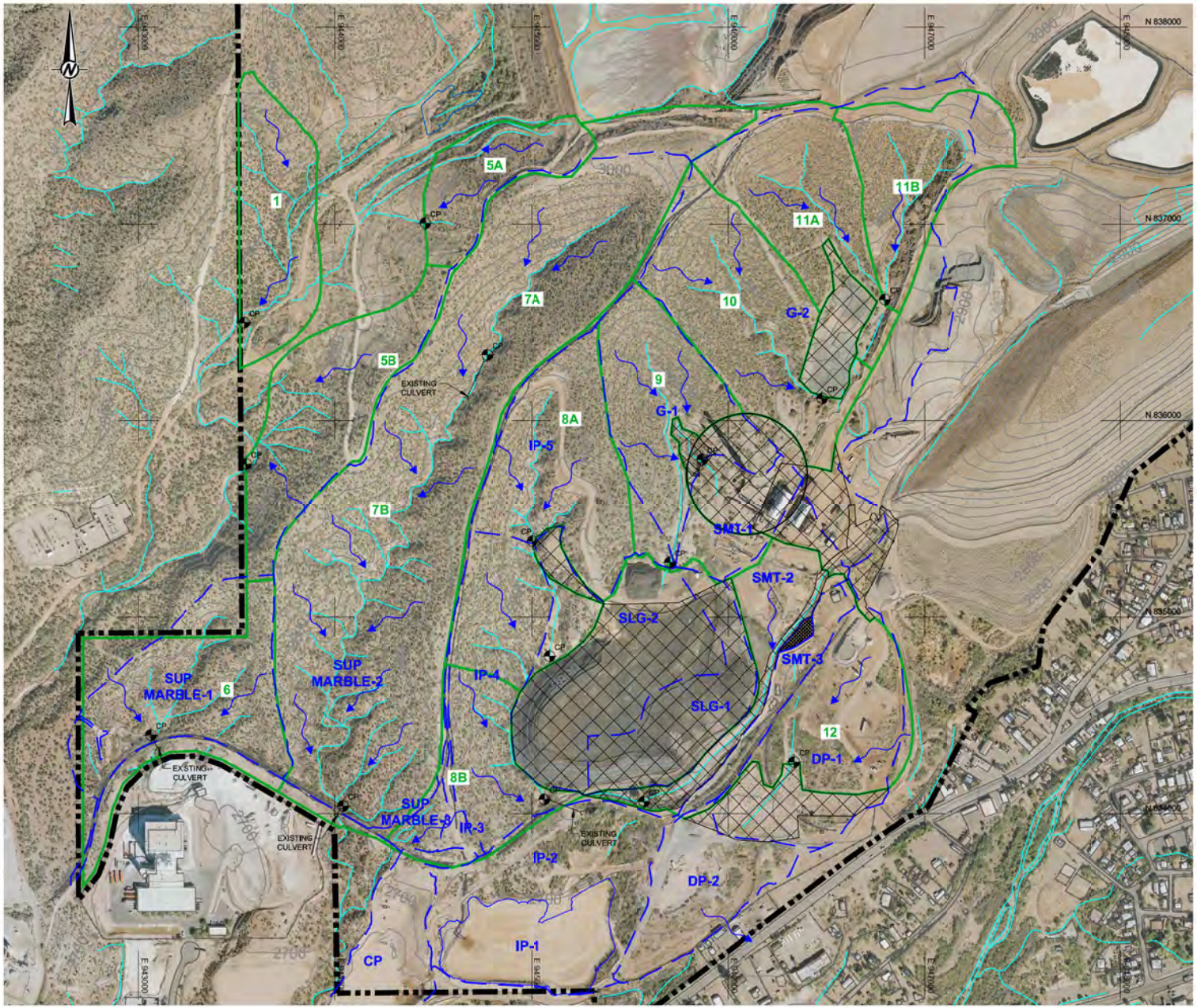
Haan, C.T., Barfield, B.J., and Hayes, J.C. 1994. Design Hydrology and Sedimentology for Small Catchments. Academic Press, San Diego, California.

National Oceanic and Atmospheric Administration (NOAA). 2006. *Precipitation-Frequency Atlas of the United States* NOAA Atlas 14, Volume 1, Version 5SUPERIOR. G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley. NOAA, National Weather Service, Silver Spring, Maryland. Extracted: Tuesday July 19 2011 from <http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_printpage.html?st=az&sta=02-8348&data=depth&units=>.

Natural Resources Conservation Service (NRCS). 2010. Conservation Practice Standard No. 350 – Sediment Basin. January 2010.

WestLand Resources Inc. 2012. MSGP-2010 Stormwater Pollution Prevention Plan (SWPPP), West Plant Operations. Prepared for Resolution Copper Mining LLC. September 2012.

FIGURE



LEGEND

- EXISTING GROUND CONTOUR (ft -MSL)
- PROPERTY LINE
- AREAS NOT TO BE REMEDIATED
- WATERSHED BOUNDARY
- G-1 — SUB BASIN ID NUMBER
- 9 — SOIL REMOVAL UNIT BOUNDARY AND ID NUMBER
- FLOW DIRECTION
- CP — CONCENTRATION POINT

REFERENCES

1. 2012 AERIAL PHOTOGRAPH PROVIDED BY RESOLUTION COPPER MINING, LLC.
2. COORDINATE SYSTEM IS ARIZONA STATE PLANE NAD83, CENTRAL ZONE, U.S. FOOT (FIPS 0202).

0 250 500
1" = 500' FEET

CLIENT: Resolution Copper Mining

PROJECT: REMEDIAL ACTION WORK PLAN
WEST PLANT SITE, SUPERIOR ARIZONA

TITLE: **WATERSHED MAP**

CONSULTANT: Golder Associates

YYYY-MM-DD	2016-03-14
DESIGNED	SPS
PREPARED	JHR
REVIEWED	DC
APPROVED	KJ

PROJECT NO.	CONTROL	REV.	FIGURE
152709704	0002	A	C-1

ATTACHMENT 1
SEDIMENT BASIN SIZING CALCULATIONS

CALCULATIONS

Date:	March 23, 2016	**Made by:**	WK
Project No.:	152709704	**Checked by:**	SPS
Subject:	Sediment Basin Sizing Calculations	**Reviewed by:**	KJ
Project Short Title:	**APPENDIX C: SEDIMENT MONITORING AND MANAGEMENT PLAN ATTACHMENT 1**		

1.0 OBJECTIVE

Perform a hydraulic and sediment yield analysis for the design of the sediment basins for the 2-year, 24-hour storm event for the smelter-impacted soil remediation project.

2.0 METHOD

- NRCS – Technical Release -55 (design storm runoff volumes)
- NRCS – Conservation Practice Standard – 350 (sediment yield)
- AutoCAD Civil 3D (basin design)

3.0 ASSUMPTIONS

- Soil Remediation Units (SRUs) to match previously delineated watersheds (See Figure C-1).
- 2-year, 24-hour storm event used for basin design.
  - Precipitation Depth: 2.33 inches (NOAA 2006) – Attachment 1B.
- 1-foot minimum freeboard for each sediment basin.
- To the extent feasible based on topography, basin depths will be between 5 and 15 feet to accommodate freeboard, sediment storage, and runoff storage. In some cases, part of the total depth will be provided by below grade excavation.
- To the extent feasible based on topography, the basin shape will be designed with a length to width ratio of 2:1 (NRCS 2010).
- Sediment yield equals 900 cubic feet per acre of disturbed watershed (NRCS 2010).

4.0 CALCULATIONS

- Runoff volumes for the 2-year, 24-hour storm event were calculated using TR-55 (NRCS 1986) – see runoff volumes (Attachment 1A) from each SRU.

Golder Associates Inc.
4730 N. Oracle, Suite 210
Tucson, AZ 85705
Tel: (520) 888-8818 Fax: (520) 888-8817 www.golder.com

5.0 RESULTS

Table 1: Sediment Basin Sizing

Soil Remediation Unit	Area (acre)	2-Year Retention Volume (ft^3)	Estimated Sediment Yield (ft^3)	Stormwater and Sediment Total (ft^3)	Stormwater and Sediment Total (yd^3)	Available Above-Ground Storage[1] (yd^3)	Additional Storage Required (yd^3)	Below-Ground Storage (Excavation)[2] (yd^3)	Storage Total[3] (yd^3)
1	11.3	42,975	10,170	53,145	1,968	512	1,456	2,000	2,512
5A	7.5	28,450	6,750	35,200	1,304	6,429	0	NA	6,429
5B	14.8	55,943	13,320	69,263	2,565	2,852	0	N/A	2,852
6	17.7	67,261	15,930	83,191	3,081	4,335	0	N/A	4,335
7(A&B)	66.9	253,380	60,210	313,590	11,614	9,531	2,083	2,600	12,131
8A	24.3	92,285	21,870	114,155	4,228	6,207	0	N/A	6,207
8B	10.8	41,103	9,720	50,823	1,882	2,609	0	N/A	2,609
10	17.5	70,288	15,750	86,038	3,187	3,602	0	N/A	3,602
11(A&B)	24.8	99,806	22,320	122,126	4,523	8,259	0	N/A	8,259
12	13.7	58,145	12,330	70,475	2,610	225	2,385	3,200	3,425

Notes:
1. Available above-ground storage calculated using AutoCAD Civil 3D from existing topographic features.
2. Excavation depths calculated using AutoCAD Civil 3D software.
3. Total storage includes a minimum 1 foot of freeboard.

6.0 CONCLUSION

Rock check dams will be the primary controls that form the downstream end of the sediment basins. They will vary in height between 5 and 15 feet. The upstream face of the rock check dam will be 3 horizontal (H):1 vertical (V) and the downstream face will be 2H:1V. The upstream face of the rock check dam will be lined with geotextile to act as a sediment filter and slow the release of accumulated water through the berm. The pieces of rock will have a narrow range of sizes, between 8 and 12 inches, to allow for voids that will not become plugged quickly.

With the exception of SRUs 1, 7, and 12, the basins will be constructed above grade using either rock check dams or compacted earthen berms. The sediment basins within SRUs 1, 7, and 12 will be excavated to provide the required volume and minimum depth beneath the ground surface. These basins will have 3H:1V interior side slopes. The sediment basin for SRU 12 will be excavated 8 feet below grade, 160 feet long by 100 feet wide. In addition to the rock check dam, the sediment basin for SRU 1 will be excavated approximately 5 feet below grade, 220 feet long and 120 feet at its widest. The sediment basin for SRU 7 will also be excavated 5 feet below grade in addition to the rock check dam, 200 feet long and 50 feet wide.

7.0 REFERENCES

Autodesk, Inc., 2014. AutoCAD Civil 3D [software package]. San Rafael, CA: Autodesk, Inc.

National Oceanic and Atmospheric Administration (NOAA). 2006. *Precipitation-Frequency Atlas of the United States* NOAA Atlas 14, Volume 1, Version 5SUPERIOR. G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley. NOAA, National Weather Service, Silver Spring, Maryland, 2006. Extracted: Tue July 19 2011 from:
< http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_printpage.html?st=az&sta=02-8348&data=depth&units=>.

Natural Resources Conservation Service (NRCS). 1986. Technical Release 55, Urban Hydrology for Small Watersheds, United States Department of Agriculture. June.

_____. 2010. Conservation Practice Standard No. 350 – Sediment Basin. January 2010.

List of Attachments:

Attachment 1A – Runoff Volume Calculations
Attachment 1B – NOAA Precipitation-Frequency Atlas of the United States

Attachment 1A

Golder Associates

CALCULATIONS

Date:	10-Feb-16	**Made by:**	SPS
Project No.:	1527097-04	**Checked by:**	WK
Subject:	Sediment Basin Design - Runoff Volume Calculations	**Reviewed by:**	
Project Short Title:	RCML - SMELTER AFFECTED SOILS REMOVAL		

SOIL REMOVAL UNIT SUMMARY TABLE

Design Storm **2 -Year Recurrence Interval**

Storm Duration (hours)	2-Year Depth (inches)	2 -Year Depth (inches)	Storm Distribution
24	2.33	2.33	II

Soil Removal Unit	Subbasin Area (ft^2)	Subbasin Area (acres)	Subbasin Area (sq mile)	CN = 85 (Referenced from Site-Wide Hydro) (acres)	CN = 86 (Referenced from Site-Wide Hydro) (acres)	CN = 87 (Referenced from Site-Wide Hydro) (acres)	Composite SCS Curve No.	$S = \frac{1000}{CN} - 10$	Unit Runoff Q (in)	Runoff Volume (ac-ft)	Runoff Volume (ft^3)
1	493,669	11.3	0.0177	11.33			CN = 85	1.76	1.04	0.987	42,975
5A	326,816	7.5	0.0117	7.50			CN = 85	1.76	1.04	0.653	28,450
5B	642,639	14.8	0.0231	14.75			CN = 85	1.76	1.04	1.284	55,943
6	772,653	17.7	0.0277	17.74			CN = 85	1.76	1.04	1.544	67,261
7A	1,013,087	23.3	0.0363	23.26			CN = 85	1.76	1.04	2.025	88,192
7B	1,897,572	43.6	0.0681	43.56			CN = 85	1.76	1.04	3.792	165,188
8A	1,060,106	24.3	0.0380	24.34			CN = 85	1.76	1.04	2.119	92,285
8B	472,159	10.8	0.0169	10.84			CN = 85	1.76	1.04	0.944	41,103
9	647,121	14.9	0.0232	14.86			CN = 85	1.76	1.04	1.293	56,334
10	762,551	17.5	0.0274		17.51		CN = 86	1.63	1.11	1.614	70,288
11A	580,172	13.3	0.0208		13.32		CN = 86	1.63	1.11	1.228	53,477
11B	502,618	11.5	0.0180		11.54		CN = 86	1.63	1.11	1.064	46,329
12	596,234	13.7	0.0214			13.69	CN = 87	1.49	1.17	1.335	58,145
Total:	9,767,396	224.23	0.35							19.88	865,969

Attachment 1B

NOAA Atlas 14, Volume 1, Version 5SUPERIOR
Station ID: 02-8348
Location name: Superior, Arizona, US*
Coordinates: 33.3008, -111.0967
Elevation:
Elevation (station metadata): 2860ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval(years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.260 (0.223-0.309)	0.339 (0.290-0.401)	0.450 (0.382-0.529)	0.535 (0.452-0.624)	0.646 (0.540-0.749)	0.732 (0.601-0.846)	0.820 (0.663-0.945)	0.905 (0.722-1.05)	1.02 (0.794-1.18)	1.11 (0.843-1.29)
10-min	0.397 (0.339-0.471)	0.516 (0.442-0.611)	0.685 (0.581-0.805)	0.814 (0.687-0.949)	0.983 (0.821-1.14)	1.12 (0.915-1.29)	1.25 (1.01-1.44)	1.38 (1.10-1.59)	1.56 (1.21-1.80)	1.69 (1.28-1.96)
15-min	0.492 (0.420-0.583)	0.640 (0.548-0.757)	0.850 (0.721-0.998)	1.01 (0.851-1.18)	1.22 (1.02-1.41)	1.38 (1.13-1.60)	1.55 (1.25-1.78)	1.71 (1.36-1.98)	1.93 (1.50-2.23)	2.09 (1.59-2.43)
30-min	0.662 (0.566-0.786)	0.862 (0.737-1.02)	1.14 (0.971-1.34)	1.36 (1.15-1.59)	1.64 (1.37-1.90)	1.86 (1.53-2.15)	2.08 (1.68-2.40)	2.30 (1.83-2.66)	2.60 (2.02-3.01)	2.82 (2.14-3.28)
60-min	0.819 (0.700-0.972)	1.07 (0.913-1.26)	1.42 (1.20-1.66)	1.68 (1.42-1.96)	2.03 (1.70-2.36)	2.30 (1.89-2.66)	2.58 (2.08-2.97)	2.85 (2.27-3.29)	3.21 (2.50-3.72)	3.49 (2.65-4.06)
2-hr	0.961 (0.818-1.14)	1.23 (1.05-1.45)	1.61 (1.36-1.90)	1.90 (1.60-2.22)	2.28 (1.89-2.65)	2.58 (2.11-2.99)	2.89 (2.34-3.35)	3.19 (2.54-3.71)	3.60 (2.81-4.21)	3.92 (2.98-4.59)
3-hr	1.00 (0.857-1.18)	1.27 (1.09-1.50)	1.64 (1.39-1.92)	1.93 (1.62-2.26)	2.33 (1.93-2.70)	2.65 (2.17-3.07)	2.99 (2.41-3.46)	3.33 (2.64-3.86)	3.80 (2.94-4.42)	4.18 (3.17-4.86)
6-hr	1.23 (1.08-1.41)	1.54 (1.35-1.77)	1.92 (1.68-2.19)	2.23 (1.94-2.53)	2.66 (2.27-3.00)	2.99 (2.53-3.38)	3.33 (2.77-3.78)	3.68 (3.02-4.17)	4.16 (3.32-4.71)	4.53 (3.54-5.16)
12-hr	1.51 (1.31-1.76)	1.88 (1.64-2.18)	2.33 (2.02-2.69)	2.69 (2.32-3.11)	3.17 (2.69-3.64)	3.54 (2.98-4.06)	3.92 (3.27-4.52)	4.30 (3.53-4.96)	4.82 (3.87-5.57)	5.21 (4.12-6.06)
24-hr	1.86 (1.74-2.01)	2.33 (2.18-2.51)	2.92 (2.72-3.15)	3.39 (3.15-3.66)	4.06 (3.75-4.38)	4.58 (4.20-4.95)	5.12 (4.67-5.56)	5.69 (5.13-6.21)	6.46 (5.74-7.13)	7.08 (6.20-7.85)
2-day	2.22 (2.05-2.41)	2.78 (2.57-3.03)	3.51 (3.24-3.82)	4.11 (3.78-4.48)	4.94 (4.51-5.40)	5.60 (5.08-6.15)	6.29 (5.65-6.96)	7.01 (6.21-7.82)	8.00 (6.98-9.03)	8.80 (7.56-10.0)
3-day	2.38 (2.21-2.57)	2.99 (2.77-3.24)	3.80 (3.51-4.12)	4.47 (4.12-4.86)	5.41 (4.95-5.89)	6.18 (5.61-6.76)	6.99 (6.28-7.69)	7.84 (6.96-8.69)	9.04 (7.90-10.1)	10.0 (8.61-11.4)
4-day	2.54 (2.36-2.74)	3.19 (2.97-3.45)	4.08 (3.78-4.41)	4.83 (4.45-5.23)	5.89 (5.39-6.39)	6.76 (6.14-7.36)	7.69 (6.91-8.43)	8.67 (7.71-9.57)	10.1 (8.82-11.3)	11.2 (9.65-12.7)
7-day	2.87 (2.67-3.12)	3.62 (3.35-3.92)	4.67 (4.30-5.06)	5.55 (5.09-6.03)	6.84 (6.22-7.43)	7.92 (7.14-8.66)	9.10 (8.10-10.0)	10.4 (9.11-11.5)	12.2 (10.6-13.8)	13.8 (11.7-15.7)
10-day	3.18 (2.97-3.44)	4.01 (3.72-4.32)	5.13 (4.74-5.53)	6.07 (5.58-6.54)	7.42 (6.77-8.02)	8.54 (7.71-9.26)	9.74 (8.70-10.6)	11.0 (9.73-12.1)	12.9 (11.2-14.4)	14.4 (12.3-16.2)
20-day	4.01 (3.72-4.31)	5.07 (4.71-5.46)	6.50 (5.99-7.00)	7.64 (7.02-8.24)	9.22 (8.42-9.96)	10.5 (9.49-11.3)	11.8 (10.6-12.8)	13.1 (11.7-14.4)	15.0 (13.2-16.7)	16.4 (14.3-18.5)
30-day	4.86 (4.53-5.21)	6.13 (5.71-6.56)	7.81 (7.25-8.37)	9.16 (8.48-9.82)	11.0 (10.1-11.9)	12.5 (11.4-13.5)	14.0 (12.7-15.2)	15.6 (14.0-17.1)	17.8 (15.8-19.7)	19.6 (17.1-21.9)
45-day	5.80 (5.42-6.22)	7.33 (6.83-7.87)	9.30 (8.65-9.99)	10.8 (10.1-11.6)	12.9 (11.9-13.9)	14.5 (13.3-15.7)	16.2 (14.7-17.5)	17.8 (16.1-19.5)	20.1 (18.0-22.2)	21.8 (19.4-24.3)
60-day	6.77 (6.34-7.25)	8.53 (7.98-9.15)	10.7 (10.0-11.5)	12.4 (11.6-13.3)	14.6 (13.6-15.7)	16.3 (15.1-17.6)	18.1 (16.6-19.5)	19.8 (18.1-21.5)	22.1 (19.9-24.2)	23.8 (21.3-26.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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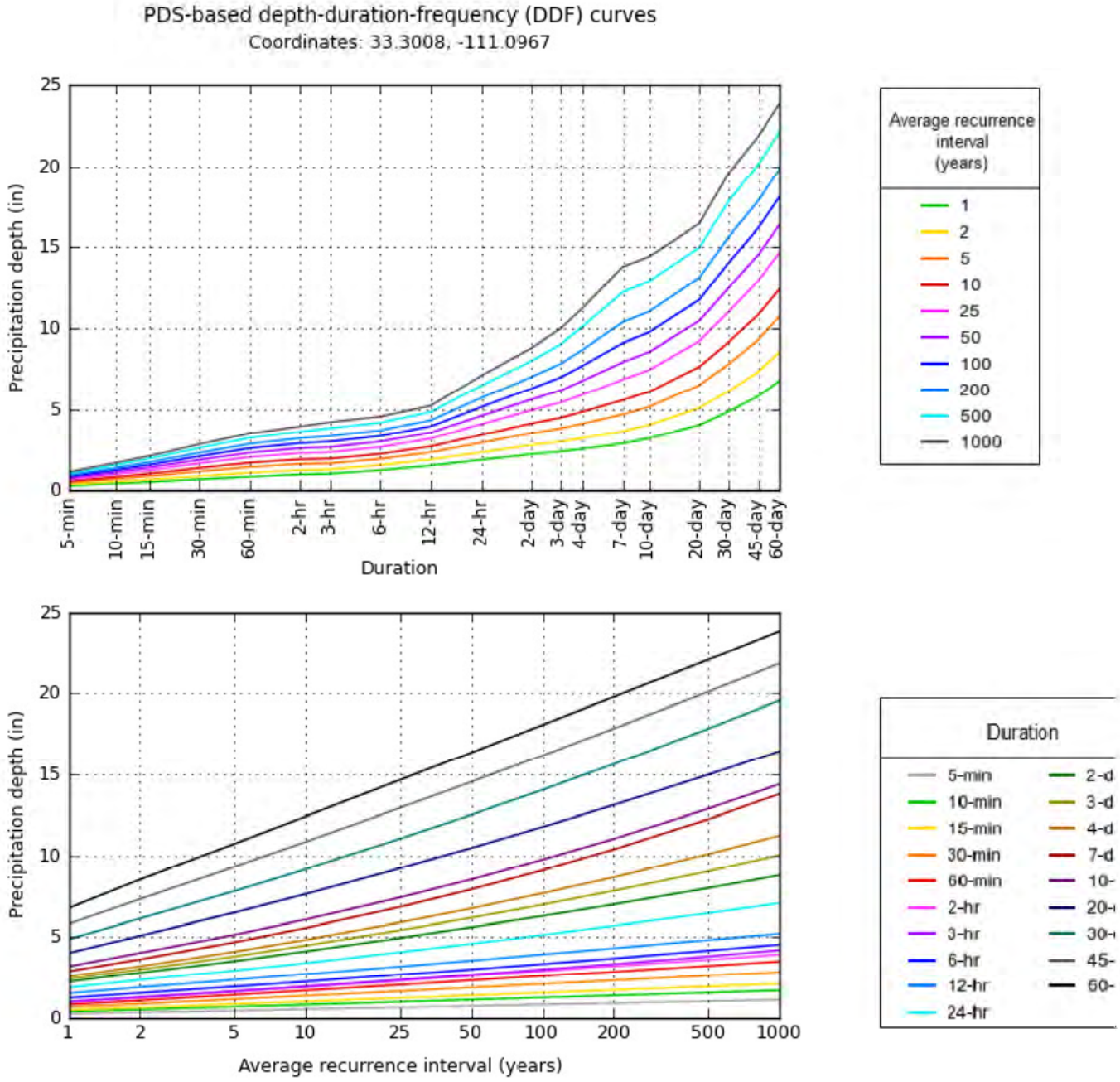
PF graphical



NOAA/NWS/OHD/HDSC Created (GMT): Tue Jul 19 20:59:33 2011

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Maps & aerials

Small scale terrain

Large scale map

Large scale aerial

Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX D
RCML COMMUNITY RELATIONS PLAN

COMMUNITY INVOLVEMENT PLAN

Resolution has engaged the public over the past 10 years about reclamation at the West Plant Site. This has been through various formats including open house meetings and site tours. Resolution has also provided information to the local Community Working Group that meets monthly. The group is made up of representative of various community clubs, local government, and businesses and open to the public.

A presentation was provided in April 2014 to the Community Working Group to outline the areas that may need to be reclaimed as part of the VRP. As Resolution progresses through reclamation monthly updates will continue to be provided to the Group.

Through the implementation of the Remedial Action Work Plan, there will be a variety of opportunities to engage with the public. The public review of Remedial Action Work Plan will be announced in the Superior Sun and Silverbelt newspapers. The Resolution Copper website will have a copy of the Remedial Action Work Plan posted at http://resolutioncopper.com.

Resolution has a Main Street Office (402 W. Main Street, Superior, Arizona 85173) that is easily accessible to the public and is open during regular business hours. The Remedial Action Work Plan will available at the Main Street Office for review.

A fact sheet (Attachment 1) will also be provided at the Main Street Office, and available on the company website.

Progress updates will be provided quarterly on the Resolution website. During public open houses (approximately quarterly) an update of activities will be provided. An announcement about the commencement of construction will be made in the local newspapers along with a fact sheet describing the activities.

Signs describing the reclamation work will be posted at the two gated entrances to the West Plant Site. The sign information will include the following:

ENVIRONMENTAL RECLAMATION NOTICE

Voluntary Remediation Program Site

Site Code: 502878-11

Project Start Date: May 2, 2016

Project End Date:
Resolution Copper will be conducting soil remediation to remove soil containing arsenic, lead and copper.

This work will be performed under the Arizona Department of Environmental Quality Voluntary Remediation Program.

For more information please contact:

Site Contact: Casey McKeon (520) 689-9374
ADEQ Contact: Joey Pace (602) 771-4818
Construction Contact: Bo Deen (520) 689-9374

Remedial Activities

West Plant Site, Superior, Arizona

Resolution Copper Mining

Smelter-Affected Soil Remediation Efforts Soon Underway

Resolution Copper Mining LLC (RCML) is pleased to report that they have received approval from the Arizona Department of Environmental Quality (ADEQ) Voluntary Remediation Program (VRP) to conduct remediation of smelter-affected soils in the West Plant Site near Superior, Arizona.

Site Background

The historic smelter stack, built by Magma Copper Company, began operating in 1924 and continued operating until 1972. Historic emissions as well as other mineral processing operations (for example, crushing or concentration) at the site, settled onto surrounding soil.

Site Characterization

Site characterization activities were conducted under the regulatory authority of the ADEQ VRP to understand the nature and extent of contamination related to smelter emissions, and to identify the constituents of concern (COCs) in the soil. COCs are constituents that have the potential to cause adverse health effects for people who have consistent and routine exposure to the affected soil. The results indicated that the COCs for the smelter-affected soil are arsenic, copper, and lead.

Site-specific soil remediation levels were developed for the three COCs in accordance with Arizona Administrative Code (AAC) R18-7-206, and were approved by the ADEQ VRP.

Remedial Action

RCML developed a Remedial Action Work Plan (RAWP) that was approved by the ADEQ VRP. Under this plan, smelter-affected soil will be excavated and transported to Tailings Pond 6, located at the north end of the West Plant Site. There, the affected soil will be used as mass grading fill as part of reclamation efforts. Tailings Pond 6 will be closed with cover material as part of the Aquifer Protection Permit requirements.

The soil remaining after excavation will be tested to ensure that the concentrations of COCs are below the cleanup levels. Once that excavation and testing are complete, the remaining soil will be revegetated.

Dust control measures will be used during the remedial activities, and dust monitoring will be conducted throughout the remediation to reduce the potential for on-site dust levels, and to reduce the potential for dust to travel off-site.

Schedule

Remediation is expected to begin in April 2016 and continue through about September 2016.

How Can You Be Involved?

You are invited to review and submit written comments on the RAWP during the public comment period listed in the sidebar.

ADEQ VRP will respond in writing to all comments received. The public is encouraged to participate in this process.

FACT SHEET
March 2016

For technical questions, please contact:

Joey Pace
Project Manager
Voluntary Remediation Program
Arizona Department of Environmental Quality
1110 W. Washington St., Phoenix, AZ 85007
(602) 771-4818
jp8@azdeq.gov

For other questions or to be placed on the site mailing list, please contact:

Casey McKeon, PhD
Environmental Manager
Resolution Copper Mining LLC
102 Magma Heights
Superior, AZ 85173
(520) 689-3254
casey.mckeon@resolutioncopper.com

Public Comment Period:
Parties wishing to submit written comments regarding the RAWP, may write to the contacts provided above.

Comments must be postmarked or received by RCML no later than 5 p.m. on May 6, 2016.

Documents are available for public review at:

http://resolutioncopper.com
and
https://azdeq.gov/environ/waste/cleanup/vrp.html

Si desea esta información en Español, por favor llame al (602) 771-4189 ó sin tarifa al (800) 234-5677 y marque el número 2 para Español.

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