COMPLETION REPORT
INTERIM REMEDIAL ACTION
GROUNDHOG MINE STOCKPILE
HANOVER AND WHITEWATER CREEKS INVESTIGATION UNIT

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February 19, 2009 073-92553-03

668202

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1.0 INTRODUCTION

This completion report summarizes the reclamation of the Groundhog Mine Site within the Hanover and Whitewater Creeks Investigation Unit (HWCIU) under an Interim Remedial Action (IRA) pursuant to the Administrative Order on Consent (AOC) for Freeport McMoRan Chino Mines Company (Chino). This work was performed in accordance with the IRA Work Plan (Chino, 2003).

The Groundhog Mine Site location is shown on Figure 1. Originally, there were five stockpiles at the Groundhog Mine Site (Figure 2), identified as G1 through G5 in the IRA Groundhog Mine Site Investigation Report (SIR; Golder Associates Inc. [Golder], 2001).

Chino removed stockpile material and hauled it to the West Stockpile near the Santa Rita Pit. The New Mexico Environment Department (NMED) allowed Chino to relocate the Groundhog stockpiles to the Chino West Stockpile, consistent with the terms of Chino Discharge Plan 526 (DP-526). Material was removed to bedrock at all stockpile locations.

Following stockpile removal, the excavated surface was characterized according to the Work Plan (Chino, 2003). The site was then reclaimed with a vegetated soil cover, shafts associated with the Groundhog Mine were closed, and stormwater control was established. This report describes the removal and reclamation activities, and provides results of the post-removal sampling. A post-removal monitoring plan is also proposed for monitoring for potential erosion, vegetation, and water quality.

This completion report is organized into the following sections. Section 2 states the purposes of the IRA and Section 3 contains the site description and a brief history. Section 4 describes the removal and reclamation activities and Section 5 recounts the monitoring activities during the removal period. Section 6 presents a post-reclamation monitoring plan for the site. A summary is presented in Section 7 and Section 8 contains references.

2.0 STATEMENT OF PURPOSE

This section discusses the objectives and scope of work of the IRA for the Groundhog Mine site. Stockpile removal at the site and surface reclamation met the objectives of the IRA and were consistent with the long-term objectives of the AOC.

2.1 Interim Action Objectives and Long-Term Strategies

The primary objective of the IRA was to reduce mass-loading of metals and acidity from source materials to groundwater and surface water in accordance with New Mexico Water Quality Control Commission (WQCC) requirements under Regulation 1203. Removal of the Groundhog stockpile material effectively reduced mass-loading from source materials and controls potentially poor-quality surface water discharges and groundwater seepage resulting from past mining activities at the site.

The remedial action implemented at the Groundhog Mine is consistent with the following long-term remedial objectives:

- Preventing future releases to surface water, groundwater, and soil or sediment;
- Limiting direct exposure to waste materials;
- Achieving post-mining land use; preventing erosion; and
- Ensuring physical stability and site safety.

This interim action is also consistent with the long-term strategy for closure/closeout and meets standards prescribed in the AOC agreement. Requirements under the New Mexico Mining Act and rules primarily pertain to returning the disturbed area to a post-mining beneficial use, such as wildlife habitat or grazing. Once vegetation matures on cover material and erosion is stabilized, the area will become a self-sustaining ecosystem for wildlife habitat and/or grazing.

2.2 Interim Remedial Action Scope of Work

The IRA was conducted in three phases. The first phase included a site investigation as described in the SIR (Golder, 2001), and a seepage collection system was constructed as a temporary measure to collect shallow groundwater. The second phase involved the development of the IRA Work Plan for removing the stockpiles (Chino, 2003). The third phase of the remedial action involved the excavation of the stockpiles based on the Work Plan.

3.0 BACKROUND AND HISTORY

The Groundhog Mine Site is approximately 1-1/2 miles northeast of Bayard, New Mexico. The site lies within a small canyon that drains into Whitewater Creek. The following sections describe the general hydrogeologic characteristics and historical operations of the site, and some of the actions taken before the IRA.

3.1 Site Characteristics

The Groundhog Mine Site is located in the valley of a north-flowing unnamed tributary to Whitewater Creek, and in Bayard Canyon. Prior to removal activities, stockpile material was underlain by unconsolidated alluvium and colluvium up to 10 feet thick. Bedrock at the site is the Kneeling Nun Tuff, Sugarlump Tuff, quartz monzonite, and grandiorite. The main structural feature in the area is the Groundhog Fault, which strikes northeast and dips to the east. The fault occurs along the eastern edge of the site.

Prior to removal of stockpile materials and alluvium/colluvium at the site, water infiltrated from the surface into the stockpile materials and alluvium during storms and snow melt. Due to the naturally low permeability of the bedrock, infiltrating water perched on the bedrock contact and flowed laterally, down gradient along the contact in the direction of the natural surface drainage (Golder, 2001).

A deeper groundwater system underlies the bedrock at the site. Based on measurements from three monitoring wells in the vicinity of the site and an evaluation of site topography, depth groundwater ranges from 25 to 100 feet below ground surface (Golder, 1999). Groundwater flow between bedrock and the alluvium/colluvium is limited by the marked contrast in permeability between the two units; the bedrock is estimated to be 3 to 5 orders of magnitude less permeable than the alluvuim (Golder, 1999). Based on the magnitude of this contrast, seepage downward from the alluvium/colluvium is minor compared to flow along the bedrock surface.

Mining-related materials at the Groundhog Mine are described in detail in the SIR (Golder, 2001). The investigation delineated the following areas (Figure 2):

- Stockpile G1
- Stockpile G2
- Stockpile G3 East

- Stockpile G3 West
- Stockpile G4
- Stockpile G5
- Valley Fill
- Foundations
- Paved Roadbed

The site removal activities included all of the areas listed above. The lateral and vertical extents of potentially acid-generating materials was defined in the SIR (Golder, 2001). The SIR estimated the total volume of mine and mine-impacted materials at the site to be approximately 210,000 cubic yards.

3.2 Historical Operations

Underground mining began at the Groundhog Mine site as early as 1869 (Lasky, 1936), and continued until approximately 1978, producing primarily lead and zinc. The Groundhog vein is located along the eastern edge of the valley, striking generally northeast. Prior to mining, the vein surfaced for approximately ½ mile and extended towards the southwest for another 3,000 feet or more along the east side of Bayard Canyon, where it was covered by Tertiary sedimentary rocks. Near the San Jose Shaft, the vein outcrop formed a "prominent wall of jaspery quartz" (Lasky, 1936).

The Groundhog site was owned by a number of companies over the years; the last operator was ASARCO. Before transferring the property to Chino in 1994, ASARCO relocated several stockpiles associated with the Groundhog Mine from Bayard Canyon to the unnamed tributary and covered them with several inches of cover soil from nearby hillsides.

3.3 Preliminary Interim Remedial Action Activities

In early 1997, Chino published the Health and Safety Plan, which was in effect for all the investigations conducted under the AOC (Chino et al, 1997). Also in 1997, Daniel B. Stephens & Associates (DBSA) conducted the Phase I Investigation, which included the Groundhog Mine Site (DBSA, 1997). Golder further investigated the area in 1999 and reported the findings in the Comprehensive Groundwater Characterization Study (Golder, 1999). Golder also produced the Site Investigation Report (2001) for the HWCIU.

Chino initiated the following temporary measures preceding the IRA at the Groundhog Mine site:

- The unnamed tributary has a drainage area of approximately 100 acres. Chino constructed a temporary concrete cutoff wall that tied into bedrock down gradient of the stockpiles, with the exception of G4, in 1996. The cutoff wall was constructed with a gravity drain to a collection sump in Whitewater Creek. Diversion ditches were also excavated that same year to divert much of the upgradient surface-water run on around the site.

- In August 1999, during a season of heavy rains, groundwater seeps were observed upgradient of the cutoff wall. The gravity drain was then replaced with a pump and connected to a process water line to Reservoir 16.

- In June 2000, Chino installed a drain field upgradient of the cutoff wall and extended the capture area of the cutoff wall with a subsurface high-density polyethylene (HDPE) hydraulic barrier across a buried portion of the drainage. The drain field was also covered with an HDPE liner that captured seepage from the stockpiles, while allowing unaffected surface water to run off into Whitewater Creek.

- A historical tin can plant was discovered beneath a culvert down gradient of the cutoff wall and excavated in 2001. A sump was excavated down gradient and a pump was installed.

- Early in 2003, the subsurface HDPE hydraulic barrier was replaced with a concrete wall keyed to the original cutoff wall. Due to its position, down gradient of the seepage collection system, Stockpile G4 was removed in February 2003, and placed on the Chino West Stockpile. Later in 2003, Chino published the AOC IRA Work Plan for the Groundhog Mine Site, which guided the work described in this completion report.

4.0 STOCKPILE REMOVAL

The IRA for the Groundhog Mine Site required removing all potentially acidic stockpile material, affected soil and bedrock, roadbed, and foundation materials. This section discusses the activities associated with stockpile removal and reclamation. Figures 3 through 12 are photographs of the removal and reclamation activities.

4.1 Pre-Excavation Preparation

Prior to excavation of material from the Groundhog site, existing utilities were located and marked by Blue Stake, and surveyed for addition to Chino's base map for future reference. Historical mine opening locations were also surveyed as part of the Blue Stake process.

Stormwater run on diversion channels had already been excavated upgradient of the stockpiles (Section 2.3). The existing seepage collection system was excavated, creating a basin behind the cutoff wall to contain stormwater runoff and act as a settling basin during excavation. Pumps removed the collected stormwater and transported it to Reservoir 17, consistent with the National Pollutant Discharge Elimination System (NPDES) requirements for construction sites.

4.2 Stockpile Excavation

Chino excavated materials from December 2003 until completion in November 2005. Excavation occurred intermittently due to the need for infrastructure relocation (Section 4.3). Using front-end loaders and track hoes, impacted materials were excavated to bedrock, where possible, given the limitations of terrain and equipment. Bedrock was then scraped to remove weathered surfaces. The stockpile material, which was left in place along the existing pipeline corridor and in the immediate vicinity of the telemetry station (Figure 13), will be addressed during closure under DP-1340.

The excavated material was transported to the West Stockpile using haul trucks. Approximately 270,000 tons of material were actually excavated during removal. This excludes the G4 Stockpile, which had already been removed prior to submittal of the IRA Work Plan. Excavated material was placed on the eastern side of the West Stockpile, within a permitted area for leaching under DP-526.

4.3 Infrastructure Relocation

Chino relocated infrastructure at the site intermittently during excavation activities. Power lines were de-energized as needed and poles removed for the duration of localized excavation activities. The

existing pipeline corridor and telemetry station (Figure 2) remain operational and will be addressed under closure.

4.4 Shaft Closure

Exposed mine openings at the Groundhog Mine were closed as required by the IRA Work Plan (Chino, 2003). Four shafts were identified in the IRA Work Plan, including the San Jose Shaft, the Groundhog North Shaft, the Groundhog No. 1 Shaft, and the Homestake Shaft. An additional glory hole was also identified near the San Jose Shaft. During removal activities, only the San Jose Shaft and San Jose Glory Hole were encountered, as well as a sinkhole near the San Jose Shaft that was likely a caved-in former stope to the San Jose Shaft.

The San Jose Shaft and associated sinkhole were closed using a toroid plug covered with a cabled tire mat and a mounded soil cover graded to drain surface water off the areas. Chino determined that the San Jose Glory Hole was adequately plugged with fill and debris and did not pose a safety hazard. Minor regrading was completed around the plugged opening to enhance stormwater runoff. St. Cloud Mining Company (St. Cloud) installed the toroid plugs and Golder observed the construction. Details of the shaft closure are in Appendix A.

4.5 Reclamation

Mine reclamation objectives require minimizing erosion associated with overland runoff and concentrated flows from high precipitation storm events. The overall goal was to provide a stable surface that enhances vegetation growth and allows the establishment of a self-sustaining eco-system. The completed project also protects surface water and groundwater and supports surface stabilization. A soil cover was placed on excavated surfaces that were not in use as stormwater collection ponds or roads. The soil cover was re-vegetated and surface-water controls established. Ultimately, revegetation of the site will reduce erosion and enhance the post-mining uses.

4.5.1 Cover Placement

After excavation, a 1-foot-thick layer of soil was placed over the remaining bedrock as a growth medium for vegetation. Cover soil was excavated from a local borrow area on the west side of the valley (Figure 13). The loose cover soil was scarified after placement to enhance seed germination. The cover soil was excavated from the borrow area and placed on the post-removal surfaces by St. Cloud. Construction oversight was provided by Telesto Solutions, Inc. (Telesto). Details of the construction activities are included in Appendix B. Figure 13 shows the borrow area and cover

placement area. The area shown in Figure 13 as "collapsed mine workings" was covered during shaft closure (Appendix A) by St. Cloud with engineering oversight by Golder.

4.5.2 Revegetation

Native seeds and mulch were spread on the soil cover and borrow area (Figure 13) with a hydroseeder by Freeport McMoRan Reclamation Services, who routinely perform this task for current closure sites in New Mexico and Arizona. Seeds were spread at the application rate specified in the IRA. The seed mixture and application rates are listed in Table 1. The native vegetation will provide forage, seeds, and cover for reptiles, small mammals, and birds common to the area, which will also benefit from the increased insect populations that are likely to accompany vegetation growth. The shrubs, grasses, and forbs will provide forage and browse for larger native animals such as deer and javelina. Functions and attributes of the primary plant species are listed in Table 2.

4.5.3 Surface Water Controls

Stormwater controls implemented during stockpile excavation and soil cover placement include maintenance of the east and west diversion ditches (Figure 14), containment of all stormwater runoff in two stormwater ponds, and erosion control measures such as hay bales, berms, and swales. The east and west diversion ditches were constructed prior to removal activities to divert unimpacted water around the Groundhog Mine Site. The east diversion ditch was constructed by Chino in 1996 prior to site characterization (Golder, 2001). The west diversion ditch was installed by Chino in 2002. Diversion ditches are designed to convey the 25-year, 24-hour storm event in accordance with the approved IRA Work Plan (Chino, 2003).

After the excavation was completed, drainage swales were established and riprap was installed by St. Cloud, with oversight by Telesto. Riprap was installed along the channel banks where runoff is routed through the site to control erosion of the soil cover by channel flow.

Currently, all stormwater runoff from the site is contained in the two stormwater ponds. Stormwater is pumped to Reservoir 17 via pumps and pipelines installed in each pond. The upper stormwater pond will be pumped dry after rainfall events to minimize the potential for seepage through the stockpile-supported pipeline corridor. Chino will continue this practice until vegetation becomes established and water quality improves (Section 6.0). When water quality improves in the upper stormwater pond, water may be pumped to a location downstream of the haul road for discharge offsite until cessation of operations when the haul road material and old pipeline corridor material will be removed.

5.0 CONSTRUCTION PERIOD MONITORING

The engineering oversight and environmental monitoring performed during removal and reclamation activities are described in this section. The long-term monitoring plan is presented in Section 6.0.

5.1 Air Monitoring

Dust suppression was conducted during excavation activities by wetting roads and operation sites, and the few occasions when visible dust was observed on an active stockpile removal site. Dust suppression was not necessary except for haul truck activities, as the stockpile materials were usually moist. Because the dust was easily controlled, Chino determined that air monitors were not needed.

5.2 Seepage Monitoring

Seepage monitoring consisted of daily inspections below the cutoff wall during field activities. To collect any potential seepage from beneath or around the cutoff wall, a sump was excavated downgradient and a pump was installed.

5.3 Engineering Oversight

The scope of the engineering oversight included supervising the excavation/reclamation process to make sure that the interim remedial action and post-removal sampling meet the guidelines of the Work Plan (Chino, 2003).

5.3.1 Oversight of Removal and Reclamation Activities

Chino provided oversight of relocation or removal of infrastructure, excavation activities, and control of surface water during excavation activities, including constructing the west diversion ditch.

Oversight of borrow area preparation and excavation, and soil cover placement was provided by Telesto (Appendix B) except for the shaft closure area. Oversight for shaft closure and soil cover installation in the shaft area was provided by Golder (Appendix A).

5.3.2 Post-Removal Sampling

The purpose of post-removal sampling was to document the geochemical nature and distribution of the remaining bedrock surface. Intrusive veins and dikes at the site are naturally mineralized. Understanding the chemical nature of the bedrock provides insight into changes and trends in the quality of shallow seepage as the system stabilizes. After excavation of stockpile materials, the

geology of the bedrock surface was mapped by a Chino field geologist. Bedrock geology is shown on Figure 14. Geologic units encountered during field mapping include:

- **Kneeling Nun and Sugarlump Tuff (Tkn)** – These units are not differentiated on Figure 14, but are both included as Kneeling Nun Tuff. This unit occurred along the slopes above the valley.
- **Tertiary Quartz Monzonite (Tqm) –** This unit is a post-mineralization dike occurring near the lower stormwater pond and in the center of the valley on the southern portion of the site.
- **Tertiary Granodiorite (Tgr)** – This unit is differentiated on Figure 14 as either biotized or phyllically altered. Phyllically altered granodiorite occurred only in areas proximal to mineralized veins and mine shafts. The majority of the site was mapped as biotized granodiorite.
- **Jasperoid Vein** – This unit is a mineralized and altered vein within the phyllically altered granodiorite. This vein is hard and resistant to weathering.

Stratified sampling was performed by Golder, with each strata being a visually identified surficial geologic unit within each of three areas (Figure 14):

- **GU Area -** Upper Groundhog area draining to the upper stormwater pond,
- **GL Area -** Lower Groundhog area draining to the lower stormwater pond, and
- **G4 Area** – Former Stockpile G-4.

Golder sampled each material that might differ in its chemical composition and was present in sufficient surface area to influence the overall geochemical behavior of the area. Sample locations are shown on Figure 14. Golder described the general texture of each sample and photographed each location. Sample logs, including photographs and geologic descriptions, are in Attachment C.1 of Appendix C.

Post-removal sample analyses included X-Ray Fluorescence (XRF) analysis of selected metals, total metals analysis, acid-base accounting (ABA), and Synthetic Precipitation Leachate Procedure (SPLP).

Fifty-five grab samples were collected and subjected to XRF analysis and paste pH testing. Results of the XRF analysis and paste pH for the GU, GL, and G4 Areas are compiled in Tables 3, 4, and 5, respectively. The results for the GU and GL Areas are presented with summary statistics for each geologic unit. For the G4 Area, there was only one sample per geologic unit, so summary statistics were inapplicable.

Based on the results of the XRF analysis and paste pH, the samples were composited per each geologic unit in GU and GL Areas. None of the four samples collected in the G4 Area were composited, as each represented a different geologic unit. The sample composite summary is listed in Table 6.

Box and whisker plots were used to qualitatively determine whether the XRF data for each geologic unit represent different distributions (Appendix C). Box and whisker plots are graphical representations of the XRF dataset for each geologic unit in the GU and GL Areas. The plots illustrate that the metal concentrations and paste pH were distinctly different between units. Iron concentrations and paste pH showed the greatest distinction between units (Figures 15 and 16).

Twelve composite samples were subjected to laboratory analysis of total metals, ABA, and SPLP (Tables 7 through 9). All of the five samples with low paste pH and classified as likely to generate acid were collected in the GU Area east of the Haul Road. Sample GU-TRG-G5, composited from grab samples collected west of the Haul Road, was classified as having a low potential to generate acid and had a paste pH of 7.28. All samples collected from the GL and G4 Areas were classified non-acid generating.

Note that for all samples classified as potentially acid generating due to natural mineralization or oxidation by the former stockpile cover, the sulfide sulfur content was low (less than 0.3 percent). In fact, for samples GU-JV, GU-TGRP, and GU-TKN, the sulfide sulfur content was so low that acid generation through oxidation is unlikely. The low values for paste pH likely reflect past reactivity, which may have resulted in formation of oxidation products, such as jarosites, which contain stored acidity that is released when they dissolve. The only samples considered to be potentially acid generating due to future sulfide oxidation were GU-TGR and GU-TQM (Table 7) collected in the GU area. While these samples have a relatively low AGP, they are classified as likely to generate acid due to their lack of neutralizing capacity.

Total metals analysis was conducted to determine the nature of the excavated bedrock surface prior to cover material placement. SPLP testing was performed to determine whether metal concentrations identified by total metals analysis have the potential to leach from the stockpiles.

Generally, samples collected from the GU Area east of the Haul Road had higher metal concentrations and leached elevated concentrations of cadmium, copper, manganese, lead, and zinc. This was expected due to the presence of the mineralized jasperoid vein and phyllically altered

granodiorite associated with the ore body. That is, the elevated concentrations are likely naturally occurring background.

The GL and G4 Areas were mineralized to a lesser degree than the GU Area. In samples collected from the GL Area west of the Haul Road, leachate did not contain elevated concentrations of metals or other constituents (Table 9). In samples collected from the G4 Area, leachate did not contain elevated concentrations of metals or other constituents, but did have pH of 8.9 or greater (Table 9).

6.0 POST-RECLAMATION MONITORING

This section presents the post-reclamation monitoring plan for the Groundhog Mine Site. The plan includes monitoring water quality and the vegetation on the soil covers. Following cessation of operations, vegetation and erosion will be monitored until a viable self-sustaining vegetated cover is established for grazing or wildlife habitat post mining land use. The Groundhog site will remain under the oversight of the Chino AOC until the Record of Decision for the Hanover and Whitewater Creeks Investigation Unit has been approved by NMED. Monitoring will then be included as part of the long-term closeout actions for Chino under DP-1340.

6.1 Water-Quality Monitoring

Surface water from the upper and lower stormwater ponds will be sampled semiannually if water is present. The surface-water monitoring will continue until there are up to eight samples over a 2-year period that have either met WQCC standards or have stabilized to background conditions. Samples will be collected from both the lower stormwater sump (which is a standpipe in the pond footprint) and the lower stormwater pond (ponded water on the surface), if present.

Background for the site will be established by inspection of the trends in concentrations vs. time in the surface water data. While some variability in the data over time is expected due to seasonal effects and the amount of precipitation prior to the sampling event, the concentrations are expected to reach consistent levels as vegetation stabilizes the soil cover and disturbed bedrock surfaces are exposed to rainfall and runoff. Evidence of decreasing metals concentrations and increasing pH was shown by the data collected during installation of the soil cover (Figures 17 through 22), and these trends are expected to continue now that the interim closure is complete. Once stabilization is indicated by semiannual sampling data, sampling frequency will increase to quarterly.

Groundwater is currently being monitored from two monitoring wells (GH-20042S and GH-2004-2D) located upgradient of the headwall (Figure 13) as required by the NMED as part of a corrective action described in a letter dated December 3, 2004. Water quality in the location of the wells will be monitored semiannually to track changes resulting from removal of the stockpile material. Results of surface and groundwater monitoring will be reported to NMED annually.

Once surface water quality meets standards or concentrations have stabilized, the cutoff wall will be removed, allowing Groundhog Mine Site stormwater to run into the unnamed tributary and then into

Whitewater Creek. The monitoring wells may then be incorporated into DP-526. This monitoring plan will replace the current plan under the NMED corrective action.

Under the corrective action plan for the site, Chino began semi-annual monitoring and reporting for the lower stormwater sump and pond and the two monitoring wells in October 2004. Analytical data for samples collected from the lower stormwater sump for the corrective action plan are presented in Table 10. These data represent construction-phase monitoring, as the soil cover was not in place until July 2008. Since removal of the stockpiles, metal concentrations have decreased and the pH has increased, showing some water-quality improvement. Figures 17 through 22 show concentrations over time in samples from the lower stormwater sump for cadmium, copper, manganese, lead, zinc, and pH. Water quality is expected to continue to improve as the soil cover becomes stabilized by vegetation. When water meets the criteria necessary to be discharged off site, the site will be included in the site-wide Storm Water Pollution Prevention Plan (SWPPP), pursuant to the Environmental Protection Agency's NPDES, Multi-Sector General Permit program.

Chino proposes to monitor the surface water and groundwater for the following suite of analytes: cadmium, calcium, cobalt, copper, fluoride, iron, magnesium, manganese, nickel, lead, zinc, pH, total dissolved solids, and sulfate. These analytes have been detected in samples from the lower stormwater sump during semiannual monitoring (Table 10) and were detected in SPLP leachate from samples of the stockpile material during the initial site investigation (Golder, 2001). This list of analytes also includes the metals detected in elevated concentrations in the bedrock surface samples discussed in Section 5.3.2.

6.2 Erosion and Vegetation Monitoring

The reclaimed areas will be monitored as follows: The revegetated soil cover and surface-water controls will be inspected, and repaired if necessary, quarterly for 1 year to determine the initial success of the seeding. The surface will be visually monitored for erosion while vegetation physically stabilizes the surface. Thereafter, vegetation will be monitored annually for 4 years as per the IRA Work Plan (Chino, 2003). Results of the vegetation survey will be submitted as part of the annual monitoring report.

Surface-water controls and erosion will be monitored quarterly until surface-water quality allows discharge of water offsite. When surface water can be discharged off site, erosion inspections will be included in the inspection of Best Management Practices under the site-wide SWPPP.

7.0 SUMMARY

The remedial action selected for the Groundhog Mine Site IRA was stockpile removal, reclamation with a vegetated soil cover, and surface-water controls. The IRA was conducted in accordance with the NMED-approved Work Plan (Chino, 2003) from December 2003 to August 2008.

Stockpile material was excavated, removed, and placed on the West Stockpile near the Santa Rita Pit. Chino was permitted to relocate the Groundhog stockpiles to the West Stockpile under the terms of Chino's DP-526. Material was excavated to bedrock at all stockpile locations.

Following stockpile removal, the excavated surface was characterized according to the Work Plan. The site was then reclaimed with a vegetated soil cover, shafts associated with the Groundhog mine were closed, and stormwater control was established.

Results of characterization of the bedrock surface indicate that elevated concentrations of some metals occur naturally; however, some residual acidity and metal concentrations may be present as leachate from the stockpile material prior to removal. Water at the site will be sampled as described in Section 6 to monitor improvements to water quality with time. Surface water will continue to be contained on-site and pumped to Reservoir 17 until samples meet water-quality standards, or when concentrations of monitored constituents has stabilized to local background conditions.

8.0 REFERENCES

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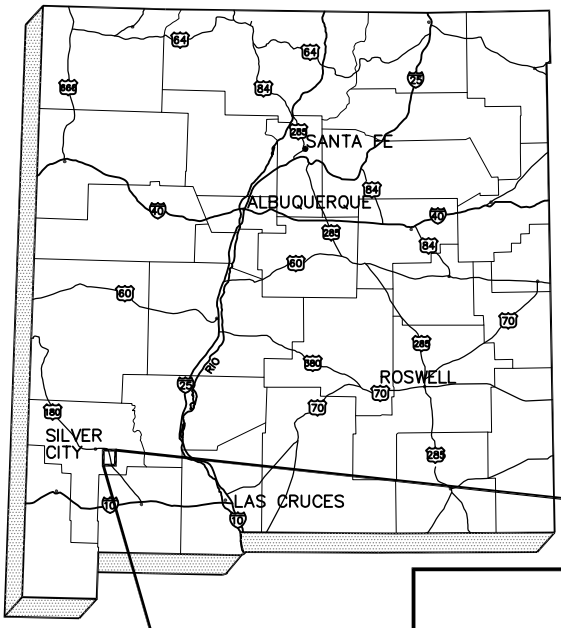
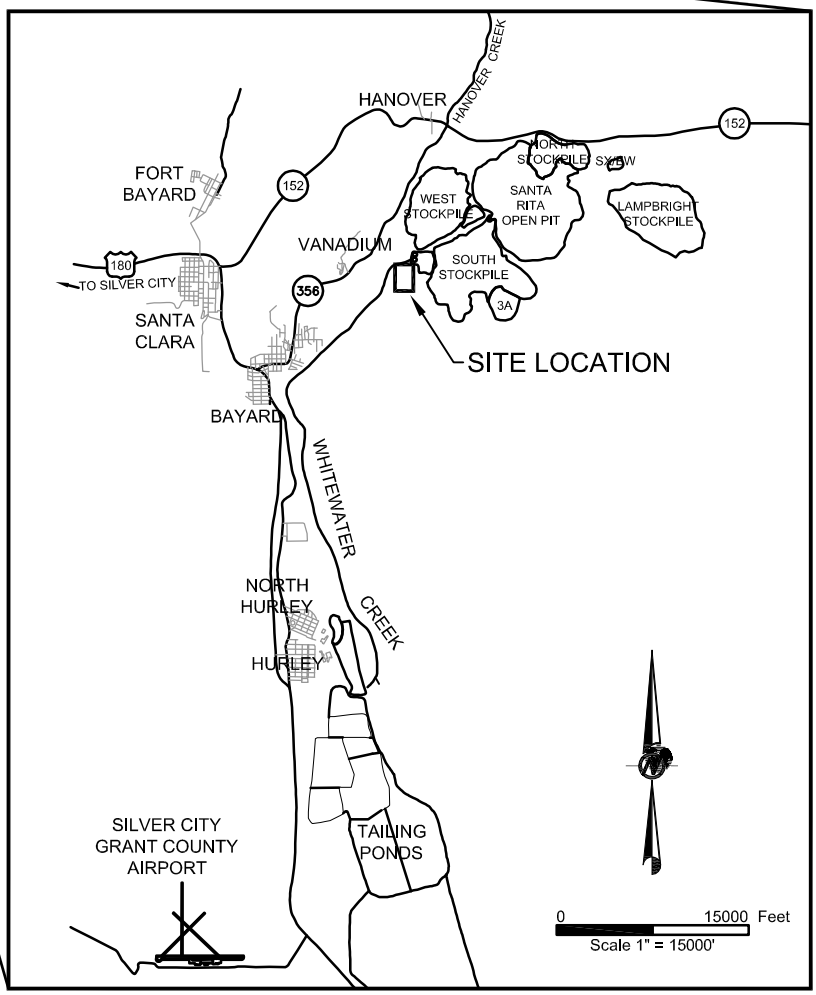
FIGURES



STATE OF NEW MEXICO
(NOT TO SCALE)



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

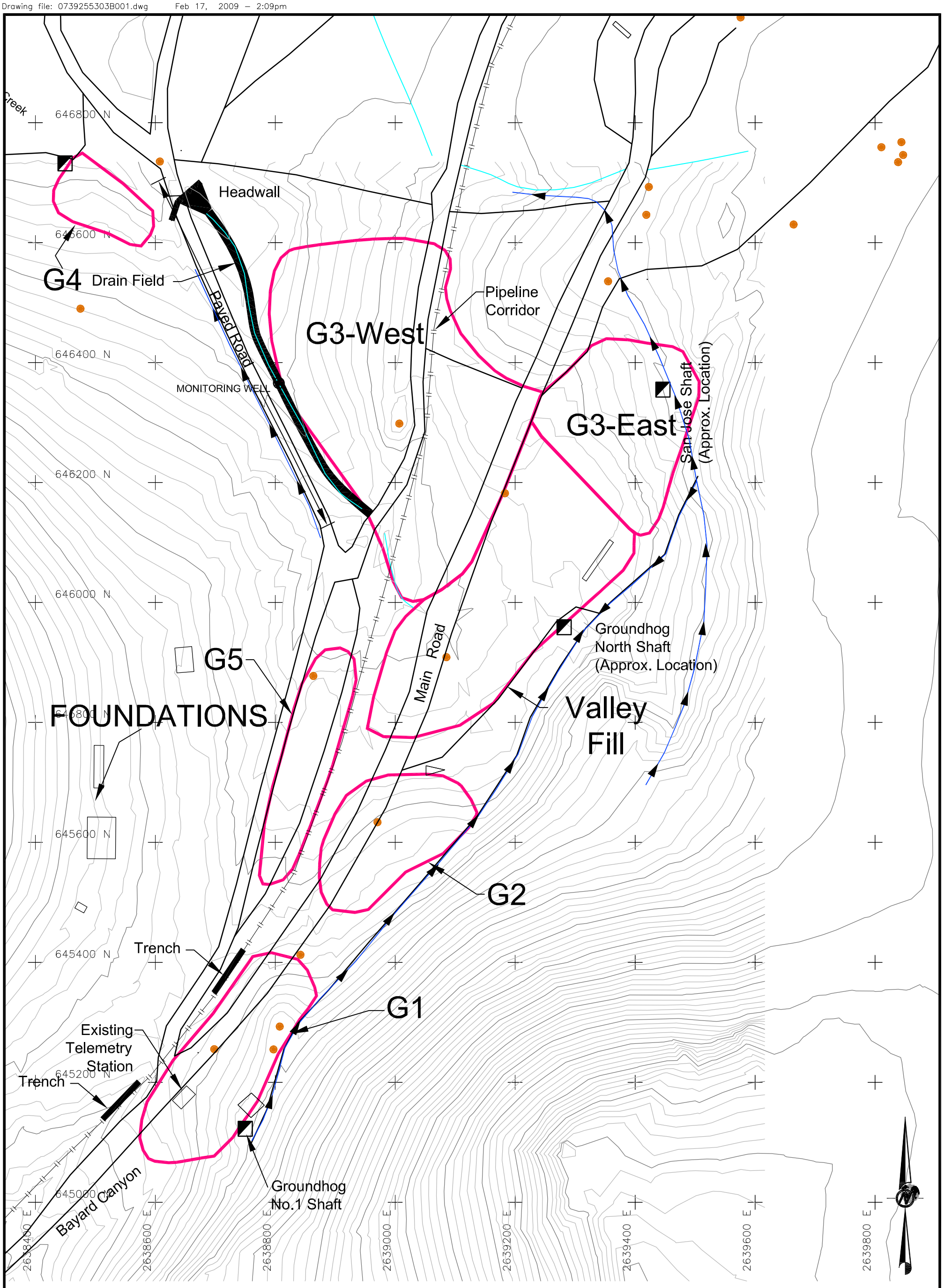
GROUNDHOG MINE SITE LOCATION

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No. 07392553403B002	
DESIGN	JP	12/18/08	SCALE AS SHOWN	REV. A
CADD	ANV	12/22/08	**FIGURE 1**	
CHECK	JP	12/22/08		
REVIEW		02/17/09		

Drawing file: 07392553403B002.dwg Feb 17, 2009 – 1:51pm

Drawing file: 0739255303B001.dwg Feb 17, 2009 – 2:09pm



EXPLANATION

Existing Diversion Ditches

Power Pole

150 0 150

SCALE : 1" to 150' FEET

PROJECT

FREEPORT-McMoRAN COPPER & GOLD
CHINO MINES COMPANY

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

GROUNDHOG PRE-REMOVAL SITE LOCATION MAP

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No. 0739255303B001	
DESIGN	JP	12/18/08	SCALE AS SHOWN	REV. A
CADD	ANV	12/22/08	FIGURE 2	
CHECK	JP	12/22/08		
REVIEW		02/17/09		

FIGURE 3: POST-REMOVAL G4 AREA
Stockpile G4 Area following excavation of stockpile material

FIGURE 4: STOCKPILE G3 WEST DURING REMOVAL
Excavation of Stockpile G3 West and drainfield

FIGURE 5: STOCKPILE G3 EAST DURING REMOVAL
Excavation of Stockpile G3 East looking east

FIGURE 6: STOCKPILES G1 AND G2 DURING REMOVAL
Excavation of Stockpiles G1 and G2, view is looking south toward the saddle of Bayard Canyon

FIGURE 7: RELOCATED PIPELINE
New Pipeline Road with relocated pipeline.
View is to the North looking toward post-removal surface of the San Jose Shaft area.

FIGURE 8: POST-REMOVAL BEDROCK SURFACE
Post-removal bedrock surface, panorama looking to the south and west from the San Jose Shaft location.

FIGURE 9: BORROW AREA AND COVER PLACEMENT
Borrow area excavation and cover placement panorama.
View is to the south and west from the San Jose Shaft location.

FIGURE 10: SOIL COVER AT UPPER STORMWATER POND
Groundhog mine site following installation of cover's surface-water controls.
View is to the south from the San Jose Shaft location.

FIGURE 11: REVEGETATED SOIL COVER AT UPPER STORMWATER POND
Revegetated soil cover and upper stormwater retention pond, October 2008.
View is to the south from the San Jose Shaft location.

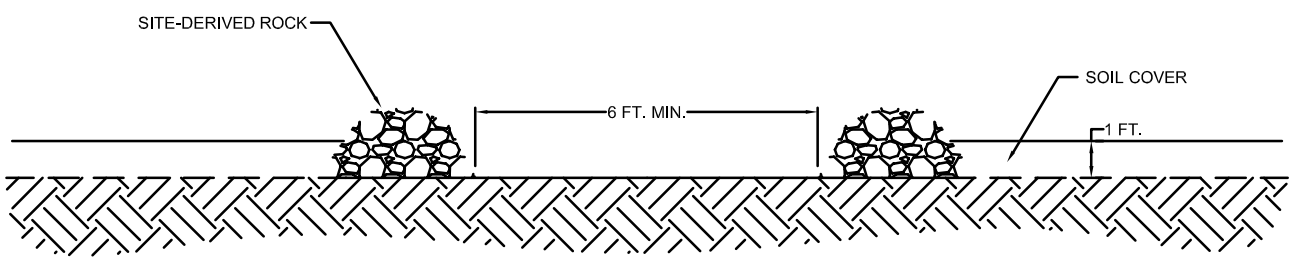
FIGURE 12: REVEGETATED SOIL COVER AT LOWER STORMWATER POND
Revegetated soil cover and lower stormwater retention pond.
View is to the southeast from the location of the Headwall.

Drawing file: telesto figure.dwg Feb 18, 2009 – 2:57pm

STORMWATER CONTAINMENT POND
EXISTING HEADWALL AND SUMP
EXISTING MONITORING WELLS
NEW ACCESS ROAD TO HAUL ROAD
ACCESS ROAD CLOSED WITH BERM
EXISTING WEST DITCH
DRAINAGE SWALE
COLLAPSED MINE WORKINGS
EXISTING EAST DITCH
BORROW AREA
EXISTING CULVERT
DRAINAGE SWALE
EXISTING CULVERT
STORMWATER CONTAINMENT POND
REMOVED FOUNDATIONS
EXISTING LAKE ONE HAULROAD
PIPELINE CORRIDOR
BURIED PIPELINE
ACCESS ROAD
EQUIPMENT STAGING AREA
ACCESS ROAD CLOSED WITH BERM
EXISTING TELEMETRY STATION
ABOVE-GROUND PIPELINE
EXISTING BURIED PIPELINE CORRIDOR
SCALE IN FEET
0
200

LEGEND

- POWER POLES
- SOIL COVER AREAS
- AREAS GRADED PRIOR TO COVERING



DRAINAGE SWALE CROSS SECTION

REFERENCES

FIGURE FROM *DRAFT GROUNDHOG MINE SOIL COVER PLACEMENT PROJECT COMPLETION REPORT*. PREPARED BY TELESTO SOLUTIONS INC., FORT COLLINS CO, JULY 2008.

PROJECT
FREEPORT-MCMORAN COPPER & GOLD
CHINO MINES COMPANY

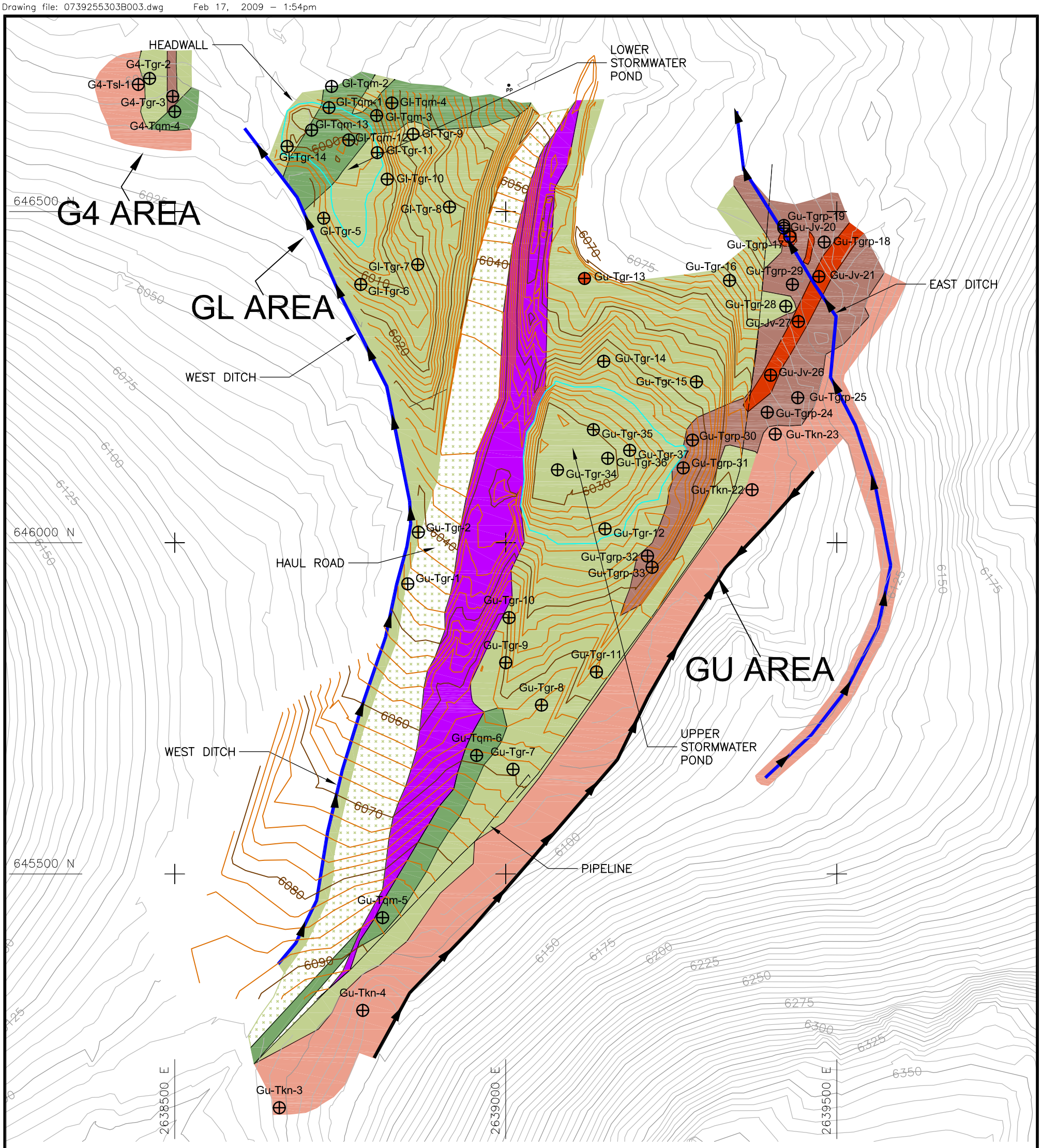
CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE
GROUNDHOG MINE SOIL COVER PLACEMENT

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-05			FILE No. telesto figure	
DESIGN	JP	01/06/09	SCALE AS SHOWN	REV. 0
CADD	HNL	01/06/09	FIGURE 13	
CHECK	JP	01/08/09		
REVIEW		02/18/09		

Drawing file: 0739255303B003.dwg Feb 17, 2009 – 1:54pm



LEGEND

- 6025 — EXISTING GROUND CONTOURS
- 6080 — CONTOURS
- ⊕ — BEDROCK SURFACE SAMPLE LOCATIONS
- DIVERSION DITCHES

GEOLOGIC LEGEND

Tkn	KNEELING NUN TUFF FM OR SUGAR LUMP TUFF FM
Tqm	QUARTZ MONZONITE
Tgr	BIOTIZED GRANODIORITE
Tgr	PHYLLICALLY ALTERED GRANODIORITE
Tgr	JASPEROID VEIN – MINERALIZED AND LEACH CAP ALTERED GRANODIORITE
	PIPELINE CORRIDOR
Tgr	PROJECTED GRANODIORITE

REFERENCES

1.) GEOLOGY PROVIDED BY FREEPORT–McMORAN CHINO MINES COMPANY.

150 0 150

SCALE: 1" to 150' FEET

PROJECT

FREEPORT-McMORAN COPPER & GOLD
CHINO MINES COMPANY

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

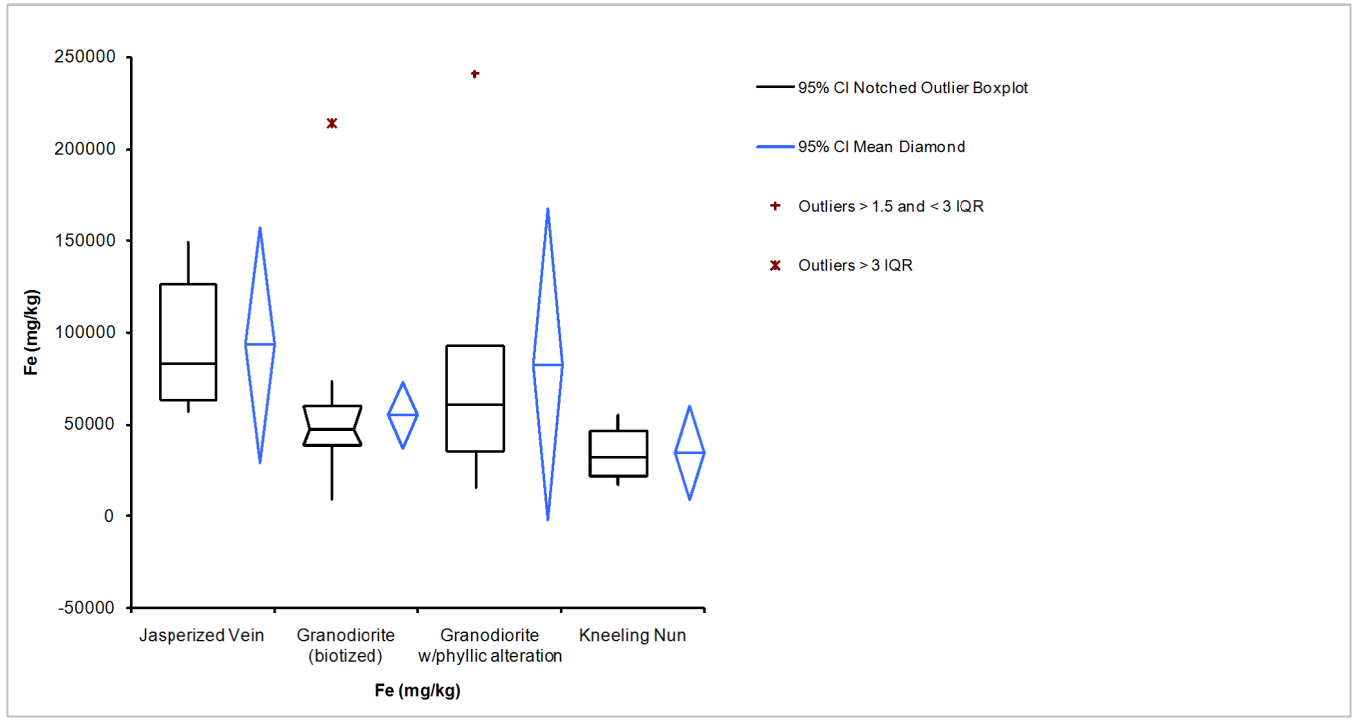
GEOLOGY OF POST-REMOVAL SURFACE AND SAMPLE LOCATIONS GROUNDHOG MINE SITE

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-05			FILE No. 0739255303B003	
DESIGN	JP	07/17/08	SCALE AS SHOWN	REV. A
CADD	NIL	07/17/08		
CHECK	JP	01/08/09		
REVIEW		02/17/09		

FIGURE 14

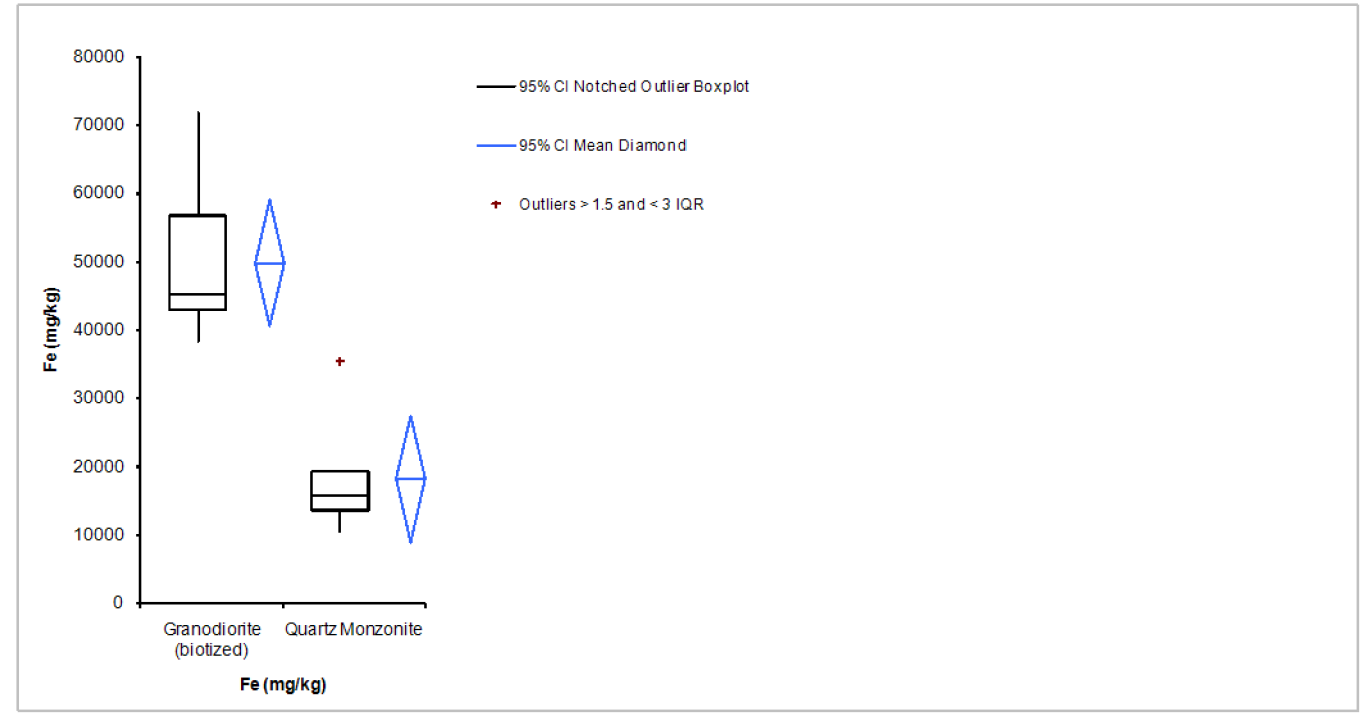
UPPER AREA



Fe (mg/kg)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	93083.670	28967.714 to 157199.626	20146.7553	40293.5107
Granodiorite (biotized)	21	54726.911	36519.261 to 72934.562	8728.6536	39999.7159
Granodiorite w/phyllic alte	6	82522.107	-2541.910 to 167586.123	33091.3518	81056.9269
Kneeling Nun	4	34203.603	8832.047 to 59575.158	7972.3450	15944.6900

Fe (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	56962.95	63667.488	83015.800	- to -	125855.809	149340.13	62188.322
Granodiorite (biotized)	21	9147.78	38786.990	47005.130	39179.170 to 59610.380	60038.663	213827.41	21251.673
Granodiorite w/phyllic alte	6	15231.07	35542.524	61236.925	15231.070 to 240320.390	93101.817	240320.39	57559.293
Kneeling Nun	4	17153.14	22095.611	32196.990	- to -	46980.465	55267.29	24884.854

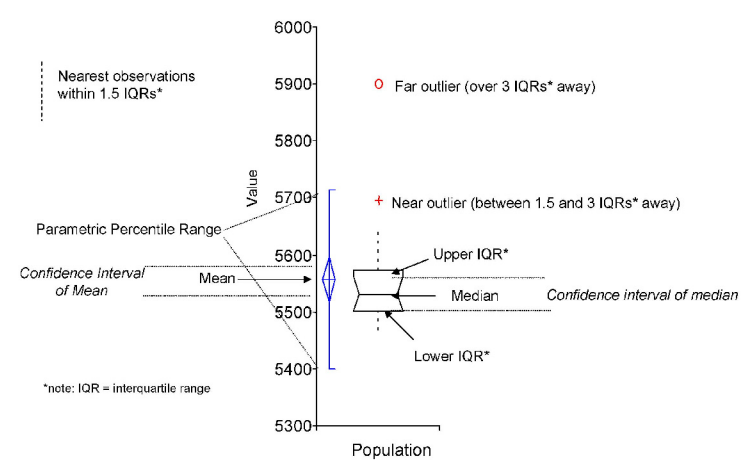
LOWER AREA



Fe (mg/kg)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	49862.479	40564.747 to 59160.210	3932.0128	11121.4117
Quartz Monzonite	6	18086.495	8790.875 to 27382.115	3616.1546	8857.7336

Fe (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	38301.81	42797.243	45242.190	38301.810 to 71875.480	56828.918	71875.48	14031.675
Quartz Monzonite	6	10293.90	13520.209	15695.060	10293.900 to 35329.330	19161.878	35329.33	5641.669

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO MINES COMPANY

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

BOX AND WHISKER PLOT
IRON
UPPER AND LOWER AREA

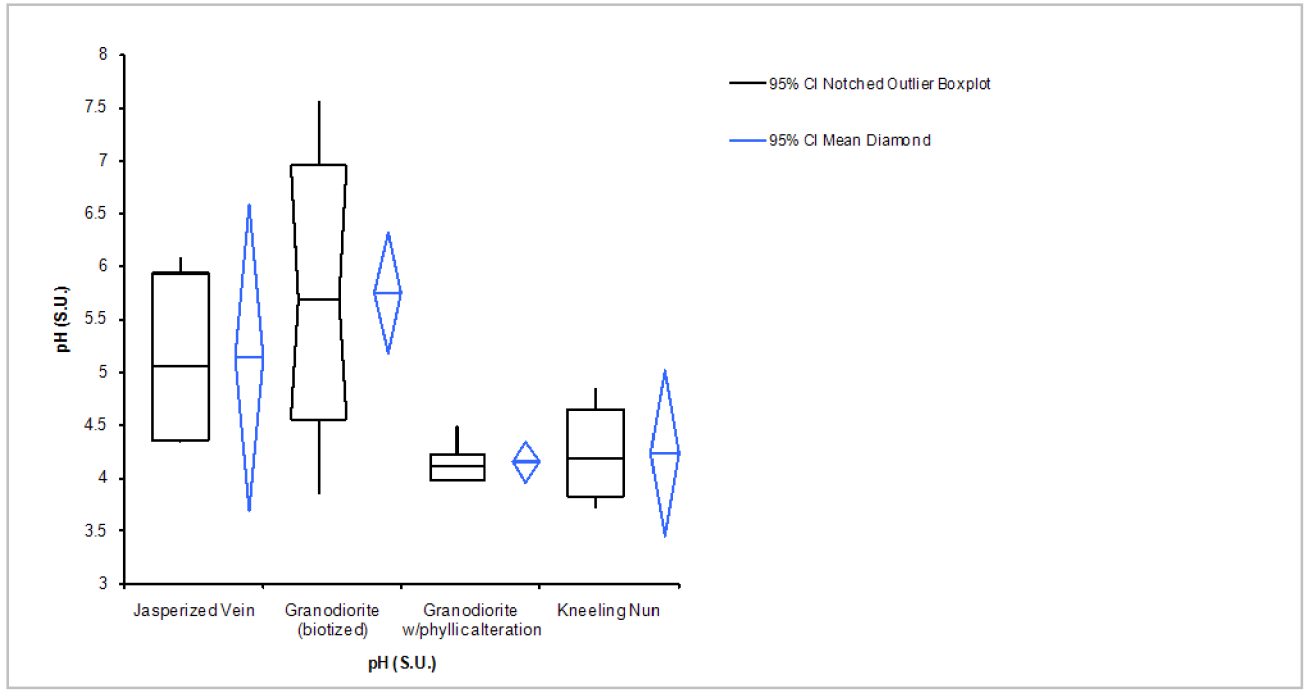
Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B004	
DESIGN	HNL	01/07/09	SCALE	N/A	REV. A
CADD	HNL	01/07/09			
CHECK	JP	01/08/09			
REVIEW		02/17/09			

FIGURE 15

Drawing file: 07392553B004.dwg Feb 17, 2009 – 2:02pm

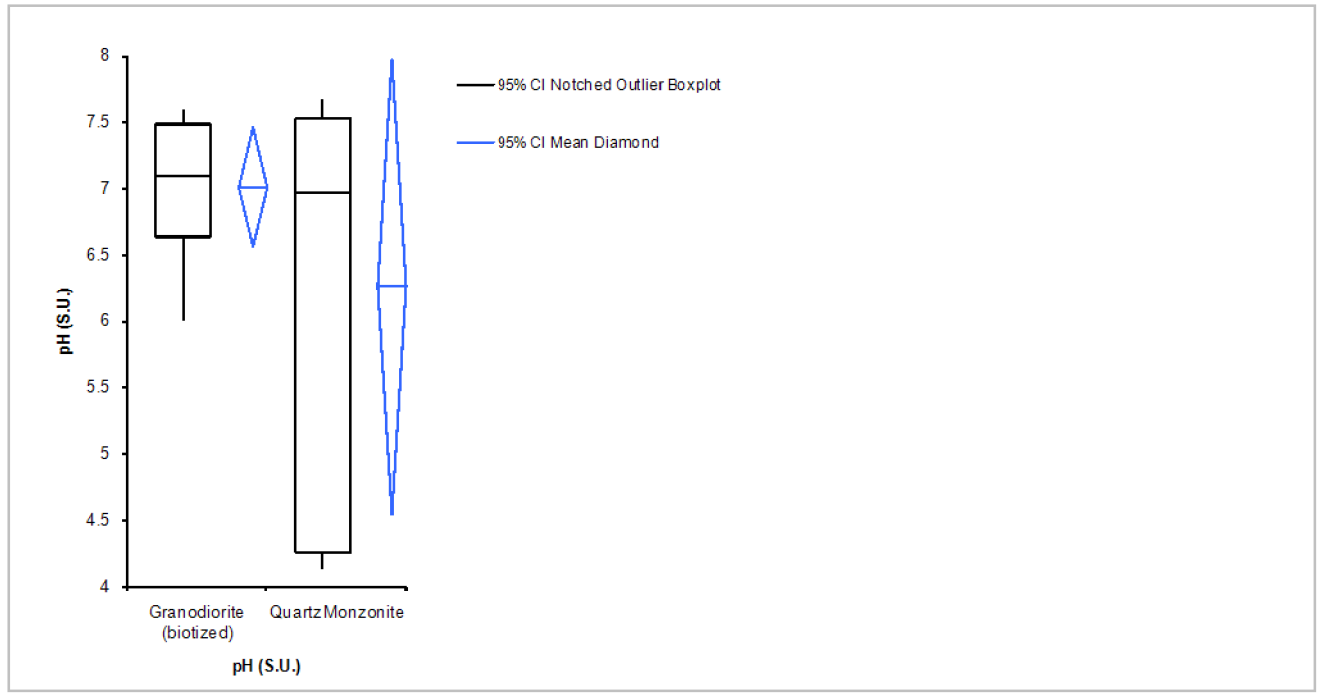
UPPER AREA



pH (S.U.)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	5.135	3.686 to 6.584	0.4554	0.9108
Granodiorite (biotized)	21	5.747	5.170 to 6.323	0.2762	1.2658
diorite w/phyllic alteration	6	4.147	3.948 to 4.345	0.0771	0.1889
Kneeling Nun	4	4.233	3.448 to 5.017	0.2466	0.4931

pH (S.U.)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	4.34	4.353	5.060	- to -	5.943	6.08	1.590
Granodiorite (biotized)	21	3.85	4.553	5.680	4.620 to 6.890	6.957	7.56	2.403
diorite w/phyllic alteration	6	3.98	3.980	4.115	3.980 to 4.490	4.224	4.49	0.244
Kneeling Nun	4	3.72	3.828	4.180	- to -	4.654	4.85	0.826

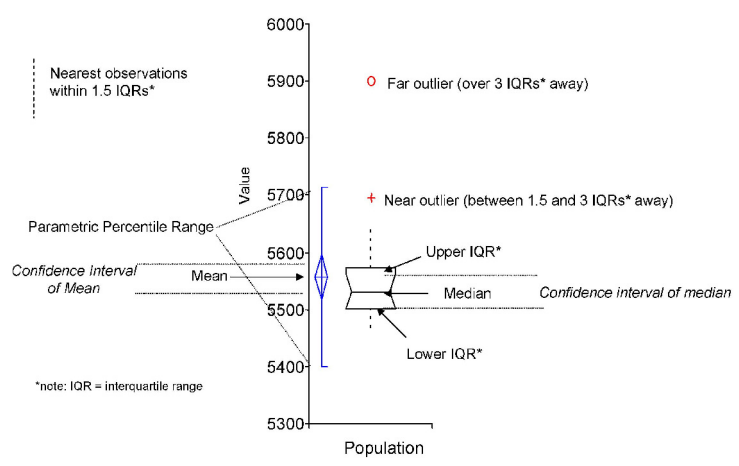
LOWER AREA



pH (S.U.)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	7.008	6.552 to 7.463	0.1928	0.5454
Quartz Monzonite	6	6.253	4.538 to 7.969	0.6675	1.6350

pH (S.U.)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	6.01	6.639	7.095	6.010 to 7.600	7.484	7.60	0.845
Quartz Monzonite	6	4.13	4.249	6.970	4.130 to 7.670	7.533	7.67	3.283

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO MINES COMPANY

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

BOX AND WHISKER PLOT
PASTE pH
UPPER AND LOWER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B005
DESIGN	HNL	01/07/09	SCALE N/A	REV. A
CADD	HNL	01/07/09		
CHECK	JP	01/08/09		
REVIEW		02/17/09		

FIGURE 16

Drawing file: 07392553B005.dwg Feb 17, 2009 – 2:05pm

TABLES

TABLE 1
SEED MIX USED AT THE GROUNDHOG MINE

Species	Life Form	Duration	Seasonality	Proposed Application Rate[a]
Blue grama (Bouteloua gracilis)	Grass	Perennial	Warm	0.25
Side-oats grama (Bouteloua curtipendula)	Grass	Perennial	Warm	1.25
Black grama (Bouteloua eriopoda)	Grass	Perennial	Warm	0.10
Green sprangletop (Leptochloa dubia)	Grass	Perennial	Warm	0.15
Plains lovegrass (Eragrostis intermedia)	Grass	Perennial	Intermediate	0.05
Bottlebrush squirreltail (Sitanion hystrix)	Grass	Perennial	Cool	1.25
Streambank wheatgrass (Agropyron dastachyum v. riparium)	Grass	Perennial	Cool	1.5
Apache plume (Fallugia pardoxa)	Shrub	Perennial	NA	0.1
Winterfat (Eurotia lanata)	Shrub	Perennial	NA	0.60
Yellow Blossom clover (Melilotus officinalis)	Forb	Annual	NA	0.15
Desert globe mallow (Sphaeralcea sp.)	Forb	Perennial	NA	0.1
Blue flax (linum lewisii)	Forb	Perennial	NA	0.15
Sand dropseed (Sporobolus cryptandrus)	Grass	Perennial	Intermediate	0.45
Fourwing saltbush (Atriplex canescens)	Shrub	Perennial	NA	0.9
Total PLS (lb/acre)				**7.45**

Notes: NA = Not applicable
a = Rate is in pounds of pure live seed (PLS) per acre (lb/ac)

TABLE 2
FUNCTIONS AND ATTRIBUTES OF THE PRIMARY PLANT SPECIES PROPOSED FOR THE CHINO MINE RECLAMATION SITES

Species	Character [a]	Attributes and Function
Blue grama (Bouteloua gracilis)	N, P, W, G	Sod and bunch grass providing ground cover and forage
Side-oats grama (Bouteloua curtipendula)	N, P, W, G	Bunch grass providing ground cover and forage
Black grama (Bouteloua eriopoda)	N, P, W, G	Bunch grass providing ground cover and forage
Green sprangletop (Leptochloa dubia)	N, P, W, G	Erect bunch grass; aggressive short-lived nurse plant with forage value
Plains lovegrass (Eragrostis intermedia)	N, P, C, G	Bunch grass providing ground cover and early spring forage
Bottlebrush squirreltail (Sitanion hystrix)	N, P, C, G	Persistent (moderately palatable) bunch grass providing ground cover
Streambank wheatgrass (Agropyron dastachyum v. riparium)	N, P, C, G	Sod-forming grass providing ground cover and forage
Apache plume (Fallugia pardoxa)	N, P, S	Mid-height shrub providing browse, cover, and erosion control
Fourwing saltbush (Atriplex canescens)	N, P, S	Mid-height to tall shrub providing browse and cover
Winterfat (Eurotia lanata)	N, P, HS	Low shrub providing winter browse
Yellow blossom clover (Melilotus officinalis)	I, A/B, F	N-fixing forb providing forage and ground cover
Desert globe mallow (Sphaeralcea sp.)	N, P, F	Persistent mid-height forb providing browse
Sand dropseed (Sporobolus cryptandrus)	N, P, W, G	Warm-season bunch grass providing erosion control of sandy soil
Blue flax (linum lewisii)	N, P, F	Persistent forb with a pretty blue flower

Notes: [a]N = Native
P = Perennial
W = Warm season
G = Grass
C = Cool season
S = Shrub
HS = Half shrub
I = Introduced
A/B = Annual or biannual
F = Forb

TABLE 3
POST-REMOVAL XRF ANALYSES AND PASTE pH
UPPER AREA

Sample ID	Cd (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Paste pH s.u.
Jasperized Vein								
GU-JV-20	<79.5	<384.16	291.56	92,977.76	1,538.08	2,608.90	955.59	6.08
GU-JV-21	<82.67	<511.63	167.93	149,340.13	2,963.62	419.07	195.24	5.75
GU-JV-26	<78.95	<347.5	873.27	73,053.84	7,747.09	1,070.86	684.06	4.37
GU-JV-27	<74.6	<288.41	1,025.57	56,962.95	3,963.14	1,849.05	1,223.53	4.34
Count	4	4	4	4	4	4	4	4
Non-Detect Count	4	4	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	1,025.57	149,340.13	7,747.09	2,608.90	1,223.53	6.08
Minimum	NA	NA	167.93	56,962.95	1,538.08	419.07	195.24	4.34
Mean	NA	NA	589.58	93,083.67	4,052.98	1,486.97	764.61	5.14
Median	NA	NA	582.42	83,015.80	3,463.38	1,459.96	819.83	5.06
Standard Deviation	NA	NA	423.15	40,293.51	2,656.18	949.28	438.84	0.91
Coefficient of Variation	NA	NA	0.72	0.43	0.66	0.64	0.57	0.18
Granodiorite (biotized)								
GU-TGR-1	<70.31	<216.57	116.65	35,687.17	158.86	2,140.06	658.37	7.56
GU-TGR-2	<69.74	<223.04	290.89	39,179.17	428.73	2,379.56	1,108.63	7.36
GU-TGR-7	<77.16	<279.7	1,068.43	49,317.88	6,135.22	2,036.73	1,883.02	5.68
GU-TGR-8	<53.35	210.82	279.48	11,687.75	1,101.88	396.95	537.88	4.62
GU-TGR-9	<54.39	170.56	144.69	9,147.78	1,966.66	296.94	564.76	6.58
GU-TGR-10	<70.54	<219.17	339.20	35,954.09	939.17	2,037.84	1,411.96	7.09
GU-TGR-11	<73.83	<263.75	1,428.99	48,120.56	3,304.17	3,004.43	3,191.56	4.42
GU-TGR-12	<72.21	<227.8	227.05	38,002.63	1,066.27	1,200.27	4,525.59	7.32
GU-TGR-13	<95.16	1097.81	413.82	213,827.41	3,069.38	825.54	4,184.28	4.74
GU-TGR-14	<71.14	<248.94	65.67	46,607.38	1,381.33	4,356.97	1,322.94	7.22
GU-TGR-15	<86.4	<370.1	1,553.77	73,062.41	15,783.75	4,602.07	1,998.64	5.48
GU-TGR-16	<75.49	<284.98	572.27	55,314.77	3,052.65	3,878.93	1,006.79	4.04
GU-TGR-17	<74.5	<290.87	873.82	59,610.38	1,748.51	7,813.78	3,693.83	6.89
GU-TGR-18	<79.68	<346.45	3,320.31	73,587.91	6,128.60	5,884.28	6,636.57	6.45
GU-TGR-19	<73.88	<295.29	538.79	60,895.23	1,645.47	4,713.62	2,227.73	6.82
GU-TGR-28	<74.04	<278.12	351.96	55,551.52	949.58	5,581.40	1,965.50	5.56
GU-TGR-29	<74.07	<311.9	476.77	67,035.82	1,742.99	3,099.92	1,847.38	4.64
GU-TGR-34	<72.45	<240.09	355.48	41,008.23	1,152.04	5,094.25	2,879.39	5.75
GU-TGR-35	<73.62	<237.64	676.74	41,962.55	551.24	5,188.00	2,375.80	3.85
GU-TGR-36	<70.99	<246.05	396.58	46,699.37	251.46	4,804.16	2,928.52	4.38
GU-TGR-37	76.28	<254.28	686.50	47,005.13	515.89	3,820.78	1,486.26	4.23
Count	21	21	21	21	21	21	21	21
Non-Detect Count	20	18	0	0	0	0	0	0
Non-Detect %	95	86	0	0	0	0	0	0
Maximum	76.28	1,097.81	3,320.31	213,827.41	15,783.75	7,813.78	6,636.57	7.56
Minimum	76.28	170.56	65.67	9,147.78	158.86	296.94	537.88	3.85
Mean	76.28	493.06	675.14	54,726.91	2,527.33	3,483.64	2,306.45	5.75
Median	76.28	210.82	413.82	47,005.13	1,381.33	3,820.78	1,965.50	5.68
Standard Deviation	NA	524.11	725.78	39,999.72	3,469.39	1,993.74	1,511.25	1.27
Coefficient of Variation	NA	1.06	1.08	0.73	1.37	0.57	0.66	0.22
Granodiorite w/phyllic alteration								
GU-TGRP-24	<84.34	<385.08	752.36	79,718.31	9,147.83	2,016.97	907.05	4.49
GU-TGRP-25	<61.39	<128.84	876.67	15,231.07	540.41	111.71	766.64	3.98
GU-TGRP-30	<70.28	<223.96	2,181.31	37,389.02	360.03	359.56	437.04	4.12
GU-TGRP-31	<71.43	<251.39	925.76	45,878.37	2,640.62	741.65	799.08	4.2
GU-TGRP-32	<92.85	<712.72	627.06	240,320.39	3,323.58	407.60	1,264.96	4.11
GU-TGRP-33	<80.1	<356.4	1,576.72	76,595.48	4,845.11	3,136.17	3,183.98	3.98
Count	6	6	6	6	6	6	6	6
Non-Detect Count	6	6	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	2,181.31	240,320.39	9,147.83	3,136.17	3,183.98	4.49
Minimum	NA	NA	627.06	15,231.07	360.03	111.71	437.04	3.98
Mean	NA	NA	1,156.65	82,522.11	3,476.26	1,128.94	1,226.46	4.15
Median	NA	NA	901.22	61,236.93	2,982.10	574.63	853.07	4.12
Standard Deviation	NA	NA	600.33	81,056.93	3,258.59	1,192.86	995.25	0.19
Coefficient of Variation	NA	NA	0.52	0.98	0.94	1.06	0.81	0.05
Kneeling Nun								
GU-TKN-22	<69.77	<196.33	534.06	29,015.07	1,259.88	679.16	627.20	4.85
GU-TKN-23	<66.63	<144.82	427.92	17,153.14	1,321.95	465.61	745.65	4.38
GU-TKN-3	<72.91	<277.64	423.27	55,267.29	1,421.55	521.59	762.10	3.72
GU-TKN-4	<70.83	<214.68	253.24	35,378.91	1,197.06	3,388.11	1,783.87	3.98
Count	4	4	4	4	4	4	4	4
Non-Detect Count	4	4	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	534.06	55,267.29	1,421.55	3,388.11	1,783.87	4.85
Minimum	NA	NA	253.24	17,153.14	1,197.06	465.61	627.20	3.72
Mean	NA	NA	409.62	34,203.60	1,300.11	1,263.62	979.71	4.23
Median	NA	NA	425.60	32,196.99	1,290.92	600.38	753.88	4.18
Standard Deviation	NA	NA	116.13	15,944.69	95.68	1,419.21	539.47	0.49
Coefficient of Variation	NA	NA	0.28	0.47	0.07	1.12	0.55	0.12
Quartz Monzonite								
GU-TQM-5	<74.03	<251.94	706.11	42,344.55	4,709.23	1,232.38	1,550.61	4.04
GU-TQM-6	<72.97	<230.74	385.79	37,742.30	2,951.54	917.67	732.49	5.03
Count	2	2	2	2	2	2	2	2
Non-Detect Count	2	2	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	706.11	42,344.55	4,709.23	1,232.38	1,550.61	5.03
Minimum	NA	NA	385.79	37,742.30	2,951.54	917.67	732.49	4.04
Mean	NA	NA	545.95	40,043.43	3,830.39	1,075.03	1,141.55	4.54
Median	NA	NA	545.95	40,043.43	3,830.39	1,075.03	1,141.55	4.54
Standard Deviation	NA	NA	226.50	3,254.28	1,242.87	222.53	578.50	0.70
Coefficient of Variation	NA	NA	0.41	0.08	0.32	0.21	0.51	0.15

Notes: < = concentration is less than the detection level
mg/kg = milligrams per kilogram
s.u. = standard units
NA = not applicable

TABLE 4
POST-REMOVAL XRF ANALYSES AND PASTE pH
LOWER AREA

Sample ID	Cd	Co	Cu	Fe	Pb	Mn	Zn	Paste pH
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	s.u.
Granodiorite (biotized)								
GL-TGR-6	<71.89	<245.24	156.87	43,454.07	514.32	3,845.05	1,470.82	7.6
GL-TGR-7	<73.77	<236.66	217.75	38,301.81	520.36	3,159.91	1,257.69	7.53
GL-TGR-8	<73.21	<270.62	163.30	52,622.53	872.05	7,324.24	4,584.96	6.01
GL-TGR-9	<70.64	<237.11	98.63	42,328.08	663.28	4,918.65	2,010.07	6.56
GL-TGR-10	<73.38	<250.4	319.50	45,166.20	951.32	5,267.00	3,287.52	7.42
GL-TGR-11	<76.65	<300.4	178.00	59,833.48	919.32	6,288.02	2,949.33	7.02
GL-TGR-14	<77.25	<263.96	520.97	45,318.18	2,212.04	9,716.86	6,718.83	6.75
Count	7	7	7	7	7	7	7	7
Non-Detect Count	7	7	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	520.97	59,833.48	2,212.04	9,716.86	6,718.83	7.60
Minimum	NA	NA	98.63	38,301.81	514.32	3,159.91	1,257.69	6.01
Mean	NA	NA	236.43	46,717.76	950.38	5,788.53	3,182.75	6.98
Median	NA	NA	178.00	45,166.20	872.05	5,267.00	2,949.33	7.02
Standard Deviation	NA	NA	142.77	7,211.15	585.43	2,226.92	1,938.52	0.58
Coefficient of Variation	NA	NA	0.60	0.15	0.62	0.38	0.61	0.08
Quartz Monzonite								
GL-TQM-1	<67.82	<147.11	70.73	17,692.11	120.73	1,029.12	1,220.71	7.67
GL-TQM-2	<76.25	<233.7	701.87	35,329.33	1,545.72	3,289.84	9,211.35	7.52
GL-TQM-3	<65.2	<141.82	167.58	17,179.22	144.53	1,224.93	1,026.69	4.26
GL-TQM-4	<63.53	<127.13	39.25	14,210.90	42.69	840.46	955.86	7.32
GL-TQM-12	<61.90	<106.18	203.84	10,293.90	80.78	1,459.67	2,113.82	6.62
GL-TQM-13	<63.54	<126.06	185.32	13,813.51	63.28	770.26	2,650.93	4.13
Count	6	6	6	6	6	6	6	6
Non-Detect Count	6	6	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	701.87	35,329.33	1,545.72	3,289.84	9,211.35	7.67
Minimum	NA	NA	39.25	10,293.90	42.69	770.26	955.86	4.13
Mean	NA	NA	228.10	18,086.50	332.96	1,435.71	2,863.23	6.25
Median	NA	NA	176.45	15,695.06	100.76	1,127.03	1,667.27	6.97
Standard Deviation	NA	NA	241.23	8,857.73	595.30	942.90	3,181.64	1.63
Coefficient of Variation	NA	NA	1.06	0.49	1.79	0.66	1.11	0.26

Notes: < = concentration is less than the detection level
mg/kg = milligrams per kilogram
s.u. = standard units

TABLE 5
POST-REMOVAL XRF ANALYSES AND PASTE pH
STOCKPILE G-4 AREA

Sample ID	Cd	Co	Cu	Fe	Pb	Mn	Zn	Paste pH
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	s.u.
G4-TSL-1	<67.36	<187.34	162.09	27,153.15	105.23	1,109.03	471.73	4.99
G4-TGR-2 (biotized)	<70.44	<230.64	152.05	38,894.73	411.06	1,448.07	506.64	7.54
G4-TGR-3 (vein)	<83.76	<522.78	195.08	149,994.92	789.31	833.68	666.57	7.23
G4-TQM-4	<69.76	<212.03	43.58	33,793.29	19.63	810.33	355.89	7.6

Notes: < = concentration is less than the detection level
mg/kg = milligrams per kilogram
s.u. = standard units

TABLE 6
GROUNDHOG POST-REMOVAL
COMPOSITE SAMPLE SUMMARY

Composite ID	Sub-Sample Golder ID
Stockpile G4	
G4-TS1-1	G4-TS1-1
G4-TGR-2 (biotized)	G4-TGR-2 (biotized)
G4-TGR-3 (vein)	G4-TGR-3 (vein)
G4-TQM-4	G4-TQM-4
Lower Area Granodiorite	
GL-TGR	GL-TGR-5
	GL-TGR-6
	GL-TGR-7
	GL-TGR-8
	GL-TGR-9
	GL-TGR-10
	GL-TGR-11
	GL-TGR-14
Lower Area Quartz Monzonite	
GL-TQM	GL-TQM-1
	GL-TQM-2
	GL-TQM-3
	GL-TQM-4
	GL-TQM-12
	GL-TQM-13
Jasperized Vein	
GU-JV	GU-JV-20
	GU-JV-21
	GU-JV-26
	GU-JV-27
Granodiorite - G5 West of Haul Road	
GU-TGR-G5	GU-TGR-1
	GU-TGR-2
Granodiorite East of Haul Road	
GU-TGR	GU-TGR-7
	GU-TGR-8
	GU-TGR-9
	GU-TGR-10
	GU-TGR-11
	GU-TGR-12
	GU-TGR-13
	GU-TGR-14
	GU-TGR-15
	GU-TGR-16
	GU-TGR-17
	GU-TGR-18
	GU-TGR-19
	GU-TGR-28
	GU-TGR-29
	GU-TGR-34
	GU-TGR-35
	GU-TGR-36
	GU-TGR-37
Granodiorite w/Phyllic Alteration	
GU-TGRP	GU-TGRP-24
	GU-TGRP-25
	GU-TGRP-30
	GU-TGRP-31
	GU-TGRP-32
	GU-TGRP-33
Kneeling Nun	
GU-TKN	GU-TKN-22
	GU-TKN-23
	GU-TKN-3
	GU-TKN-4
Quartz Monzonite	
GU-TQM	GU-TQM-5
	GU-TQM-6

TABLE 7
GROUNDHOG POST-REMOVAL SAMPLING
ACID-BASE ACCOUNTING RESULTS FOR COMPOSITED SAMPLES

Sample ID	Paste pH [a]	ABA Results				Sulfur				Material Classification
		Net Neutralizing Potential	ANP/AGP	AGP	ANP	Unidentifiable	Sulfide	Sulfate	Total	
	s.u.	$tCaCO_3/kt$		$tCaCO_3/kt$	$tCaCO_3/kt$	%	%	%	%	
G4-TSL-1	4.94	0.00	NA	<0.3	<0.3	<0.01	<0.01	0.02	0.02	Not Likely to Generate Acid
G4-TGR-2 (biotized)	7.77	12.8	>42.67	<0.3	12.8	<0.01	<0.01	<0.01	<0.01	Not Likely to Generate Acid
G4-TGR-3 (vein)	7.5	2.6	>8.67	<0.3	2.6	0.04	<0.01	0.09	0.14	Not Likely to Generate Acid
G4-TQM-4	7.88	20.5	>68.3	<0.3	20.5	<0.01	<0.01	<0.01	<0.01	Not Likely to Generate Acid
GL-TGR	7.33	19.3	15.85	1.3	20.6	<0.01	0.04	0.11	0.15	Not Likely to Generate Acid
GL-TQM	6.45	17.7	5.66	3.8	21.5	<0.01	0.12	0.06	0.18	Not Likely to Generate Acid
GU-JV	4.48	-0.80	<.375	0.80	<0.3	0.03	0.03	0.15	0.2	Likely to Generate Acid[b]
GU-TGR-G5	7.28	14.4	3.82	5.10	19.5	<0.01	0.16	0.07	0.23	Low Potential to Generate Acid
GU-TGR	5.45	-2.20	0.68	6.9	4.7	<0.01	0.22	0.29	0.51	Likely to Generate Acid
GU-TGRP	3.89	-2.40	<0.1	2.40	<0.3	0.02	0.08	0.31	0.41	Likely to Generate Acid[b]
GU-TKN	3.94	-2.60	<0.1	2.60	<0.3	0.01	0.08	0.45	0.54	Likely to Generate Acid[b]
GU-TQM	4.45	-8.50	0.00	8.50	<0.3	0.01	0.27	0.56	0.84	Likely to Generate Acid

Notes:

ABA = acid-base accounting
ANP = acid-neutralizing potential
AGP = acid-generating potential - calculated based on sulfide sulfur
s.u. = standard units
tCaCO3/kt = tons calcium carbonate per kiloton of sediment
< = concentration less than detection limit
a = Saturated Paste pH
b = Classified as "likely to generate acid" based on ANP/AGP ratio, but sample does not contain sufficient sulfide content to generate acid.

TABLE 8
GROUNDHOG POST-REMOVAL SAMPLING
TOTAL METALS RESULTS FOR COMPOSITED SAMPLES

Sample ID	Al	Cd	Co	Cu	Fe	Pb	Mn	Zn
G4-TSL-1	11,800	1.92	13.3	138	11,900	88.9	1,060	426
G4-TGR-2 (biotized)	13,900	0.53	8.22	94.8	18,300	502	1,070	263
G4-TGR-3 (vein)	6,080	0.74	0.85	128	53,300	282	305	272
G4-TQM-4	14,500	0.79	11.9	45.3	21,100	11.4	817	258
GL-TGR	11,900	4.55	8.84	258	27,900	821	4,030	2,170
GL-TQM	7,700	3.18	5.75	166	8,590	300	723	1,390
GU-JV	4,860	1.42	2.94	511	48,000	2,710	1,920	595
GU-TGR-G5	8,910	3.00	9.85	284	24,700	305	1,710	871
GU-TGR	10,600	3.51	7.48	515	31,600	1,050	2,170	1,530
GU-TGRP	5,230	2.07	2.03	859	38,100	1,850	644	971
GU-TKN	7,600	1.33	5.21	351	23,100	1040	1,660	767
GU-TQM	7,070	1.98	5.91	435	24,000	2520	898	805

Note: All concentrations in milligrams per kilogram

TABLE 9
GROUNDHOG POST-REMOVAL SAMPLING
SPLP RESULTS FOR COMPOSITED SAMPLES

Sample ID	pH (s.u.)	Al (mg/L)	Cd (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	Pb (mg/L)	Zn (mg/L)	TDS (mg/L)	F (mg/L)	SO_4 (mg/L)
G4-TSL-1	9.45	1.8	<0.002	<0.006	0.02	0.8	0.03	<0.0075	0.04	61	0.52	4.6
G4-TGR-2 (biotized)	9.77	0.7	<0.002	<0.006	<0.01	0.3	0.007	<0.0075	0.01	50	1.96	5.3
G4-TGR-3 (vein)	9.69	2.2	<0.002	<0.006	0.02	4.4	0.008	0.0559	0.04	76	0.86	3.1
G4-TQM-4	8.93	1.0	<0.002	<0.006	<0.01	0.7	0.02	<0.0075	0.01	58	1.15	7.6
GL-TGR	7.86	<0.08	<0.002	<0.006	0.01	<0.06	0.01	<0.0075	<0.01	110	0.69	64.6
GL-TQM	9.12	<0.08	0.011	<0.006	<0.01	<0.06	1.38	<0.0075	0.29	190	0.34	71.5
GU-JV	3.99	<0.08	0.002	<0.006	0.07	0.06	0.43	<0.0075	0.2	61	0.20	19.0
GU-TGR-G5	8.95	<0.08	<0.002	<0.006	<0.01	<0.06	<0.004	<0.0075	<0.01	130	0.24	47.7
GU-TGR	6.42	0.1	0.033	0.02	0.83	<0.06	7.32	0.284	9.11	260	0.30	162
GU-TGRP	4.49	1.6	0.041	0.04	8.65	<0.06	6.25	2.2	13.4	300	0.85	193
GU-TKN	4.17	3.3	0.027	0.03	3.17	<0.06	2.99	0.291	7.25	260	<0.50	175
GU-TQM	4.23	2.9	0.025	0.03	2.91	<0.06	2.78	0.313	6.8	200	<0.50	161

Notes:

mg/L = milligrams per liter

TDS = total dissolved solids

TABLE 10
STORMWATER QUALITY
FOR LOWER STORMWATER POND SUMP

Sample Location ID	Date Sampled	pH	Temp (°C)	Cond (µS)	TDS (mg/L)	F (mg/L)	SO_4 (mg/L)	Cd (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	Ni (mg/L)	Pb (mg/L)	Zn (mg/L)
GH-Sump	4/14/2005	3.92	17.7	5550	9220	6.04	5530	2.31	1.11	95.1	0.28	333	0.846	1.24	844
GH-Sump	9/26/2005	4.05	23.6	3643	4450	1.32	2870	0.749	0.307	20.2	<0.3	95.3	0.178	0.289	224
GH-Sump	3/14/2006	4.88	13.1	3293	5100	5.34	3160	0.701	0.284	20.2	<0.06	116	0.184	0.16	232
GH-Sump	8/4/2006	5.27	22.6	2298	2390	1.08	1530	0.35	0.147	9.11	0.15	44	0.086	0.0815	92
GH-Sump	2/6/2007	4.8	10.5	2047	2900	2.22	1870	0.273	0.117	6.41	<0.06	45	0.073	0.053	72.6
GH-Sump	7/23/2007	5.64	22.8	2314	2600	1.15	1600	0.299	0.15	7.19	<0.06	52.8	0.097	0.078	76.8

Notes: µS = microSiemens
mg/L = milligrams per liter

ATTACHMENT 1

BIOLOGICAL RESOURCES REPORT
CAROTHERS ENVIRONMENTAL, LLC

CAROTHERS ENVIRONMENTAL, LLC

BIOLOGICAL RESOURCES REPORT

Bat Habitat Evaluations of Historic Shafts and Adits for Chino Mining Company, Groundhog Mine

Prepared for:

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June 28, 2007

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INTRODUCTION

Historic mine features and associated buildings have the potential to provide valuable roosting habitat for bats and other wildlife. Use of historic mines and buildings by bats is variable during different seasons. It is common for bats to use abandoned mines in summer months for rearing young, during spring and fall for rest during migration, and as hibernation sites in winter.

Carothers Environmental, LLC (CE) was contracted by Golder Associates Inc., to conduct bat habitat evaluations of three areas containing abandoned mine features (shafts/adits/structures) proposed for mine closure activities by Chino Mining Company to determine if closure activities could potentially impact bats and/or bat habitat. The objective of the project was to determine of valuable bat habitat is present in areas proposed for closure that should be maintained, while also meeting safety requirements to protect the public. In total, CE conducted evaluations of three collapsed shafts (Site B), one abandoned adit (Site A), and one historic shed (Site C).

METHODOLOGY

Literature Review

CE obtained a list of bat species that are known to occur or that potentially occur in Grant County, New Mexico from the Biota Information System of New Mexico (BISON-M), Department of Game and Fish, Conservation Services Division Database. No bat species are currently listed on the U.S. Fish and Wildlife Service (USFWS 2007) internet web site for Grant County (http://ifw2es.fws.gov/endangeredspecies/lists/default.cfm); however, obtaining a species list from the USFWS internet web site does not constitute informal or formal consultation with the USFWS (Attachment A, USFWS species list for Grant County).

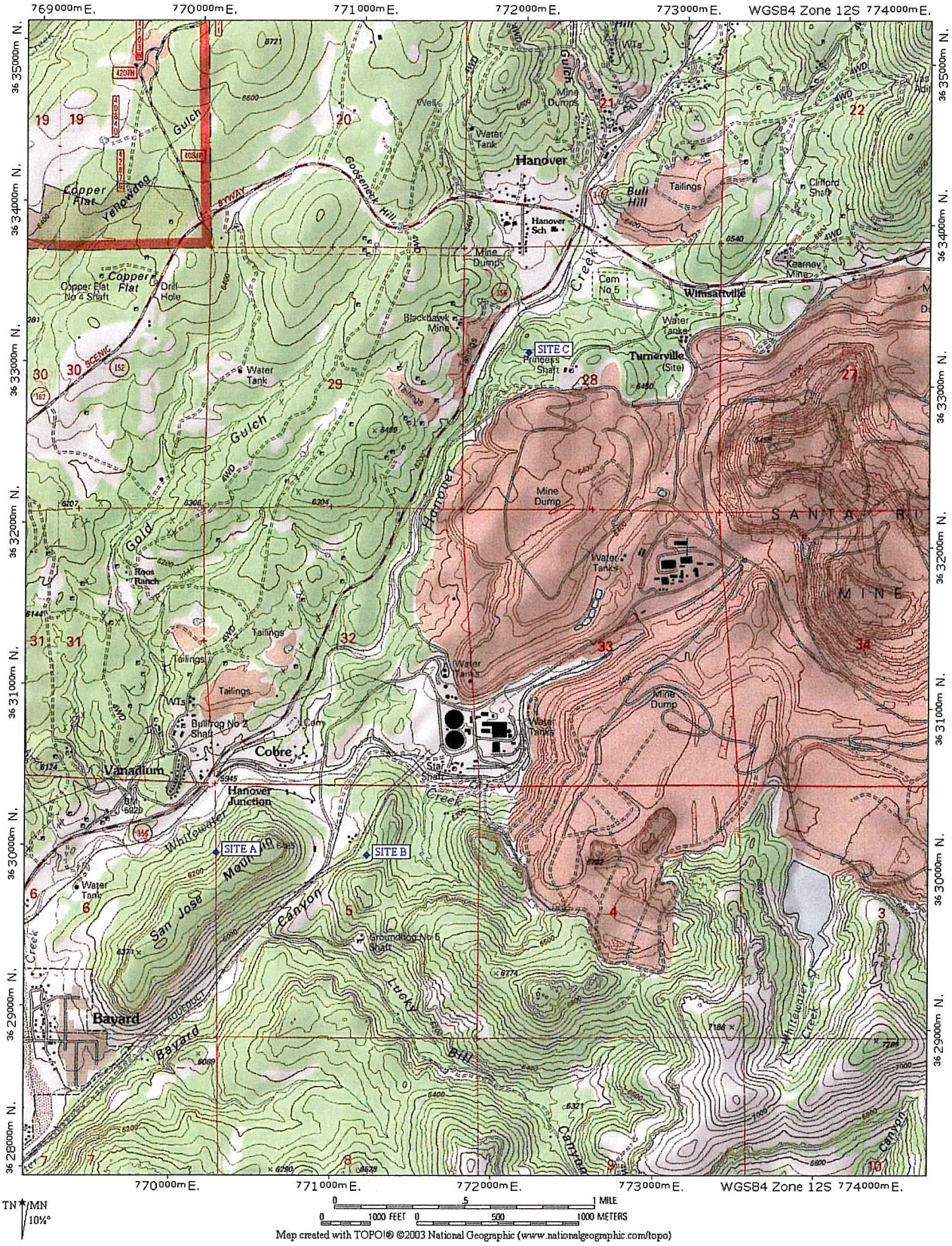
Field Surveys

CE's project team for this effort included Senior Biologist Kenneth Carothers and Technical Rigging Specialist Barry Ward. CE's project team was accompanied by Ms. Jen Pepe of Golder Associates, Inc., during survey efforts. Ms. Pepe was provided to CE for safety reasons and to assist with locating shafts/adits/buildings adjacent to active mining areas.

During the field survey, CE staff visited three distinct areas on June 5, 2007 to determine habitat suitability and presence/absence of bats. The areas visited were named Sites A, B, and C. Site A consisted of an abandoned adit with a small waste rock pile on the east side of Whitewater Creek and the west slope of San Jose Mountain. Site B consisted of a glory hole at the Groundhog Mine, which is believed to have been connected subsurface to the San Jose Shaft. There were three apparent openings in close proximity to each other at this site that were evaluated under this effort. Site C is a small mine working with an existing small shed on the east side of Hanover Creek, across the highway from the Black Hawk Mine. Each site location is provided on Figure 1.

CAROTHERS ENVIRONMENTAL, LLC

Figure 1: June 5, 2007 Bat Habitat Evaluation Site Locations



Before entering any shafts, adits, or abandoned buildings, CE personnel conducted visual observations to determine if the site was safe to enter. CE practices a specific safety protocol during any underground activities. CE's safety rules include the use of two-way radios, hard hats/climbing helmets, back-up securing of all climbing ropes, all climbing equipment is double checked by at least two experienced individuals prior to weighting a rope, boots must have good ankle support, and each surveyor is equipped with a high intensity discharge head lamp with spare batteries. No surveyors were ever sent into a shaft or adit alone, and a minimum of one person was always above ground on standby in the event that any rescue operations were required. All CE personnel involved in this project have extensive safety training as well as wilderness first responder and self rescue training. CE executed all of the internal surveys without incident and no one was injured.

Each site was evaluated for potential to support bats based on whether or not they were accessible to bats (and humans). Determinations of habitat suitability were based on whether or not the site had any bat sign or individuals present. Buildings were carefully searched for presence/absence determination, as well as for signs of use by bats. All accessible areas of each structure were examined, and determinations were made regarding whether or not removal of the structure would have an impact to bats. When no individuals or bats were present, recommendations for closure by any means were made; however, seasonal "windows" for closure activities or building demolition may apply depending on if the site has had evidence of use during certain times of the year.

RESULTS

No bats and/or recent bat sign were observed in any of the three areas evaluated. General habitat within the survey areas ranged from grasslands to Great Basin Conifer Woodland (Brown 1994). In general, the survey areas were dominated by various junipers (*Juniperus* spp.), pinyon pine (*Pinus edulis*), and shrub species such as rabbit brush (*Chrysothamnus nauseosus*), four-wing saltbush (*Atriplex canescens*), cliffrose (*Cowania mexicana*), apache plume (*Fallugia paradoxa*), and snake weed (*Gutierrezia sarothrae*). Predominant grasses of the area were *Bouteloua gracilis.*

Site A: This adit is recommended for closure by any means. No bats or bat sign were observed, and it is not likely to provide significant habitat for bats now or in the future. It is CE's opinion that this adit presents a safety hazard to the public, as it is easily accessible and there is no lock on the existing gate.

Site B: No access to subsurface workings was possible, as all three potential entrances to the openings are blocked with debris. There is no apparent access available for bats or other wildlife. CE recommends that these workings be closed as soon as possible so as to avoid any further collapse.

Site C: While the historic shed provided possible roosting habitat for bats, no guano or other signs of use by bats was evident. CE did not observe any bats at this location. The shed is the only feature that could provide bat roosting habitat, as there are no open subsurface workings available at this location.

RECOMMENDATIONS

Because no federally listed bat species are known to occur in Grant County, and because survey results revealed that the sites in question are not currently used by bats, CE does not recommend formal consultation with the USFWS under Section 7 of the Endangered Species Act (ESA) for the proposed action relative to permanently closing the shafts/adits or removal of the abandoned building. Table 1 provides management recommendations.

Our determinations for closure of shafts and adits, and demolition of abandoned buildings are based on the premise that when both fall and spring surveys are performed and no individuals are present, closure or demolition by any means can proceed. It is typically recommended that closure activities avoid maternity and hibernation seasons (early spring and during winter) to minimize the potential to impact bats. Based on our observations, and in consideration of the current seasonal conditions, CE recommends that closure and demolition activities take place during the summer of 2007. Because the sites were recently evaluated (June 2007) and no bats or signs of recent use by bats were documented, it is unlikely that any bats would move into the area as seasonal residents between now and this coming fall. Therefore, for closure activities, CE recommends that all actions take place as soon as possible to avoid the most likely time of use by bats. If these structures are not able to be removed during the summer of 2007, additional evaluations may be necessary in order to clear the structures for demolition in the spring or summer of 2008.

Table 1: Shaft/Adit Summary Results

Site	No. or Name	UTMs (NAD 83) (Easting, Northing)	Bats Present Y/N	Management Recommendations
Groundhog	A	E770233, N3629981	N	Closure by any means
Groundhog	B	E771165, N3629990	N	Closure by any means
Groundhog	C	E772076, N3633139	N	Closure by any means

LITERATURE CITED

Brown, D. E. (Ed.) (1994) Biotic Communities: Southwestern United States and Northwestern Mexico. Salt Lake City, UT: University of Utah Press.

U.S. Fish & Wildlife Service Internet web site (June 26, 2007). Listing of species potentially Occurring in Grant County, New Mexico. http://ifw2es.fws.gov/endangeredspecieslists/default.cfm

CAROTHERS ENVIRONMENTAL, LLC

ATTACHMENT A

USFWS SPECIES LIST FOR GRANT COUNTY

Common Name	Scientific Name	Listing Status
bald eagle	*Haliaeetus leucocephalus*	AD, T
beautiful shiner	*Cyprinella formosa*	T
black-footed ferret	*Mustela nigripes*	E, EXPN
Chihuahua chub	*Gila nigrescens*	T
Chiricahua leopard frog	*Rana chiricahuensis*	T
Gila chub	*Gila intermedia*	PE
Gila springsnail	*Pyrgulopsis gilae*	C
Gila topminnow (incl. Yaqui)	*Poeciliopsis occidentalis*	E
Gila trout	*Oncorhynchus gilae*	T
gray wolf	*Canis lupus*	DR, E, EXPN, T
loach minnow	*Tiaroga cobitis*	T
Mexican spotted owl	*Strix occidentalis lucida*	T
New Mexico springsnail	*Pyrgulopsis thermalis*	C
northern aplomado falcon	*Falco femoralis septentrionalis*	E
southwestern willow flycatcher	*Empidonax traillii extimus*	E
spikedace	*Meda fulgida*	T
yellow-billed Cuckoo	*Coccyzus americanus*	C

Listing Status Definitions

E -- Endangered
T -- Threatened
EXPN, XN -- Experimental Population, Non-Essential
PE -- Proposed Endangered
C -- Candidate Taxon, Ready for Proposal
DR -- Delisted Taxon, Taxonomic Revision (Improved Understanding)
AD -- Proposed Delisting

CAROTHERS ENVIRONMENTAL, LLC

ATTACHMENT B

SITE PHOTOGRAPHS

Opening to adit at Site A

Internal view of adit at Site A

One of three openings at Site B

Two of three openings at Site B

Three of three openings at Site B

Shed at Site C

ATTACHMENT 2

BOREHOLE LOGS

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack		BORING NO. **BH-1**
BORING LOCATION DESCRIPTION: Ditch west of San Jose Shaft			**PAGE 1 OF 1**
	SAMPLING METHOD:		DRILLING
			START / FINISH
NORTHING: 6281 EASTING: 11442	WATER LEVEL		**11:45 / 12:30**
	TIME		
ELEVATION: 6,021.574	DATE		Date: **2/13/08**
	CASING DEPTH		
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS: Near Bedrock - Sugarlump Tuff		

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization Consistency, cementation Other observations (i.e, odor, roots, etc.)	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk, mod, str)
	0'-5'				**Sugarlump Tuff** - hard drilling			60	40	Pink	D	L	N
	5'-10'				**Sugarlump Tuff** - hard drilling			50	50	Pink	D	L	N
	10'-15'				**TGR$_P$** - drilling not as hard, very weathered			60	40	Red/ Brown	M	M	N
	15'-20'				**TGR$_p$** - moderately weathered, dry			60	40	Light Brown	D	M	N
	20'-25'				**TGR & TGR$_P$** - variable gray to brown, altered and slightly weathered		10	70	20	Light Brown	D	L	N
	25'-30'				**TD = 25 feet**								

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-2**
BORING LOCATION DESCRIPTION: North side of San Jose Shaft	SAMPLING METHOD:	**PAGE 1 OF 1**
NORTHING: 6295 EASTING: 11403	WATER LEVEL / TIME	DRILLING START 13:00 FINISH 13:45
ELEVATION: 6,016.063	DATE / CASING DEPTH	Date: **2/13/08**
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization Consistency, cementation Other observations (i.e, odor, roots, etc.)	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk, mod, str)
	0'-5'				**Jasperized Quartz Vein** - rock chips of variable jasper and quartz (clear), fines of red silt		30	60	10	Red/ Brown	D	N	N
	5'-10'				Increased iron staining						D	N	N
	10'-15'				Color change to grayish red, clasts are subangular, mineralized and altered quartz		20	70	10	Gray/ Red/ Brown	D	N	N
	15'-20'				Jasper and biotite, likely jasper veins in granodiorite matrix, iron-stained fines (less than above)						D	N	N
	20'-25'				Color change to pinkish gray, clasts are fine grained, mostly quartz with biotite, subangular (not tuff) **TD: 25 feet**		10	75	15	Pink/ Gray	D	N	N
	25'-30'				Note: upper 10 feet jasp vein is weathered with iron-stained fine matrix, quartz rock fragments Note: below 10 feet, vein may be interfingering with granodiorite, fine-grained fabric with biotite, gray fragments with some iron-stained matrix								
					Note: rock fragments are not as weathered as in BH-1								

Notes:

a Sum of gravel, sand, and fines = 100%

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-3**
BORING LOCATION DESCRIPTION: Between San Jose Shaft & sinkhole	SAMPLING METHOD:	**PAGE 1 OF 1**
		DRILLING START **13:45** FINISH **14:10**
NORTHING: 6286 EASTING: 11398	WATER LEVEL / TIME / DATE / CASING DEPTH	Date: **2/13/2008**
ELEVATION: 6,014.717		
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization Consistency, cementation Other observations (i.e, odor, roots, etc.)	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk, mod, str)
	0'-5'				**Jasperized Quartz Vein** - rock chips of variable jasper and quartz (clear), fines of red silt		20	60	20	Red/ Brown	D	N	N
	5'-10'				Color change to grayish red, clasts are subangular, mineralized and altered quartz, zones of iron-staining from 5 to 14 feet		10	75	15	Gray/ Red/ Brown	D	N	N
	10'-15'												
	15'-20'				**Silty Sand with Clay** - subangular clasts as above, but color and texture change (no pyrite or weathered minerals; fill?)			60	40	Light Brown	D	L	N
	20'-25'				Same as above, but lighter brown **TD = 20 feet**					Light Brown	D	L	N

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-4**
BORING LOCATION DESCRIPTION: Southwest of San Jose Shaft, towards Glory Hole	SAMPLING METHOD:	**PAGE 1 OF 1**
		DRILLING START **14:30** FINISH **14:45**
NORTHING: 6266 EASTING: 11391	WATER LEVEL / TIME / DATE / CASING DEPTH	Date: **2/13/08**
ELEVATION: 6,011.61		
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization Consistency, cementation Other observations (i.e, odor, roots, etc.)	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk, mod, str)
	0'-5'				**TGRp** - moderately weathered to clay (on rinds of gravel)		30	60	10	Gray/ Brown	D	L	N
	5'-10'				Soft drilling								
	10'-15'				**Jasperized Vein** - mixed with rock fragments of fine-grained quartz with biotite, reddish brown matrix		20	70	10	Gray/ Red/ Brown	D	N	N
	15'-20'				Hard drilling at 15 feet Primarily quartz and jasper fragments								
	20'-25'												
					TD = 25 feet								

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-5**
BORING LOCATION DESCRIPTION: Southeast corner of sinkhole		**PAGE 1 OF 1**
	SAMPLING METHOD:	DRILLING START **15:15** FINISH **15:30**
NORTHING: 6279 EASTING: 11382	WATER LEVEL / TIME / DATE / CASING DEPTH	Date: **2/13/08**
ELEVATION: 6,010.092		
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk,
	0'-5'				**TGRp** - mixed with surface disturbance residual, moderately weathered rock, some gravel cobbles and ore-clay		30	50	20	Yellow/ Orange	D	N	N
	5'-10'				Breakthrough to void at 7 feet								
	10'-15'												
	15'-20'												
	20'-25'												

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-6**
BORING LOCATION DESCRIPTION: About 3' south of BH-5, to confirm void	SAMPLING METHOD:	**PAGE 1 OF 1**
		DRILLING START **13:40** FINISH **13:50**
NORTHING: 6277 EASTING: 11379	WATER LEVEL / TIME / DATE / CASING DEPTH	Date: **2/13/08**
ELEVATION: 6,009.043		
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk,
	0'-5'				**TGRp** - mixed with surface disturbance residual, moderately weathered rock, some gravel cobbles and ore-clay								
	5'-10'				**Chrysacolla Vein** - 6 feet Breakthrough to void at 7 feet								
	10'-15'												
	15'-20'												
	20'-25'												

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-7**
BORING LOCATION DESCRIPTION: About 10' south of BH-6, along soft side of vein	SAMPLING METHOD:	**PAGE 1 OF 1**
		DRILLING START **13:55** FINISH **16:00**
NORTHING: 6268 EASTING: 11376	WATER LEVEL / TIME / DATE / CASING DEPTH	Date: **2/13/08**
ELEVATION: 6,008.068		
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk,
	0'-5'				**Jasper Vein**								
	5'-10'				**TGR**								
	10'-15'				**TD = 12 feet;** just touched on chrysacolla vein Detailed logging not performed								

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-8**
BORING LOCATION DESCRIPTION: About 5' northeast of BH-9	SAMPLING METHOD:	**PAGE 1 OF 1**
NORTHING: 6307 EASTING: 11387	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START **16:05** FINISH **16:10**
ELEVATION: 6,010.523		Date: **2/13/08**
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk,
	0'-5'				**Jasper Vein**								
	5'-10'				**TGRp** - visual log of drilling, only highly weathered, zoned rd/p/gr/y								
	10'-15'				**TD = 12 feet**, no void Detailed logging not performed								

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

BOREHOLE LOG

SITE NAME : **Groundhog Mine**	DRILLING METHOD: Airtrack	BORING NO. **BH-9**
BORING LOCATION DESCRIPTION: About 10' north of northeast corner of sinkhole	SAMPLING METHOD:	**PAGE 1 OF 1**
		DRILLING START **16:15** FINISH **16:25**
NORTHING: 6302 EASTING: 11384	WATER LEVEL / TIME / DATE / CASING DEPTH	Date: **2/13/08**
ELEVATION: 6,010.224		
DRILL RIG: Ingersoll ANGLE: 90 SAMPLER:	SURFACE CONDITIONS:	

SAMPLE TYPE[B]	DEPTH	RECOVERY	GRAPHIC LOG	SYMBOL	DESCRIPTION OF MATERIAL Grain size description (i.e., Poorly graded sand with gravel) Angularity Gravel/sand lithology Interbeds, laminations, contacts, etc. Interbed thicknesses Primary and secondary mineralization	ESTIMATED % (a) Oversize (>3")	Gravel	Sand	fines	COLOR (Wet)	MOISTURE	PLASTICITY (np, l, m, h)	HCL REACTION (None, wk,
	0'-5'				**Mixed Jasperized Vein**								
	5'-10'				**TGRp**								
	10'-15'				**TD = 12 feet**, no void Detailed logging not performed								

DRILLING CONTRACTOR: St. Cloud

DRILLER: Ignacio Banales

LOGGED BY: J. Pepe

DATE: 2-13-08

JOB NO. 073-92532-03

Project: Groundhog

Notes:

a Sum of gravel, sand, and fines = 100%

FIGURES

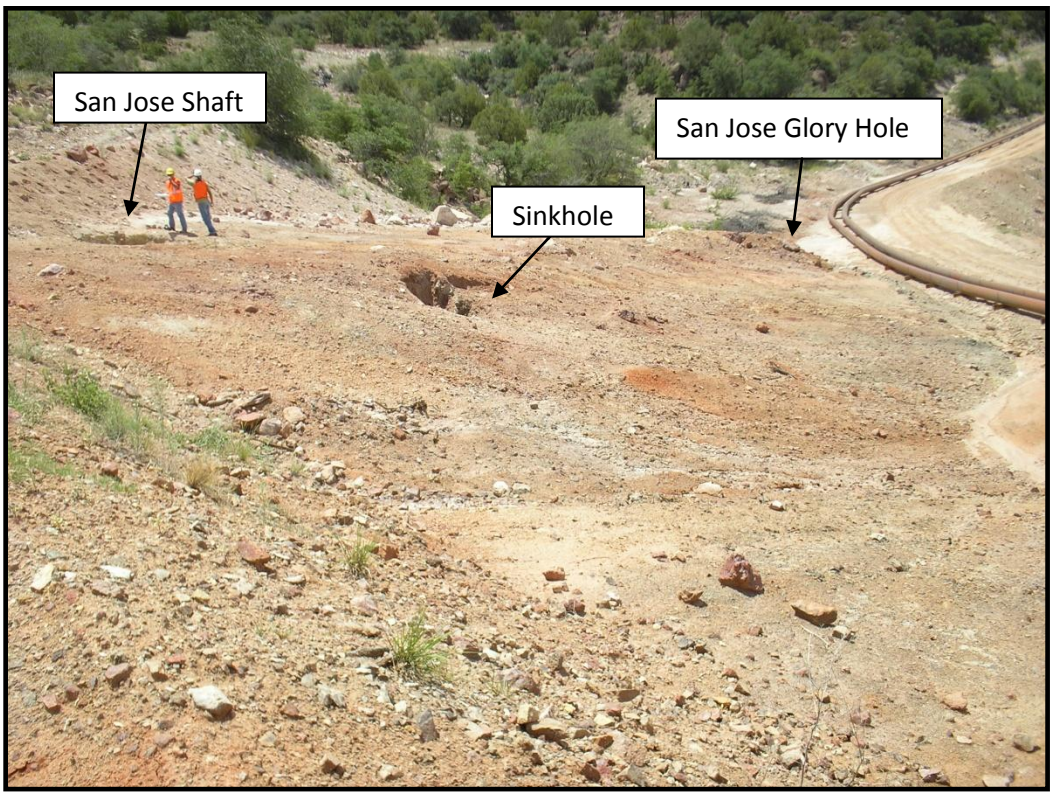
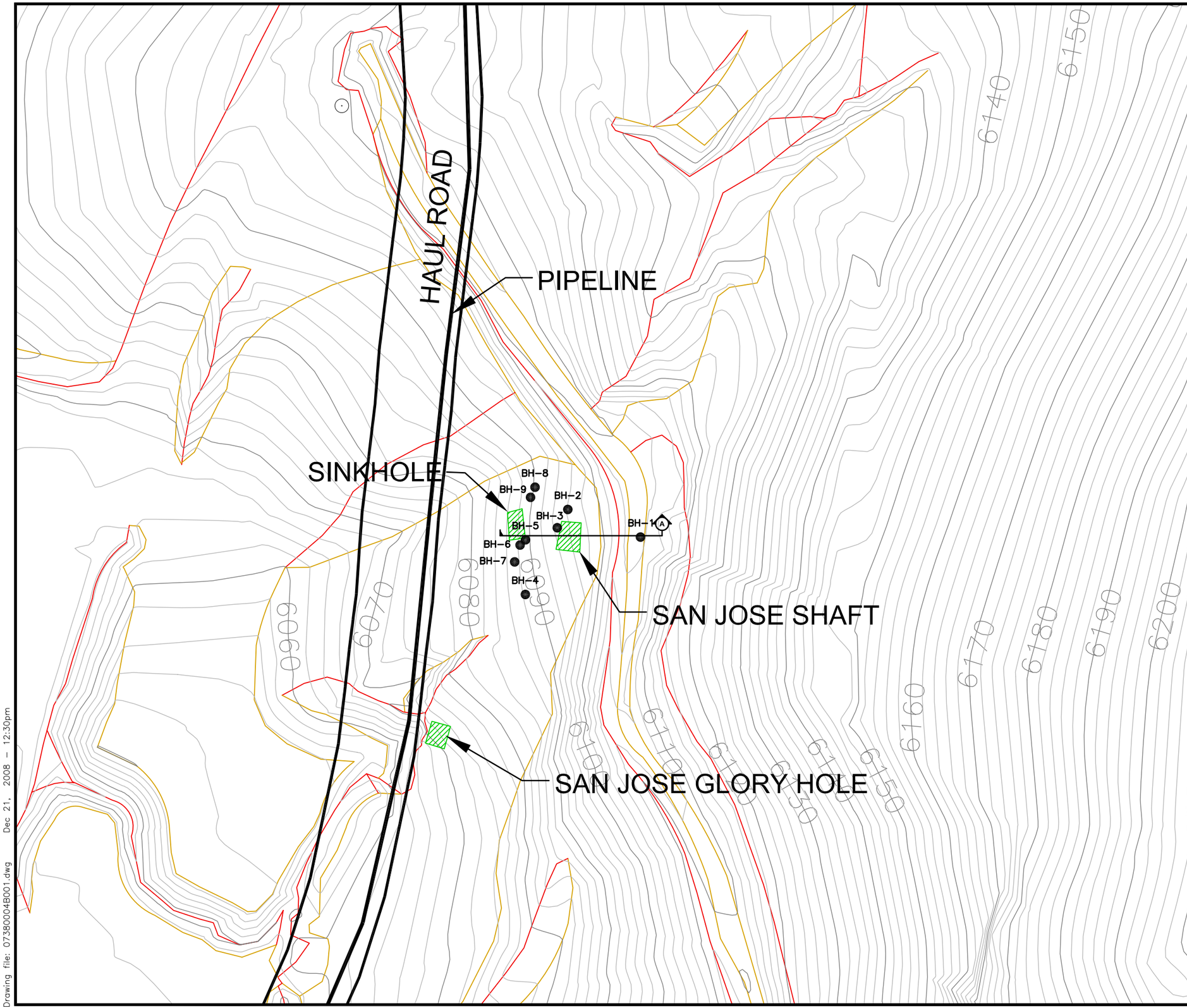


Figure 1: Mine Openings at the Groundhog Mine, June 2007

Figure 2: San Jose Shaft Opening, September 2007

Figure 3: Sinkhole near San Jose Shaft, September 2007

Figure 4: Filled in San Jose Glory Hole, September 2007



50 0 50
SCALE FEET

LEGEND

A — SECTION CALLOUT (FIGURE 6)

● — BOREHOLE LOCATIONS

PROJECT
CHINO MINES COMPANY
GROUNDHOG SHAFT CLOSURE
GRANT COUNTY, NM

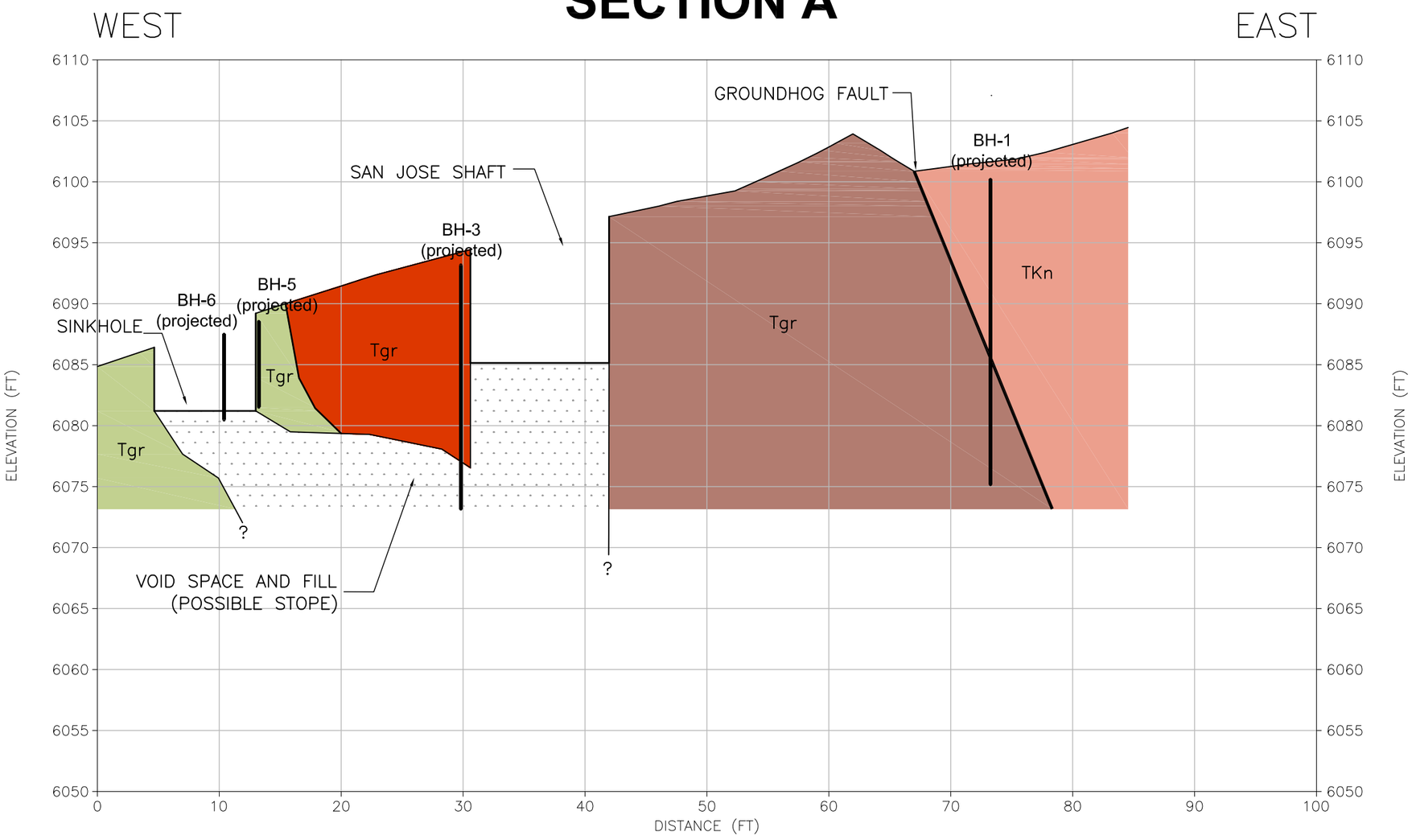
TITLE
GROUNDHOG MINE BOREHOLE AND SECTION LOCATIONS

Golder Associates
Silver City, New Mexico

PROJECT No.		073-80004	FILE No.	Shaft Closure
DESIGN	HNL	12/08/08	SCALE AS SHOWN	REV. 0
CADD	HNL	12/16/08	5	
CHECK	JP	12/16/08		
REVIEW	JP	12/16/08		

Drawing file: 07380004B001.dwg Dec 21, 2008 - 12:30pm

SECTION A



10 0 10
SCALE FEET

LEGEND

BOREHOLE LOCATIONS

GEOLOGIC LEGEND

TKn	TUFF
Tgr	GRANODIORITE WITH VARIABLE PHYLLIC ALTERATION
Tgr	JASPERIZED VEIN/MINERALIZED AND ALTERED GRANODIORITE
Tgr	BIOTIZED GRANODIORITE
	FILL

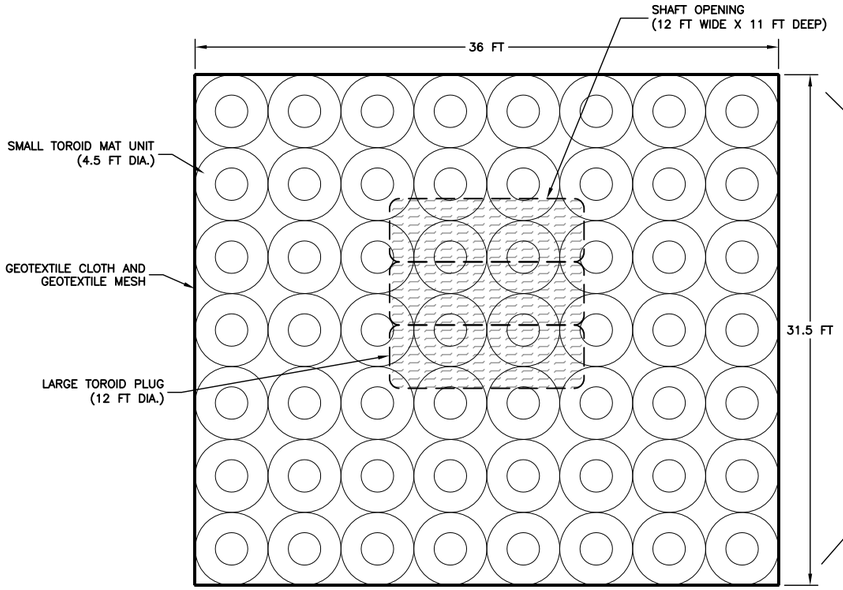
PROJECT
CHINO MINES COMPANY
GROUNDHOG SHAFT CLOSURE
GRANT COUNTY, NEW MEXICO

TITLE
SUBSURFACE GEOLOGY, MINE SHAFT FILL, AND VOID SPACE

Golder Associates
Silver City, New Mexico

PROJECT No.		073-80004	FILE No.	Section A
DESIGN	HNL	12/09/08	SCALE AS SHOWN	REV. 0
CADD	HML	12/16/08	6	
CHECK	JP	12/16/08		
REVIEW	JP	12/16/08		

Drawing file: 07380004B002.dwg Dec 21, 2008 – 12:31pm



TOROID MAT PLAN

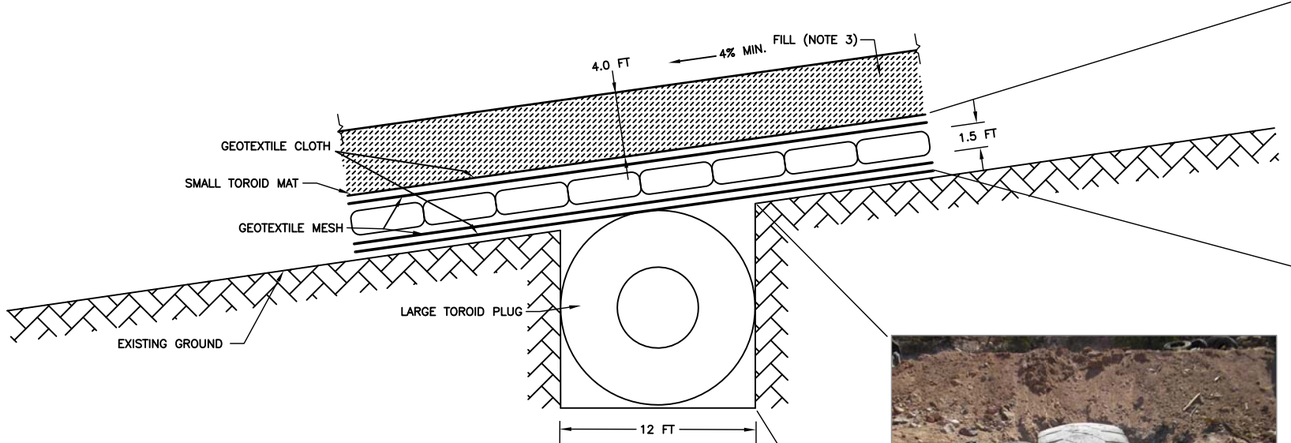
FINAL PLACEMENT OF TOROID MAT

NOTES

1.) TOROID PLUG CONSISTS OF 5 TIRES (ONE 12' DIAMETER, TWO 7' DIAMETER, AND TWO 5' DIAMETER)

2.) TOROID MAT CONSISTS OF 56 4.5' DIAMETER TIRES SECURED BY STEEL CABLES. GEOTEXTILE MESH AND CLOTH WERE INSTALLED ABOVE AND BELOW THE TIRES AS SHOWN.

3.) FILL AND COVER WERE FROM LOCAL BORROW (GRAVELLY SAND WITH APPROXIMATELY 5% FINES)



TOROID PLUG SECTION

TOROID MAT WITH GEOTEXTILE CLOTH AND MESH

TIRES PLACED IN SHAFT

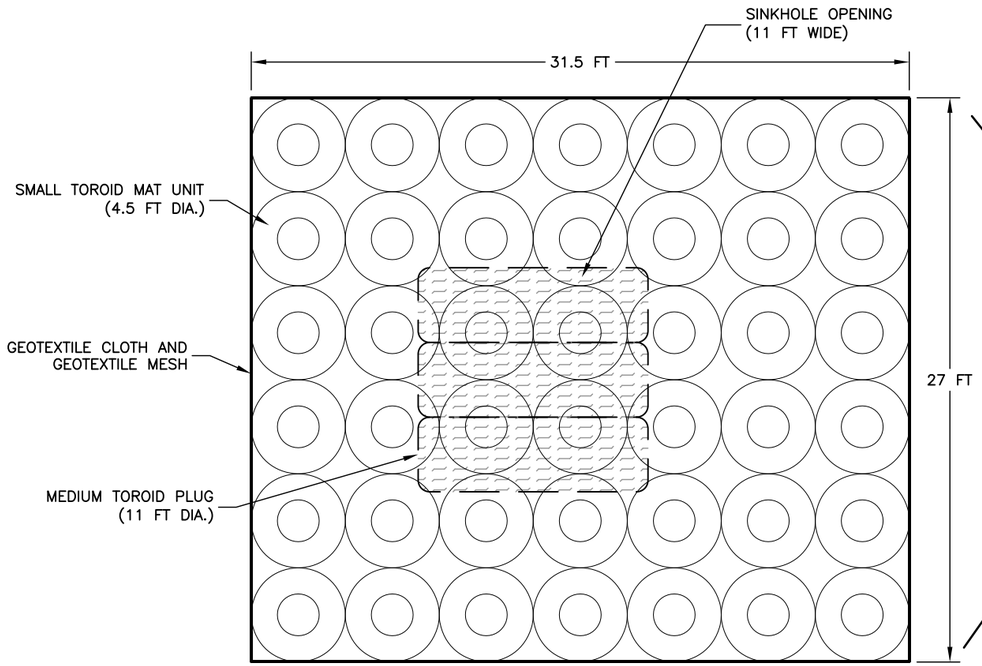
PROJECT
CHINO MINES COMPANY
GROUNDHOG SHAFT CLOSURE
GRANT COUNTY, NEW MEXICO

TITLE
SAN JOSE SHAFT TOROID CLOSURE LAYOUT

Golder Associates
Silver City, New Mexico

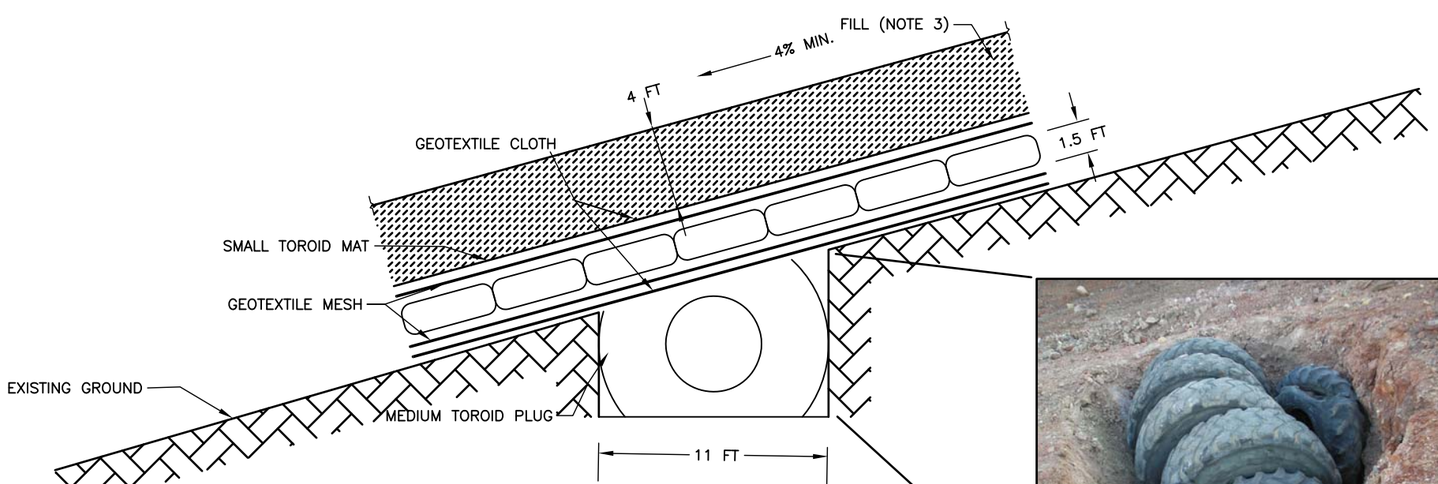
PROJECT No.		073-8004	FILE No.	Primary
DESIGN	HNL	5/29/08	SCALE N.T.S.	REV. 0
CADD	HNL	12/05/08	7	
CHECK	JP	12/15/08		
REVIEW	JP	12/15/08		

Drawing file: 07380004B003.dwg Dec 21, 2008 – 12:31pm



TOROID MAT PLAN

FINAL PLACEMENT OF TOROID MAT



TOROID PLUG SECTION

TIRES PLACED IN SINKHOLE

NOTES

1.) TOROID PLUG CONSISTS OF 7 TIRES (FOUR 7' DIAMETER, AND THREE 5' DIAMETER)

2.) TOROID MAT CONSISTS OF 42 4.5' DIAMETER TIRES SECURED BY STEEL CABLES. GEOTEXTILE MESH AND CLOTH WERE INSTALLED ABOVE AND BELOW THE TIRES AS SHOWN.

3.) FILL AND COVER WAS FROM LOCAL BORROW (GRAVELLY SAND WITH APPROXIMATELY 5% FINES)

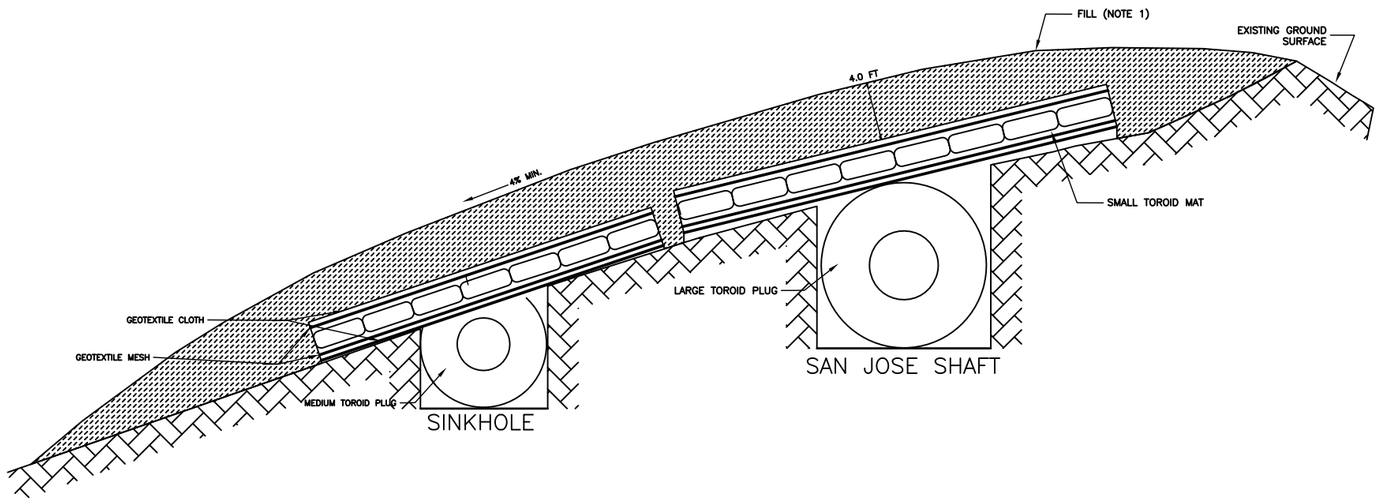
PROJECT
CHINO MINES COMPANY
GROUNDHOG SHAFT CLOSURE
GRANT COUNTY, NEW MEXICO

TITLE
SINKHOLE TOROID CLOSURE LAYOUT

Golder Associates
Silver City, New Mexico

PROJECT No.		073-8004	FILE No.	Secondary
DESIGN	HNL	5/29/08	SCALE N.T.S.	REV. 0
CADD	HNL	12/08/08	8	
CHECK	JP	12/15/08		
REVIEW	JP	12/15/08		

Drawing file: 07380004B004.dwg Dec 21, 2008 – 12:32pm



FINAL PLACEMENT OF COVER MATERIAL

NOTES

1.) FILL AND COVER WERE FROM LOCAL BORROW (GRAVELLY SAND WITH MINIMUM 5% FINES)

PROJECT

CHINO MINES COMPANY
GROUNDHOG SHAFT CLOSURE
GRANT COUNTY, NEW MEXICO

TITLE

FINAL TOROID CLOSURE LAYOUT

Golder Associates
Silver City, New Mexico

PROJECT No.		073-80004	FILE No.	Closure Section
DESIGN	HNL	12/09/08	SCALE N.T.S.	REV. 0
CADD	HNL	12/09/08		
CHECK	JP	12/15/08	9	
REVIEW	JP	12/15/08		

Drawing file: 07380004B005.dwg Dec 21, 2008 – 12:33pm

TECHNICAL MEMORANDUM

Golder Associates Inc.
301 W. College Avenue, Suite 8
Silver City, New Mexico 88061

Telephone: 575-388-0118
Fax Access: 575-388-0120

TO: Ms. Pam Pinson, Chino Mines Company **DATE:** December 19, 2008

FROM: Ms. Jen Pepe, Golder Associates **OUR REF.:** 073-80004

RE: GROUNDHOG MINE SHAFT CLOSURE COMPLETION REPORT

1.0 INTRODUCTION

Golder Associates Inc. (Golder) conducted field oversight for closing the San Jose Shaft, associated sinkhole, and a glory hole at the Groundhog Mine site in accordance with the Groundhog Mine Stockpile Interim Remedial Action (IRA) Work Plan (Chino Mines Company [Chino], 2003). Chino closed these historical mine openings to eliminate safety hazards and to prevent surface water and shallow groundwater from entering the deeper groundwater system.

Golder characterized the Groundhog Mine stockpiles during an investigation from 2000 to 2001 (Golder, 2001). During this investigation, four shafts were identified at the site: the San Jose Shaft, the Groundhog North Shaft, the Groundhog No. 1 Shaft, and the Homestake Shaft. A glory hole (referred to as the San Jose Glory Hole), was also identified near the San Jose Shaft. Another mine opening near the Groundhog No. 1 Shaft was indicated by historical maps of mine workings, but was not observed in the field during the investigation.

Chino completed stockpile removal in 2005, as outlined in the IRA Work Plan (Chino, 2003). However, the Groundhog North Shaft, the Groundhog No. 1 Shaft, and the Homestake Shaft were not found. The San Jose Shaft and San Jose Glory Hole were encountered, as well as a sinkhole near the San Jose Shaft that was likely associated with a stope to the San Jose Shaft. All three of these mine openings had been backfilled with stockpile materials by ASARCO prior to transfer of the property in 1994. However, the fill had settled since then, revealing the mine openings. This technical memorandum describes additional characterization and closure of the mine openings that were found.

2.0 FIELD INVESTIGATION

The mine openings visually identified after stockpile removal are shown on Figures 1 through 4. These openings are located adjacent to a jasperized quartz vein that is more resistant to weathering than the surrounding granodiorite bedrock. The extent of the underground workings is unknown, but historical maps and cross-section drawings indicate that void space may be shallow beneath the jasperized vein. A visual survey of the mine openings is summarized as follows:

- The San Jose Shaft was a primary shaft that historically had a headframe. The headframe was removed prior to Chino's ownership of the property. After stockpile removal, the shaft was collapsed at the ground surface, exposing timbers (Figure 2). However, the hole had been plugged with fill and debris, obscuring any potential shallow void space underneath. The collapsed hole was approximately 12 feet square.

- The sinkhole (Figure 3) adjacent to the San Jose Shaft was also collapsed, but no timbers were visible. The hole had been plugged with fill. The San Jose Shaft and the sinkhole are on opposite sides of the jasperized vein and likely intersect in the shallow subsurface, given their proximity.

- The San Jose Glory Hole (Figure 4) was a drift rather than a vertical shaft. Historical cross-section drawings indicate that the San Jose Glory Hole was angled downward and to the north, intersecting the San Jose Shaft. The mine opening had been filled with stockpile material, but the hole was not collapsed and appeared stable.

Prior to closure, a biological survey was performed to assess potential bat habitat associated with the mine openings. A drilling investigation was also performed adjacent to the shaft openings to determine the extent and depth of any shallow void spaces that would influence closure options or pose a safety hazard during closure activities.

2.1 Biological Survey

Chino contracted Carothers Environmental, LLC (CE) to perform a bat survey of the mine openings (Attachment 1). CE surveyed three sites in June 2007, including the mine openings at the Groundhog Mine, referred to as "Site B" in the CE report. The other two sites surveyed by CE are not part of the Groundhog Mine site.

CE did not observe bats and/or bat sign at the Groundhog Mine openings, and determined that any subsurface workings were inaccessible as habitat. All three potential entrances to the openings had been blocked with fill and debris. CE recommended that the mine openings be closed by any means to avoid further collapse.

2.2 Drilling investigation

St. Cloud Mining Company (St. Cloud) conducted a drilling program on February 13, 2008, to determine the extent of void space in the vicinity of the shafts. Nine holes were drilled into bedrock using an Ingersoll Airtrack drill rig. Boreholes were drilled to a minimum depth of 12 feet and logged by a Golder engineer (Attachment 2). Boreholes were concentrated around the San Jose Shaft and sinkhole (Figure 5), as information regarding subsurface conditions was needed to design a stable plug.

Bedrock encountered during drilling included tuff, variably altered granodiorite, and the jasperized quartz vein. The jasperized vein was hard and competent compared to the granodiorite, which was weathered and fractured near the surface. The drilling investigation indicated that subsurface void space shallower than 12 feet below ground surface was limited to the area immediately adjacent to the sinkhole (boreholes BH-5 and 6), where the jasperized vein was not encountered. This confirmed that the sinkhole was likely formed by a collapsing stope, which had been excavated along the vein, as shown on Figure 6. Borehole BH-3 encountered fill below 15 feet, underlying competent jasperized quartz.

Historical cross-section drawings also indicate a potential void space between the San Jose Shaft and the San Jose Glory Hole, but at a depth greater than 25 feet. Borehole (BH-4) was drilled between these two mine openings to a depth of 25 feet. Competent jasperized quartz was encountered the entire depth of borehole BH-4, confirming that no shallow void exists and the area between the San Jose Glory Hole and the San Jose Shaft is physically stable in its current configuration.

3.0 SHAFT CLOSURE

The IRA Work Plan (Chino, 2003) stated that shafts would be closed by plugging and sealing using methods appropriate to the conditions after removal activities. Methods considered for

closure included concrete plugs, bentonite seals, polyurethane foam, toroid plugs, and/or regrading for drainage. The purpose of closure was to eliminate safety hazards and prevent surface water and shallow groundwater from entering the deeper groundwater system. Because the stockpile material was removed to bedrock, shallow groundwater seepage previously observed at the stockpile/bedrock interface was no longer present. Therefore, the main objectives were plugging the collapsing shaft and sinkhole to eliminate safety hazards and surface regrading to enhance drainage.

Based on the weathered nature of the shallow bedrock and ongoing settlement in the shaft and sinkhole, Chino selected the toroid plug as the most appropriate method. Toroid plugs use spent tires from earthmoving equipment to form a flexible plug that expands to fill the hole while stabilizing the collapsing shaft walls. Once enough tires have been wedged into the hole, local fill is added to further fill void spaces in and around the plug. Then the plug is covered with geotextile net and cloth, and a cabled tire mat is added to hold the plug in place. The weight of the tire mat further expands the toroid plug, increasing the strength of the seal. The plug and mat are then covered with local fill and graded to drain surface water. This method was chosen over traditional plugs because it will not shrink over time and compromise the strength of the seal, as with concrete and grout, and is a viable option to polyurethane foam. The method has been accepted by the Mines and Minerals Division (MMD) as an effective new technology for mine closure (MMD, 2008).

The San Jose Shaft and sinkhole closure began in April and continued through June of 2008. In addition to the bat survey, archaeological and Blue Stake surveys were performed prior to construction activities. St. Cloud installed the Toroid plugs and Golder observed the construction.

Details of the closure configuration of the San Jose Shaft and sinkhole are shown on Figures 7 and 8, respectively. Loose soil and timbers were removed from the holes. Tires were then placed vertically in the holes using a trackhoe and hand labor. Fill excavated from a borrow area at the Bayard Canyon saddle was then added around the tires to fill voids to the extent possible. A non-woven geotextile cloth and geotextile mesh were laid over the plugged hole and covered with a cabled tire mat. The tire mat was then covered with an additional

geotextile cloth and mesh. Additional fill from the borrow area at the saddle was placed over both plug/mat configurations to a thickness of approximately 4 feet. The fill was mounded and graded to enhance surface water runoff. The final closure configuration is shown on Figure 9.

Based on Chino's visual inspection of the San Jose Glory Hole and results of the drilling investigation, the glory hole was not considered a safety hazard. The glory hole had been excavated into competent jasperized quartz and plugged with local fill to prevent access. Minor regrading was completed around the plugged opening to enhance stormwater runoff.

4.0 SUMMARY AND CONCLUSIONS

Mine openings at the Groundhog Mine were closed from April to June, 2008, as required by the IRA Work Plan (Chino, 2003). Four shafts were identified in the IRA Work Plan, including the San Jose Shaft, the Groundhog North Shaft, the Groundhog No. 1 Shaft, and the Homestake Shaft. An additional glory hole was also identified near the San Jose Shaft. During removal activities, only the San Jose Shaft and San Jose Glory Hole were encountered, as well as a sinkhole near the San Jose Shaft that was likely associated with a stope to the San Jose Shaft.

The San Jose Shaft and sinkhole were closed using a toroid plug covered with a cabled tire mat and a mounded soil cover graded to drain surface water off the areas. The San Jose Glory Hole was found plugged with fill and debris and was not considered a safety hazard. Minor regrading was completed around the plugged opening to enhance stormwater runoff.

Chino will inspect the toroid plugs quarterly, as part of the scheduled inspections of the Groundhog Mine site, to monitor for erosion, runoff control, and the effectiveness of the toroid plugs in preventing further collapse of the holes.

5.0 REFERENCES

Chino Mines Company, 2003. *Groundhog Mine Stockpile Interim Remedial Action Work Plan.* October 23, 2003.

Golder Associates Inc., 2001. *Groundhog Mine Stockpile Site Investigation Report. Submitted to Chino Mines Company*. July 20, 2001.

Mining and Minerals Division (MMD), 2008. New Mexico Energy, Minerals, and Natural Resources Department. "Lake Valley Mine Safeguard Project - Phase II." http://www.emnrd.state.nm.us/MMD/AML/LakeValleyII.htm (accessed April 29, 2008).

Attachments: Figures 1 through 9
Attachments 1 and 2

JP/KJ/dw

APPENDIX B

GROUNDHOG MINE SOIL COVER PLACEMENT
PROJECT COMPLETION REPORT
TELESTO SOLUTIONS, INC.

Groundhog Mine Soil Cover Placement
Project Completion Report

Prepared For

Chino Operations
Freeport-McMoRan Copper & Gold
210 Cortez Ave
Hurley, NM. 88043

Prepared By

Telesto Solutions Inc.
2950 East Harmony Rd. Suite 200
Fort Collins, Colorado 80528

July 2008

TELESTO
SOLUTIONS • INCORPORATED

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Figure 1 Groundhog Mine Soil Cover Placement

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1.0 INTRODUCTION

Telesto Solutions, Inc. (Telesto) was contracted by Chino Operations of Freeport-McMoRan Copper & Gold Corporation (FMI) to plan and oversee soil cover placement at the Groundhog Mine site (site). Pam Pinson of the Chino Environmental Land and Water Department was the Project Manager for FMI. St. Cloud Mining Company (St. Cloud) from Truth or Consequences, New Mexico was the contractor for the work. Personnel of Telesto provided construction quality assurance for the work.

St. Cloud mobilized and was fully operational during the second week of January 2008. Cover soil placement and final grading was completed on April 29, 2008. St. Cloud completed abandoned mine closure work in the area for Golder & Associates, Silver City, NM (Golder) from April 30 to May 9, 2008. Demobilization was completed in June 2008.

The work was designed to conform to the General Obligations and Conditions outlined in Permit Revision 01-1 to Permit No. GF009RE, Chino Mine, Existing Mining Operation, by the Mining and Minerals Division (MMD permit).

Project photos are included in the report in Appendix A. Daily construction progress reports have not been included with this report but are available on request from Telesto.

2.0 SCOPE OF WORK TASKS

The work at the Groundhog Mine site consisted of borrow area preparation, minor grading of areas to be covered, cover soil excavation, hauling and spreading, drainage swale construction, sediment removal, and ripping of the soil in preparation for revegetation. The original scope of work included revegetation. However, at the request of FMI, revegetation was not completed by St. Cloud.

2.1 Borrow Area Preparation, Excavation and Reclamation

Borrow area preparation included debris removal and clearing and grubbing trees and larger vegetation to provide easier access to the soil. Debris and cleared vegetation was stockpiled at the south end of the project adjacent to St. Cloud's equipment staging area.

Following clearing and grubbing, ten test pits were excavated in the borrow area by St. Cloud under the supervision of Telesto. The test pits were excavated to provide a more accurate estimate of available borrow soil volume and optimum locations for soil excavation. Soil depths in the test pits ranged from ten inches to three feet. The soil was underlain by weathered Sugarlump tuff bedrock.

Following excavation, the maximum slope in the borrow area was 2.5h:1v and a minimum six-inch-thick layer of soil was left in place to facilitate revegetation. Larger outcroppings of rocks and nearby trees were left in place for aesthetic reasons and to aid in erosion control. The stockpiled cleared and grubbed vegetation was placed in random locations in small piles for eco-habitats.

2.2 Minor Grading of Site

Prior to placement of soil cover, St. Cloud performed minor grading, in areas shown on Figure 1, to provide a more uniform cover placement surface.

2.3 Placing of Soil Cover

Areas of soil cover placement are shown on Figure 1. The soil was typically hauled from the borrow area by truck, dumped and spread in a single twelve-inch-thick lift. Following soil spreading and grading, the soil cover was prepared for revegetation by ripping with a D-5 dozer.

The small area covered east of Chino's weather telemetry station was also just east of above-ground steel pipelines. This area was covered with soil from an existing borrow area on the south end of the project, adjacent to St. Cloud's equipment staging area. To

avoid crossing the pipeline with loaded haul trucks, a front end loader was used to reach over the steel pipelines and dump soil at the toe of the cover area. The soil was spread with a D-5 dozer that accessed the area over an existing pipe crossing south of the telemetry station. The existing crossing was reinforced with an additional twelve inches of soil prior to crossing with the dozer.

2.4 Drainage Swale Construction

St. Cloud constructed rock-lined drainage swales in covered areas where flow concentrates, as shown on Figure 1.

2.5 Sediment Removal

Storm water containment ponds are located on both the east and west sides of the site. St. Cloud removed accumulated sediments from the ponds. Approximately 1400 cubic yards of sediment was removed from the upper (east) containment area, and slightly less sediment was removed from the lower (west) containment pond. Removed sediment was stockpiled adjacent to the St. Cloud's equipment staging area. Personnel of James Hamilton Construction Company hauled the sediment to a disposal location at the Chino Mine.

2.6 Additional Work Items

St. Cloud under the supervision of Golder performed exploratory drilling in an area of collapsed mine workings on the east side of the project. Drill hole survey coordinates in the Chino local coordinate system are shown in Table 1. Closure of the mine features, immediately following the drilling, was planned and overseen by personnel of Golder.

To improve access to the Lake One Haul Road from the Groundhog mine entrance, St. Cloud cut a new road on the upper portion of the west cover area through the existing haul road berm. St. Cloud closed the old access point to the haul road after the placement of soil cover was complete.

St. Cloud also covered and closed an access road on the east side of the site. The soil used for the cover and berm for this area came from an existing borrow area on the south end of the project, adjacent to St. Cloud's equipment staging area. St. Cloud regraded this borrow area during excavation to flatten steep slope.

TABLES

Table 1 Drill Test Hole Coordinates Drilled by St. Cloud
Chino Local Coordinate system (feet)

Hole Designation	Survey Designation	Northing	Easting	Elevation
ATH*-1	2000	6280.95	11441.786	6021.574
ATH-2	2001	6295.264	11403.796	6016.063
ATH-3	2002	6285.696	11398.318	6014.717
ATH-4	2003	6260.82	11391.095	6011.61
ATH-5	2004	6279.381	11381.766	6010.092
ATH-6	2005	6276.61	11378.921	6009.043
ATH-7	2006	6267.815	11376.116	6008.068
ATH-8	2007	6306.842	11386.65	6010.523
ATH-9	2008	6301.556	11384.326	6010.224

* ATH (Air Track Hole)

FIGURES

STORMWATER CONTAINMENT POND

EXISTING HEADWALL AND SUMP

EXISTING MONITORING WELLS

NEW ACCESS ROAD TO HAUL ROAD

ACCESS ROAD CLOSED WITH BERM

EXISTING WEST DITCH

DRAINAGE SWALE

BORROW AREA

EXISTING CULVERT

COLLAPSED MINE WORKINGS

EXISTING EAST DITCH

DRAINAGE SWALE

EXISTING CULVERT

STORMWATER CONTAINMENT POND

REMOVED FOUNDATIONS

EXISTING LAKE ONE HAULROAD

PIPELINE CORRIDOR

BURIED PIPELINE

ACCESS ROAD

EQUIPMENT STAGING AREA

ACCESS ROAD CLOSED WITH BERM

EXISTING TELEMETRY STATION

ABOVE-GROUND PIPELINE

EXISTING BURIED PIPELINE CORRIDOR

SCALE IN FEET

0 200

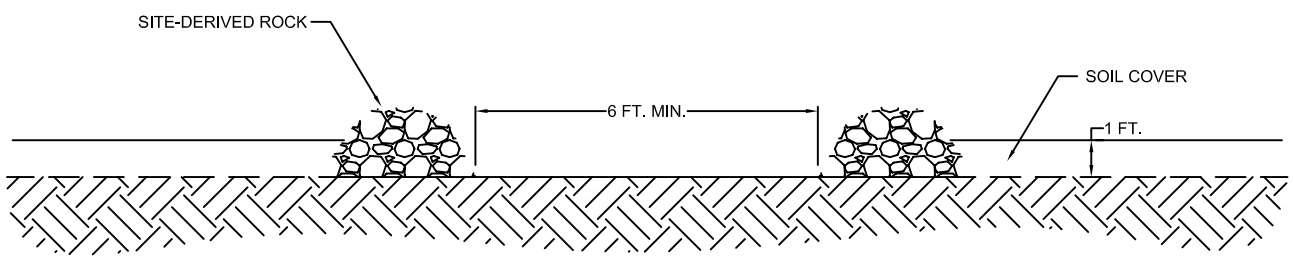
N

LEGEND

POWER POLES

SOIL COVER AREAS

AREAS GRADED PRIOR TO COVERING



DRAINAGE SWALE CROSS SECTION

PROJECT: 200300	TASK: 06
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

FIGURE 1
GROUNDHOG MINE SOIL COVER PLACEMENT

PREPARED FOR: FREEPORT-MCMORAN COPPER & GOLD

7/1/2008 P:\Projects\200-Chino\200300-Ground Hog and GH#5\200300 Groundhog AUTOCAD\groundhog 7-23-07.dwg

APPENDIX A
Project Photos

Borrow Area During Excavation

Borrow Area from Pipeline Corridor

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PROJECT: 200303	TASK: 06	GROUND HOG PROJECT	PREPARED FOR: FREEPORT-MCMORAN COPPER & GOLD
PREPARED BY: TELESTO SOLUTIONS INCORPORATED			

South End of Borrow Area Following Excavation

Spreading Cover Soil in East Cover Area

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PROJECT: 200303	TASK: 06	GROUND HOG PROJECT	PREPARED FOR:
PREPARED BY: TELESTO SOLUTIONS • INCORPORATED			FREEPORT-MCMORAN COPPER & GOLD

Drainage Swale at East Cover Area

Soil Cover In Place at East Cover Area.

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PROJECT: 200303	TASK: 06	GROUND HOG PROJECT	PREPARED FOR:
PREPARED BY: TELESTO SOLUTIONS • INCORPORATED			FREEPORT-MCMORAN COPPER & GOLD

West Cover Area Partially Covered

West Side Drainage Swale Under Construction

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PROJECT: 200303	TASK: 06	GROUND HOG PROJECT	PREPARED FOR: FREEPORT-MCMORAN COPPER & GOLD
PREPARED BY: TELESTO SOLUTIONS INCORPORATED			

West Containment Pond Following Sediment Removal

Soil Cover and Drainage Swale in West Cover Area

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PROJECT: 200303	TASK: 06	GROUND HOG PROJECT	PREPARED FOR:
PREPARED BY: TELESTO SOLUTIONS • INCORPORATED			FREEPORT-MCMORAN COPPER & GOLD

APPENDIX C

GROUNDHOG MINE SITE
POST-REMOVAL FIELD SAMPLING
AND ANALYSIS

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Attachment C.1 Sample Logs
Attachment C.2 XRF Analysis
Attachment C.3 Laboratory Data Sheets

1.0 INTRODUCTION

This appendix describes sampling of the post-excavation surface at Chino Mines Company's (Chino's) Interim Remedial Action (IRA) at the Groundhog Mine site (Figure C-1). The purpose of post-removal sampling was to document post-removal conditions and to determine an appropriate list of constituents for post-corrective action monitoring of surface water. X-Ray Fluorescence (XRF) analysis was used to evaluate the spatial distribution of selected metals by geologic unit as a basis for compositing samples for laboratory analysis. Laboratory analyses of the acid-base accounting (ABA), total metals, and Synthetic Precipitation Leachate Procedure (SPLP) were used to document the chemical nature of each geologic unit.

This appendix includes the approach to sample collection: sample types, locations, numbers, and identifiers (IDs); and field decontamination procedures, analytical methods, and results of laboratory analyses. This investigation employed Standard Operating Procedures (SOPs) developed for the Hanover and Whitewater Creeks Investigation Unit (Chino et al, 1997) where appropriate.

2.0 FIELD SAMPLING

This section discusses field data-collection procedures. Following excavation of stockpile material, geologic units were mapped and samples were collected by Pam Pinson (Chino) and Jen Pepe (Golder). Prior to field work, Phil Harrigan of the New Mexico Environmental Department (NMED) concurred with the number and locations of samples (NMED, 2007).

The Groundhog Mine IRA Work Plan (Chino, 2003; the Work Plan) described periodic sampling of paste pH, using an action level of 5.5 standard units, to determine when sufficient stockpile material and impacted underlying soils had been excavated. However, Chino decided during excavation to remove material in the stockpile areas down to bedrock, to remove as much residual acidity as possible from the site. All samples were collected from the weathered bedrock surface following excavation of the stockpile materials.

2.1 Field Mapping and Sample Descriptions

The exposed weathered bedrock surface was mapped by Pam Pinson (Chino). The surface was inspected and described using general geologic descriptions of each surficial geologic unit present within the excavation footprint. The surficial geologic units were described in a field notebook and sketched on a field map. Any other identifying characteristics, such as staining, fracturing, nature of geologic contacts, etc., were also noted.

A geologic map of the excavation footprint is shown on Figure C-2. Geologic units encountered during field mapping include:

- Kneeling Nun and Sugarlump Tuff (Tkn) – These units are not differentiated on Figure C-2, but are both included in as Kneeling Nun Tuff. This unit occurred along the slopes above the valley.
- Tertiary Quartz Monzonite (Tqm) – This unit is a post-mineralization dike occurring near the lower stormwaterpond and in the center of the valley on the south portion of the site.
- Tertiary Granodiorite (Tgr) – This unit is differentiated on Figure C-2 as either biotized or phyllically altered. Phyllically altered granodiorite occurred only in areas proximal to mineralized veins and mine shafts. The majority of the site was mapped as biotized granodiorite.
- Jasperoid Vein – This unit is a mineralized and altered vein within the phyllically altered granodiorite. This vein is hard and resistant to weathering.

Jen Pepe (Golder) sampled each material that might differ in its chemical composition and was present in sufficient surface area to influence the overall geochemical behavior of the area. Sample

locations were based on visual rock fragments. At each sampling location, the field geologist described the general texture of the weathered bedrock. Each sample location was photographed. Sample logs including photographs and geologic descriptions are in Attachment C.1.

2.2 Sample Types and Collection Method

Grab samples were collected from each geologic unit within an excavation footprint. A small portion of each grab sample was used for XRF analysis. The remainder of each grab sample was composited in the laboratory for additional analyses, as described in Section 5.2.

Bedrock sampling is modified from SOP 21, "Sample Collection from Soil Borings, Excavations, and Hand Dug Pits" (Chino et al, 1997). The project-specific sampling procedure that was developed is described below.

1. The sample was collected to the depth possible (generally 1 or 2 inches) using a clean, gloved hand or a plastic spatula.

2. Approximately 2 kilograms of material was evenly collected from the sample area. Where the bedrock was not weathered enough to allow sampling of surface materials, samples of bedrock were collected in fractured areas to avoid using a rock hammer.

3. After description, the sample was placed directly into Ziploc bags, and labeled according to SOP 4, "Sample Custody and Documentation Procedures" (Chino et al, 1997). Each sample was double bagged, with each bag labeled.

2.3 Sample Locations and Numbers

Sampling locations were distributed over each surficial geologic unit (Figure C-2). Each sampling location was surveyed using a hand-held Global Positioning System unit. At least four grab samples were collected from each unit.

The samples actually collected compared to locations originally planned are shown in Table C-1. The Work Plan proposed a grid sampling design (Chino et al, 1997), but with concurrence from NMED (2007), samples were actually collected using a stratified judgment design from the following areas (Figure C-2).

- GU Area - Upper Groundhog area draining to the upper stormwater pond,
- GL Area - Lower Groundhog area draining to the lower stormwater pond, and
- G4 Area – Former Stockpile G-4.

Five geologic units were mapped east of the Haul Road in the GU Area, including the Tkn, Tqm, Tgr (biotized), Tgr (phyllically altered), and Tgr (Jasperoid vein) units. This area drains to the upper stormwater pond and includes the mineralized veining along the eastern margin of the site associated with historical mine workings. Thirty-seven samples were collected in the GU Area. Forty-eight samples were originally planned; however, portions of the area were not sampled because some stockpile material had to be left in place pending removal of infrastructure at the time of mine closure, primarily in the area of the telemetry station near the canyon saddle. In addition, five samples planned for the area of the former Stockpile G5 could not be collected as the new Haul Road was constructed over the stockpile footprint. Two samples were collected on the west side of the Haul Road adjacent to the Stockpile G5 footprint at the request of NMED (2007) to confirm that stockpile materials were not present.

Two geologic units were mapped in the GL Area, the Tqm and Tgr (biotized). Fourteen of the originally planned 28 samples were collected from the GL Area. A portion of the area was covered by the new Haul Road, and the excavated surface could not be sampled.

The G4 Area was sampled separately, as it drains directly to a tributary (Whitewater Creek) downgradient of the headwall containing runoff from the rest of the Groundhog Mine Site. Four samples were collected from the four geologic units in the G-4 Area, which include the Tkn, Tqm, Tgr, and a hematite-stained Tgr vein.

The Work Plan specified that the footprints of the residential foundations and an adjacent paved road would be sampled. However, these areas fell either in the footprint of the borrow area (Figure C-2), or along the alignment of the west drainage ditch and had been excavated below any impact defined by the Groundhog Mine IRA Site Investigation Report (Golder, 2001). Therefore, Chino deemed these samples unnecessary.

3.0 SAMPLE DESIGNATION

Each sample was assigned a unique sample identifier (ID). The sample ID for the grab samples collected in the field indicate the area from which the sample was collected, the geologic unit, and a numerical identifier. For example, the sample ID GU-Tkn-3 is the third sample collected from the Kneeling Nun Tuff in the GU Area

4.0 DECONTAMINATION OF FIELD EQUIPMENT

Disposable equipment was used to the extent possible, in order to reduce opportunities for cross contamination and decrease decontamination requirements. Reusable field equipment was decontaminated according to SOP 6, "Decontamination of Equipment Used to Sample Soil and Water," (Chino et al, 1997) with the modification that no nitric acid rinse was used.

5.0 SAMPLE HANDLING AND LABORATORY ANALYSIS

All samples were double bagged in Ziploc bags and labeled. A chain-of-custody form was completed for each sample and accompanied the samples to the SVL Analytical Laboratory (SVL) in Kellogg, Idaho.

Samples were packed for shipment to prevent sample-container breakage and to secure the shipping container from opening during shipping. A custody seal was placed on the outside of each shipping container prior to shipping and covered with clear tape to prevent tampering. Sample handling followed SOP 5 "Packaging and Shipping of Environmental Containers" (Chino et al, 1997).

An aliquot of each sample was sent to Golder's field laboratory in Hurley for XRF analysis. XRF analysis was performed according to procedures detailed in Attachment C.1. The purpose of the XRF analysis was to evaluate variability within each geologic unit as a basis for compositing samples for additional laboratory analysis. XRF analysis was performed for arsenic, cadmium, cobalt, copper, iron, lead, manganese, and zinc. As noted in Attachment C.1, the XRF unit was calibrated for copper at approximately 4,500 milligrams per kilogram for a different project, a higher concentration than expected at the Groundhog Mine Site. Nonetheless, the XRF results were suitable for evaluating relative concentrations within and between geologic units.

SVL performed saturated paste pH measurements on each of the samples received using the American Society of Agronomists Method 9 (ASA 9). Using the paste pH results, geologic descriptions, and XRF results, Golder then selected samples to be composited by SVL for additional analysis:

- Paste pH: ASA 9
- ABA: Modified Sobek
- SPLP: Method 1312
- Total Metals: SW-846 Method 3050

Samples were air dried and crushed to 3/8-inch according to SPLP Method 1312. A sub-sample was then pulverized to -160 mesh (approximately 0.09 millimeters) for ABA and total metals analysis. The samples were not sieved prior to crushing.

Total metals analysis included aluminum, cadmium, cobalt, copper, iron, manganese, lead, and zinc. SPLP was conducted for each of these metals plus fluoride, total dissolved solids, and sulfate.

6.0 ANALYTICAL RESULTS

6.1 XRF Analyses and Paste pH

Results for the XRF analyses and paste pH for the GU, GL, and G4 Areas are compiled in Tables C-2, C-3, and C-4, respectively. The results for the GU and GL Areas are presented with summary statistics for each geologic unit. For the G4 Area, there was only one sample per geologic unit, so summary statistics were inapplicable.

Generally, the XRF detection limits for arsenic, cadmium, and cobalt were too high to be useful in the in the evaluation, as most results were non-detectable. However, copper, iron, lead, manganese, and zinc concentrations were detected in all samples.

Box and whisker plots (Figures C-3 through C-14) are graphical representations of the XRF dataset for each geologic unit in the GU and GL Areas. The box and whisker plots were used to qualitatively determine whether the XRF data for each geologic unit represent different distributions. These plots illustrate that the metals concentrations and paste pH are distinctly different between units. Iron and paste pH show the greatest distinction between units.

Based on the results of the XRF analysis and paste pH, the samples were composited per each geologic unit in GU and GL Areas, with the exception of GU Area samples collected west of the Haul Road, to confirm the absence of Stockpile G5 (these two samples were composited together). None of the four samples collected in the G4 Area were composited, as each represented a different geologic unit or sub-unit. The sample composite summary is listed in Table C-5.

6.2 Laboratory Analyses of Composited Samples

This section presents the results of laboratory chemical analysis for composited samples of the post-removal surface. Portions of the 55 grab samples were composited into 12 composite samples by SVL as shown in Table C-5. Composited samples were analyzed for paste pH, ABA, total metals analysis, and SPLP. Laboratory data sheets are provided in Attachment C.3, and results are summarized below.

6.2.1 Acid-Base Accounting

ABA results are presented in Table C-6. Figures C-15 through C-20 provide graphical analysis of the pertinent results.

In accordance with Price (1997), the following screening criteria are used to classify samples in terms of their acid-generation potential:

ARD Potential	Screening Criterion	Comments
Likely	Neutralizing Potential/Acid Potential (ANP/AGP) < 1	Likely ARD generating unless sulfide minerals are non-reactive
Possibly	1 < ANP/AGP < 2	Possibly ARD generating if ANP is insufficiently reactive or is depleted at a rate faster than sulfides
Low	2 < ANP/AGP < 4	Not potentially ARD generating unless sulfides are preferentially exposed or extremely reactive in combination with insufficiently reactive ANP
None	ANP/AGP > 4	Not acid generating

Notes:
ANP = acid-neutralization potential
AGP = acid-generation potential
ARD = acid-rock drainage

A fifth category follows an empirical rule of thumb: materials with sulfide sulfur contents less than 0.3 percent and a paste pH greater than 5.5 are generally considered non-acid-generating, regardless of their ratio of acid-neutralization potential (ANP) to acid-generation potential (AGP).

The material classifications based on Price (1997) are shown in Table C-6. Based on ANP/AGP ratios alone, of the 12 samples, 6 were classified as likely to generate acid, 1 has a low potential to generate acid, and 5 are not acid generating. Figure C-15 shows ANP values versus AGP values. Also included are the linear expressions of the acid-rock drainage criteria advocated by Price (1997). Figure C-16 relates pyritic sulfur content to the paste pH graphically. Samples in the upper left quadrant of Figure C-16 are considered not acid generating.

Note that for all samples classified as potentially acid generating, the sulfide sulfur content is low (less than 0.3 percent). In fact, for samples GU-JV, GU-TGRP, and GU-TKN, the sulfide sulfur content is so low that acid generation through oxidation is considered unlikely. The low values for paste pH likely reflect past reactivity, which may have resulted in formation of oxidation products, such as jarosites, that contain stored acidity, which is released when they dissolve. The only samples considered to be potentially acid generating due to future sulfide oxidation are GU-TGR and GU-TQM.

Additional graphical analysis of ABA, presented in Figures C-17 through C-20, includes plots of pyrite sulfur versus total sulfur, sulfate sulfur versus total sulfur, paste pH versus NP, and paste pH versus the ANP/AGP ratio, respectively.

All of the five samples with low paste pH and classified as likely to generate acid were collected in the GU Area east of the Haul Road. Sample GU-TRG-G5, composited from grab samples collected west of the Haul Road, was classified as having a low potential to generate acid and has a paste pH of 7.28. All samples collected from the GL and G4 Areas are classified as not acid generating.

6.2.2 Total Metals and SPLP Results

The purpose of the evaluation is to characterize the contaminants present in order to develop a list of constituents of concern for post-removal water-quality monitoring. Total metals analysis and SPLP results are listed in Tables C-7 and C-8, respectively. Total metals analysis was conducted to determine the nature of the excavated bedrock surface prior to cover material placement. SPLP testing was performed to determine whether metal concentrations identified by total metals analysis have the potential to leach from the stockpiles.

With the exception of one sample, G4-TSL-1, good agreement was observed between leachate pH and paste pH, in that values were either consistently alkaline/neutral or acidic. The low paste pH for sample G4-TSL-1 is anomalous relative to all other measurements in samples from the G4 Area, and may be an error.

Generally, in samples collected from the GU Area east of the Haul Road, cadmium, copper, manganese, lead, and zinc concentrations were elevated. The samples collected adjacent to the former location of Stockpile G5 did not leach any metals in elevated concentrations.

In samples collected from the GL Area, leachate did not contain elevated concentrations of metals or other constituents. In samples collected from the G4 Area, leachate did not contain elevated concentrations of metal or other constituents, but did have a high pH (8.9 or greater).

6.3 Quality Assurance/Quality Control Samples Analysis

Three duplicate grab samples were collected in the field for XRF analysis. Four split samples were also sent to SVL for total metals analysis as part of routine confirmation analysis. Duplicate and split-sample XRF results are included in Attachment C.3.

One decontamination rinseate blank (DRB) was collected from rinse water used to decontaminate plastic spatulas. Results of the DRB are listed in Table C-9. No metal concentrations were detected in the DRB sample.

Also listed in Table C-9 are the XRF split-sample laboratory results compared to the XRF results. These results illustrate the correlation of laboratory total metals and XRF results. The XRF results tended to overpredict total metals concentrations. Comparing the XRF analytical results of the G4 Area samples to the laboratory concentrations further illustrates this point. For the G4 Area samples copper, lead, and manganese were fairly well predicted, while iron was consistently overpredicted by the XRF analysis.

7.0 REFERENCES

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Price, William A, 1997. Draft, *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia*. Reclamation Section, Energy and Minerals Division, Ministry of Employment and Investment, British Columbia. April 1997.

APPENDIX C

TABLES

TABLE C-1
POST-REMOVAL SAMPLE SUMMARY FOR XRF ANALYSES

Stockpiles	Planned[a]	Total Planned per Combined Area	Combined Area	Collected[b]	Comments
G1	8	48	GU	37	Stockpile material at telemetry station still to be removed, additional samples will be collected after closure.
G2	8				
G3 East	9				
Valley Fill	18				
G5	5				
G3 West	28	28	GL	14	Additional samples will be collected along Haul Road alignment after Haul Road closure.
G4	3		G4	4	
Roads					
Paved Area Near Drainfield	6			0	Removed to native ground uphill of wasterock and excavated out for drainage ditch.
Foundations					
Residential Area	5			0	Removed to below native ground within borrow area

Notes:

a = Total samples to be collected per the IRA Work Plan (Chino, 2003)

b = Total samples collected for post-removal characterization in 2008

XRF = X-Ray Fluorescence

GU= Upper Groundhog Area

GL = Lower Groundhog Area

TABLE C-2
POST-REMOVAL XRF ANALYSES AND PASTE pH
UPPER AREA

Sample ID	Cd (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Paste pH s.u.
Jasperized Vein								
GU-JV-20	<79.5	<384.16	291.56	92,977.76	1,538.08	2,608.90	955.59	6.08
GU-JV-21	<82.67	<511.63	167.93	149,340.13	2,963.62	419.07	195.24	5.75
GU-JV-26	<78.95	<347.5	873.27	73,053.84	7,747.09	1,070.86	684.06	4.37
GU-JV-27	<74.6	<288.41	1,025.57	56,962.95	3,963.14	1,849.05	1,223.53	4.34
Count	4	4	4	4	4	4	4	4
Non-Detect Count	4	4	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	1,025.57	149,340.13	7,747.09	2,608.90	1,223.53	6.08
Minimum	NA	NA	167.93	56,962.95	1,538.08	419.07	195.24	4.34
Mean	NA	NA	589.58	93,083.67	4,052.98	1,486.97	764.61	5.14
Median	NA	NA	582.42	83,015.80	3,463.38	1,459.96	819.83	5.06
Standard Deviation	NA	NA	423.15	40,293.51	2,656.18	949.28	438.84	0.91
Coefficient of Variation	NA	NA	0.72	0.43	0.66	0.64	0.57	0.18
Granodiorite (biotized)								
GU-TGR-1	<70.31	<216.57	116.65	35,687.17	158.86	2,140.06	658.37	7.56
GU-TGR-2	<69.74	<223.04	290.89	39,179.17	428.73	2,379.56	1,108.63	7.36
GU-TGR-7	<77.16	<279.7	1,068.43	49,317.88	6,135.22	2,036.73	1,883.02	5.68
GU-TGR-8	<53.35	210.82	279.48	11,687.75	1,101.88	396.95	537.88	4.62
GU-TGR-9	<54.39	170.56	144.69	9,147.78	1,966.66	296.94	564.76	6.58
GU-TGR-10	<70.54	<219.17	339.20	35,954.09	939.17	2,037.84	1,411.96	7.09
GU-TGR-11	<73.83	<263.75	1,428.99	48,120.56	3,304.17	3,004.43	3,191.56	4.42
GU-TGR-12	<72.21	<227.8	227.05	38,002.63	1,066.27	1,200.27	4,525.59	7.32
GU-TGR-13	<95.16	1097.81	413.82	213,827.41	3,069.38	825.54	4,184.28	4.74
GU-TGR-14	<71.14	<248.94	65.67	46,607.38	1,381.33	4,356.97	1,322.94	7.22
GU-TGR-15	<86.4	<370.1	1,553.77	73,062.41	15,783.75	4,602.07	1,998.64	5.48
GU-TGR-16	<75.49	<284.98	572.27	55,314.77	3,052.65	3,878.93	1,006.79	4.04
GU-TGR-17	<74.5	<290.87	873.82	59,610.38	1,748.51	7,813.78	3,693.83	6.89
GU-TGR-18	<79.68	<346.45	3,320.31	73,587.91	6,128.60	5,884.28	6,636.57	6.45
GU-TGR-19	<73.88	<295.29	538.79	60,895.23	1,645.47	4,713.62	2,227.73	6.82
GU-TGR-28	<74.04	<278.12	351.96	55,551.52	949.58	5,581.40	1,965.50	5.56
GU-TGR-29	<74.07	<311.9	476.77	67,035.82	1,742.99	3,099.92	1,847.38	4.64
GU-TGR-34	<72.45	<240.09	355.48	41,008.23	1,152.04	5,094.25	2,879.39	5.75
GU-TGR-35	<73.62	<237.64	676.74	41,962.55	551.24	5,188.00	2,375.80	3.85
GU-TGR-36	<70.99	<246.05	396.58	46,699.37	251.46	4,804.16	2,928.52	4.38
GU-TGR-37	76.28	<254.28	686.50	47,005.13	515.89	3,820.78	1,486.26	4.23
Count	21	21	21	21	21	21	21	21
Non-Detect Count	20	18	0	0	0	0	0	0
Non-Detect %	95	86	0	0	0	0	0	0
Maximum	76.28	1,097.81	3,320.31	213,827.41	15,783.75	7,813.78	6,636.57	7.56
Minimum	76.28	170.56	65.67	9,147.78	158.86	296.94	537.88	3.85
Mean	76.28	493.06	675.14	54,726.91	2,527.33	3,483.64	2,306.45	5.75
Median	76.28	210.82	413.82	47,005.13	1,381.33	3,820.78	1,965.50	5.68
Standard Deviation	NA	524.11	725.78	39,999.72	3,469.39	1,993.74	1,511.25	1.27
Coefficient of Variation	NA	1.06	1.08	0.73	1.37	0.57	0.66	0.22
Granodiorite w/phyllic alteration								
GU-TGRP-24	<84.34	<385.08	752.36	79,718.31	9,147.83	2,016.97	907.05	4.49
GU-TGRP-25	<61.39	<128.84	876.67	15,231.07	540.41	111.71	766.64	3.98
GU-TGRP-30	<70.28	<223.96	2,181.31	37,389.02	360.03	359.56	437.04	4.12
GU-TGRP-31	<71.43	<251.39	925.76	45,878.37	2,640.62	741.65	799.08	4.2
GU-TGRP-32	<92.85	<712.72	627.06	240,320.39	3,323.58	407.60	1,264.96	4.11
GU-TGRP-33	<80.1	<356.4	1,576.72	76,595.48	4,845.11	3,136.17	3,183.98	3.98
Count	6	6	6	6	6	6	6	6
Non-Detect Count	6	6	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	2,181.31	240,320.39	9,147.83	3,136.17	3,183.98	4.49
Minimum	NA	NA	627.06	15,231.07	360.03	111.71	437.04	3.98
Mean	NA	NA	1,156.65	82,522.11	3,476.26	1,128.94	1,226.46	4.15
Median	NA	NA	901.22	61,236.93	2,982.10	574.63	853.07	4.12
Standard Deviation	NA	NA	600.33	81,056.93	3,258.59	1,192.86	995.25	0.19
Coefficient of Variation	NA	NA	0.52	0.98	0.94	1.06	0.81	0.05
Kneeling Nun								
GU-TKN-22	<69.77	<196.33	534.06	29,015.07	1,259.88	679.16	627.20	4.85
GU-TKN-23	<66.63	<144.82	427.92	17,153.14	1,321.95	465.61	745.65	4.38
GU-TKN-3	<72.91	<277.64	423.27	55,267.29	1,421.55	521.59	762.10	3.72
GU-TKN-4	<70.83	<214.68	253.24	35,378.91	1,197.06	3,388.11	1,783.87	3.98
Count	4	4	4	4	4	4	4	4
Non-Detect Count	4	4	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	534.06	55,267.29	1,421.55	3,388.11	1,783.87	4.85
Minimum	NA	NA	253.24	17,153.14	1,197.06	465.61	627.20	3.72
Mean	NA	NA	409.62	34,203.60	1,300.11	1,263.62	979.71	4.23
Median	NA	NA	425.60	32,196.99	1,290.92	600.38	753.88	4.18
Standard Deviation	NA	NA	116.13	15,944.69	95.68	1,419.21	539.47	0.49
Coefficient of Variation	NA	NA	0.28	0.47	0.07	1.12	0.55	0.12
Quartz Monzonite								
GU-TQM-5	<74.03	<251.94	706.11	42,344.55	4,709.23	1,232.38	1,550.61	4.04
GU-TQM-6	<72.97	<230.74	385.79	37,742.30	2,951.54	917.67	732.49	5.03
Count	2	2	2	2	2	2	2	2
Non-Detect Count	2	2	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	706.11	42,344.55	4,709.23	1,232.38	1,550.61	5.03
Minimum	NA	NA	385.79	37,742.30	2,951.54	917.67	732.49	4.04
Mean	NA	NA	545.95	40,043.43	3,830.39	1,075.03	1,141.55	4.54
Median	NA	NA	545.95	40,043.43	3,830.39	1,075.03	1,141.55	4.54
Standard Deviation	NA	NA	226.50	3,254.28	1,242.87	222.53	578.50	0.70
Coefficient of Variation	NA	NA	0.41	0.08	0.32	0.21	0.51	0.15

Notes: < = concentration is less than the detection level
mg/kg = milligrams per kilogram
s.u. = standard units
NA = not applicable

TABLE C-3
POST-REMOVAL XRF ANALYSES AND PASTE pH
LOWER AREA

Sample ID	Cd	Co	Cu	Fe	Pb	Mn	Zn	Paste pH
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	s.u.
Granodiorite (biotized)								
GL-TGR-6	<71.89	<245.24	156.87	43,454.07	514.32	3,845.05	1,470.82	7.6
GL-TGR-7	<73.77	<236.66	217.75	38,301.81	520.36	3,159.91	1,257.69	7.53
GL-TGR-8	<73.21	<270.62	163.30	52,622.53	872.05	7,324.24	4,584.96	6.01
GL-TGR-9	<70.64	<237.11	98.63	42,328.08	663.28	4,918.65	2,010.07	6.56
GL-TGR-10	<73.38	<250.4	319.50	45,166.20	951.32	5,267.00	3,287.52	7.42
GL-TGR-11	<76.65	<300.4	178.00	59,833.48	919.32	6,288.02	2,949.33	7.02
GL-TGR-14	<77.25	<263.96	520.97	45,318.18	2,212.04	9,716.86	6,718.83	6.75
Count	7	7	7	7	7	7	7	7
Non-Detect Count	7	7	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	520.97	59,833.48	2,212.04	9,716.86	6,718.83	7.60
Minimum	NA	NA	98.63	38,301.81	514.32	3,159.91	1,257.69	6.01
Mean	NA	NA	236.43	46,717.76	950.38	5,788.53	3,182.75	6.98
Median	NA	NA	178.00	45,166.20	872.05	5,267.00	2,949.33	7.02
Standard Deviation	NA	NA	142.77	7,211.15	585.43	2,226.92	1,938.52	0.58
Coefficient of Variation	NA	NA	0.60	0.15	0.62	0.38	0.61	0.08
Quartz Monzonite								
GL-TQM-1	<67.82	<147.11	70.73	17,692.11	120.73	1,029.12	1,220.71	7.67
GL-TQM-2	<76.25	<233.7	701.87	35,329.33	1,545.72	3,289.84	9,211.35	7.52
GL-TQM-3	<65.2	<141.82	167.58	17,179.22	144.53	1,224.93	1,026.69	4.26
GL-TQM-4	<63.53	<127.13	39.25	14,210.90	42.69	840.46	955.86	7.32
GL-TQM-12	<61.90	<106.18	203.84	10,293.90	80.78	1,459.67	2,113.82	6.62
GL-TQM-13	<63.54	<126.06	185.32	13,813.51	63.28	770.26	2,650.93	4.13
Count	6	6	6	6	6	6	6	6
Non-Detect Count	6	6	0	0	0	0	0	0
Non-Detect %	100	100	0	0	0	0	0	0
Maximum	NA	NA	701.87	35,329.33	1,545.72	3,289.84	9,211.35	7.67
Minimum	NA	NA	39.25	10,293.90	42.69	770.26	955.86	4.13
Mean	NA	NA	228.10	18,086.50	332.96	1,435.71	2,863.23	6.25
Median	NA	NA	176.45	15,695.06	100.76	1,127.03	1,667.27	6.97
Standard Deviation	NA	NA	241.23	8,857.73	595.30	942.90	3,181.64	1.63
Coefficient of Variation	NA	NA	1.06	0.49	1.79	0.66	1.11	0.26

Notes: < = concentration is less than the detection level
mg/kg = milligrams per kilogram
s.u. = standard units

TABLE C-4
POST-REMOVAL XRF ANALYSES AND PASTE pH
STOCKPILE G-4 AREA

Sample ID	Cd	Co	Cu	Fe	Pb	Mn	Zn	Paste pH
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	s.u.
G4-TSL-1	<67.36	<187.34	162.09	27,153.15	105.23	1,109.03	471.73	4.99
G4-TGR-2 (biotized)	<70.44	<230.64	152.05	38,894.73	411.06	1,448.07	506.64	7.54
G4-TGR-3 (vein)	<83.76	<522.78	195.08	149,994.92	789.31	833.68	666.57	7.23
G4-TQM-4	<69.76	<212.03	43.58	33,793.29	19.63	810.33	355.89	7.6

Notes: < = concentration is less than the detection level
mg/kg = milligrams per kilogram
s.u. = standard units

TABLE C-5
GROUNDHOG POST-REMOVAL
COMPOSITE SAMPLE SUMMARY

Composite ID	Sub-Sample Golder ID
Stockpile G4	
G4-TS1-1	G4-TS1-1
G4-TGR-2 (biotized)	G4-TGR-2 (biotized)
G4-TGR-3 (vein)	G4-TGR-3 (vein)
G4-TQM-4	G4-TQM-4
Lower Area Granodiorite	
GL-TGR	GL-TGR-5
	GL-TGR-6
	GL-TGR-7
	GL-TGR-8
	GL-TGR-9
	GL-TGR-10
	GL-TGR-11
	GL-TGR-14
Lower Area Quartz Monzonite	
GL-TQM	GL-TQM-1
	GL-TQM-2
	GL-TQM-3
	GL-TQM-4
	GL-TQM-12
	GL-TQM-13
Jasperized Vein	
GU-JV	GU-JV-20
	GU-JV-21
	GU-JV-26
	GU-JV-27
Granodiorite - G5 West of Haul Road	
GU-TGR-G5	GU-TGR-1
	GU-TGR-2
Granodiorite East of Haul Road	
GU-TGR	GU-TGR-7
	GU-TGR-8
	GU-TGR-9
	GU-TGR-10
	GU-TGR-11
	GU-TGR-12
	GU-TGR-13
	GU-TGR-14
	GU-TGR-15
	GU-TGR-16
	GU-TGR-17
	GU-TGR-18
	GU-TGR-19
	GU-TGR-28
	GU-TGR-29
	GU-TGR-34
	GU-TGR-35
	GU-TGR-36
	GU-TGR-37
Granodiorite w/Phyllic Alteration	
GU-TGRP	GU-TGRP-24
	GU-TGRP-25
	GU-TGRP-30
	GU-TGRP-31
	GU-TGRP-32
	GU-TGRP-33
Kneeling Nun	
GU-TKN	GU-TKN-22
	GU-TKN-23
	GU-TKN-3
	GU-TKN-4
Quartz Monzonite	
GU-TQM	GU-TQM-5
	GU-TQM-6

TABLE C-6
GROUNDHOG POST-REMOVAL SAMPLING
ACID-BASE ACCOUNTING RESULTS FOR COMPOSITED SAMPLES

Sample ID	Paste pH [a]	ABA Results				Sulfur				Material Classification
		Net Neutralizing Potential	ANP/AGP	AGP	ANP	Unidentifiable	Sulfide	Sulfate	Total	
	s.u.	$tCaCO_3/kt$		$tCaCO_3/kt$	$tCaCO_3/kt$	%	%	%	%	
G4-TSL-1	4.94	0.00	NA	<0.3	<0.3	<0.01	<0.01	0.02	0.02	Not Likely to Generate Acid
G4-TGR-2 (biotized)	7.77	12.8	>42.67	<0.3	12.8	<0.01	<0.01	<0.01	<0.01	Not Likely to Generate Acid
G4-TGR-3 (vein)	7.5	2.6	>8.67	<0.3	2.6	0.04	<0.01	0.09	0.14	Not Likely to Generate Acid
G4-TQM-4	7.88	20.5	>68.3	<0.3	20.5	<0.01	<0.01	<0.01	<0.01	Not Likely to Generate Acid
GL-TGR	7.33	19.3	15.85	1.3	20.6	<0.01	0.04	0.11	0.15	Not Likely to Generate Acid
GL-TQM	6.45	17.7	5.66	3.8	21.5	<0.01	0.12	0.06	0.18	Not Likely to Generate Acid
GU-JV	4.48	-0.80	<.375	0.80	<0.3	0.03	0.03	0.15	0.2	Likely to Generate Acid[b]
GU-TGR-G5	7.28	14.4	3.82	5.10	19.5	<0.01	0.16	0.07	0.23	Low Potential to Generate Acid
GU-TGR	5.45	-2.20	0.68	6.9	4.7	<0.01	0.22	0.29	0.51	Likely to Generate Acid
GU-TGRP	3.89	-2.40	<0.1	2.40	<0.3	0.02	0.08	0.31	0.41	Likely to Generate Acid[b]
GU-TKN	3.94	-2.60	<0.1	2.60	<0.3	0.01	0.08	0.45	0.54	Likely to Generate Acid[b]
GU-TQM	4.45	-8.50	0.00	8.50	<0.3	0.01	0.27	0.56	0.84	Likely to Generate Acid

Notes:

ABA = acid-base accounting
ANP = acid-neutralizing potential
AGP = acid-generating potential - calculated based on sulfide sulfur
s.u. = standard units
tCaCO3/kt = tons calcium carbonate per kiloton of sediment
< = concentration less than detection limit
a = Saturated Paste pH
b = Classified as "likely to generate acid" based on ANP/AGP ratio, but sample does not contain sufficient sulfide content to generate acid.

TABLE C-7
GROUNDHOG POST-REMOVAL SAMPLING
TOTAL METALS RESULTS FOR COMPOSITED SAMPLES

Sample ID	Al	Cd	Co	Cu	Fe	Pb	Mn	Zn
G4-TSL-1	11,800	1.92	13.3	138	11,900	88.9	1,060	426
G4-TGR-2 (biotized)	13,900	0.53	8.22	94.8	18,300	502	1,070	263
G4-TGR-3 (vein)	6,080	0.74	0.85	128	53,300	282	305	272
G4-TQM-4	14,500	0.79	11.9	45.3	21,100	11.4	817	258
GL-TGR	11,900	4.55	8.84	258	27,900	821	4,030	2,170
GL-TQM	7,700	3.18	5.75	166	8,590	300	723	1,390
GU-JV	4,860	1.42	2.94	511	48,000	2,710	1,920	595
GU-TGR-G5	8,910	3.00	9.85	284	24,700	305	1,710	871
GU-TGR	10,600	3.51	7.48	515	31,600	1,050	2,170	1,530
GU-TGRP	5,230	2.07	2.03	859	38,100	1,850	644	971
GU-TKN	7,600	1.33	5.21	351	23,100	1040	1,660	767
GU-TQM	7,070	1.98	5.91	435	24,000	2520	898	805

Note: All concentrations in milligrams per kilogram

TABLE C-8
GROUNDHOG POST-REMOVAL SAMPLING
SPLP RESULTS FOR COMPOSITED SAMPLES

Sample ID	pH (s.u.)	Al (mg/L)	Cd (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (mg/L)	Mn (mg/L)	Pb (mg/L)	Zn (mg/L)	TDS (mg/L)	F (mg/L)	SO_4 (mg/L)
G4-TSL-1	9.45	1.8	<0.002	<0.006	0.02	0.8	0.03	<0.0075	0.04	61	0.52	4.6
G4-TGR-2 (biotized)	9.77	0.7	<0.002	<0.006	<0.01	0.3	0.007	<0.0075	0.01	50	1.96	5.3
G4-TGR-3 (vein)	9.69	2.2	<0.002	<0.006	0.02	4.4	0.008	0.0559	0.04	76	0.86	3.1
G4-TQM-4	8.93	1.0	<0.002	<0.006	<0.01	0.7	0.02	<0.0075	0.01	58	1.15	7.6
GL-TGR	7.86	<0.08	<0.002	<0.006	0.01	<0.06	0.01	<0.0075	<0.01	110	0.69	64.6
GL-TQM	9.12	<0.08	0.011	<0.006	<0.01	<0.06	1.38	<0.0075	0.29	190	0.34	71.5
GU-JV	3.99	<0.08	0.002	<0.006	0.07	0.06	0.43	<0.0075	0.2	61	0.20	19.0
GU-TGR-G5	8.95	<0.08	<0.002	<0.006	<0.01	<0.06	<0.004	<0.0075	<0.01	130	0.24	47.7
GU-TGR	6.42	0.1	0.033	0.02	0.83	<0.06	7.32	0.284	9.11	260	0.30	162
GU-TGRP	4.49	1.6	0.041	0.04	8.65	<0.06	6.25	2.2	13.4	300	0.85	193
GU-TKN	4.17	3.3	0.027	0.03	3.17	<0.06	2.99	0.291	7.25	260	<0.50	175
GU-TQM	4.23	2.9	0.025	0.03	2.91	<0.06	2.78	0.313	6.8	200	<0.50	161

Notes:

mg/L = milligrams per liter

TDS = total dissolved solids

TABLE C-9
LABORATORY QA/QC DATA, XRF SPLIT SAMPLES, AND DECON RINSEATE BLANK

Decon Rinseate Blank - Sample ID: GH-RB-1 (mg/l)							
Aluminum	Cadmium	Cobalt	Copper	Iron	Lead	Manganese	Zinc
<0.080	<0.0020	<0.0060	<0.010	<0.060	<0.0075	<0.0040	<0.0100

Split-Sample Analytical Results (mg/kg)								
	GU-TGRP-30		GU-TKN-4		GU-JV-21		GL-TGR-6	
	Laboratory	XRF	Laboratory	XRF	Laboratory	XRF	Laboratory	XRF
Copper	1,930	2,181	192	253	153	168	164	157
Iron	28,000	37,389	21,400	35,379	84,400	149,340	27,600	43,454
Lead	211	360	865	1,197	1,350	2,964	449	514

Notes:

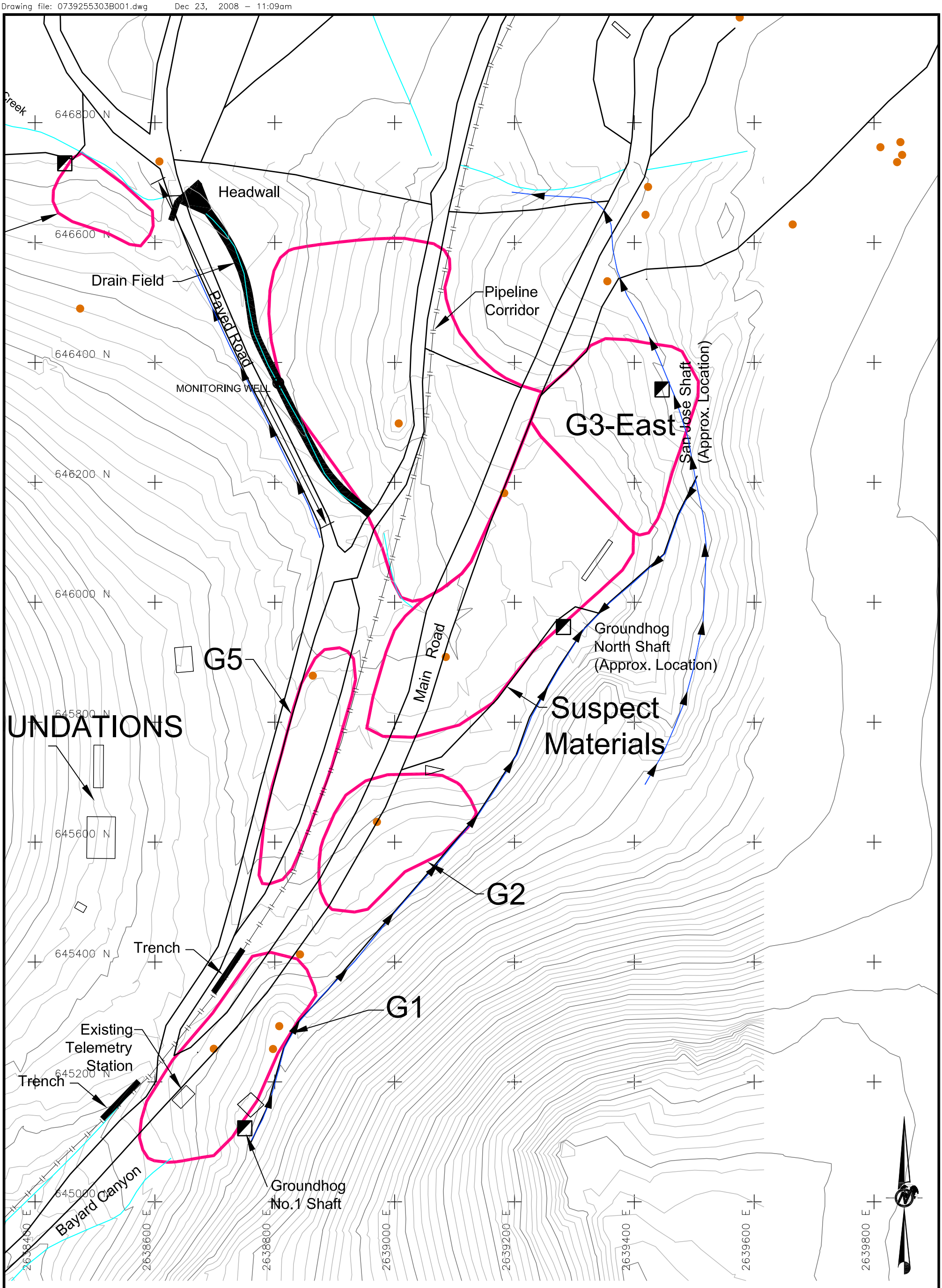
mg/L = milligrams per liter

mg/kg = milligrams per kilogram

APPENDIX C

FIGURES

Drawing file: 0739255303B001.dwg Dec 23, 2008 – 11:09am



EXPLANATION

- Existing Diversion Ditches
- New Channels
- Powerpoles

150 0 150
SCALE : 1" to 150' FEET

PROJECT
Freeport-McMoRan Copper & Gold
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG SHAFT CLOSURE
GRANT COUNTY, NEW MEXICO

TITLE

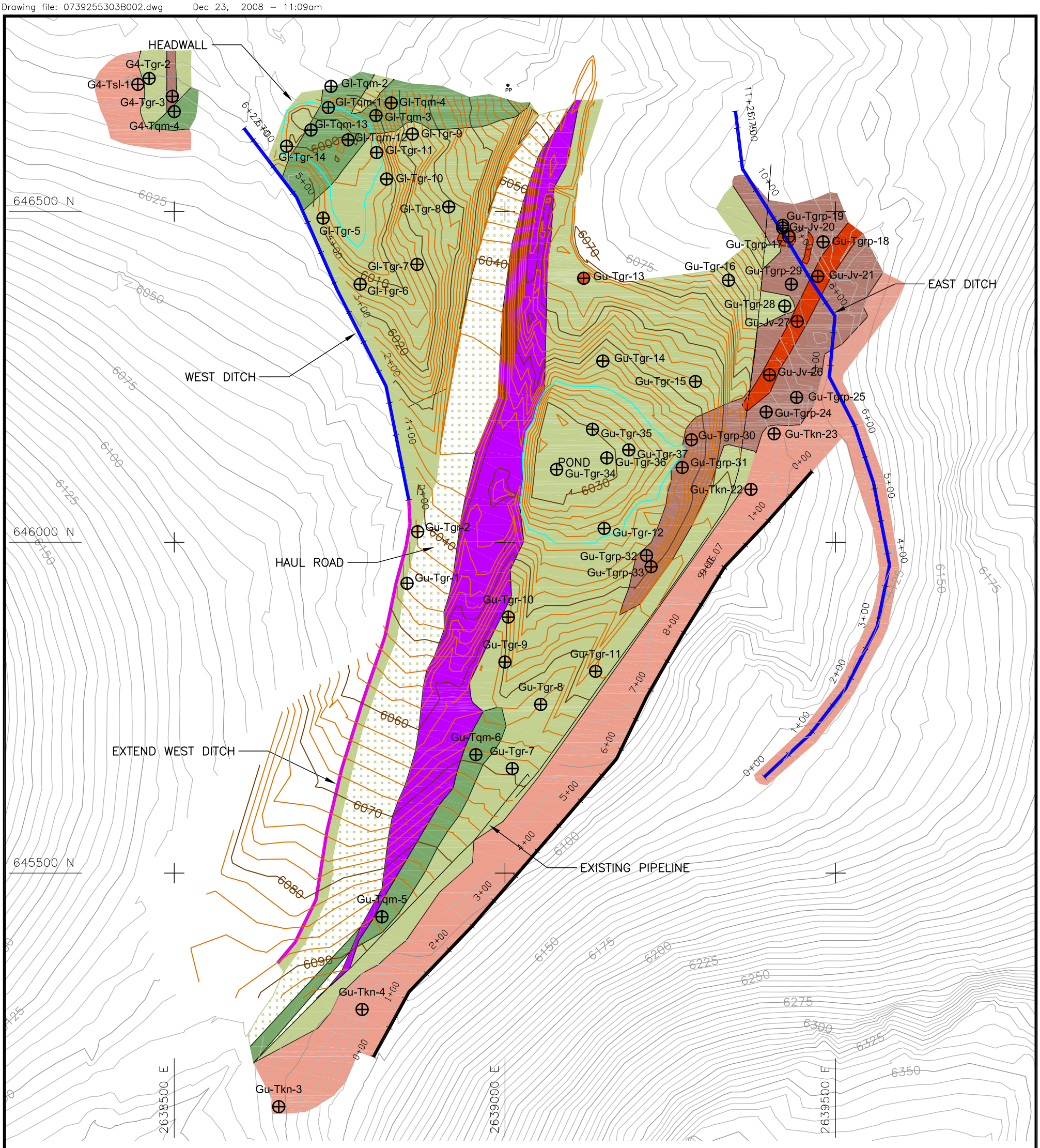
GROUNDHOG PRE-REMOVAL SITE LOCATION MAP

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No. 0739255303B001	
DESIGN	JP	12/18/08	SCALE AS SHOWN	REV. A
CADD	ANV	12/22/08		
CHECK	JP	12/22/08		
REVIEW				

FIGURE C-1

Drawing file: 0739255303B002.dwg Dec 23, 2008 – 11:09am



LEGEND

6025 — EXISTING GROUND CONTOURS

6080 — CONTOURS

⊕ SOIL SAMPLE LOCATIONS

GEOLOGIC LEGEND

Tkn	KNEELING NUN TUFF FM OR SUGAR LUMP TUFF FM
Tqm	QUARTZ MONZONITE
Tgr	BIOTIZED GRANODIORITE
Tgr	PHYLLICALLY ALTERED GRANODIORITE
Tgr	JASPEROID VEIN – MINERALIZED AND LEACH CAP ALTERED GRANODIORITE
	PIPELINE CORRIDOR
Tgr	PROJECTED GRANODIORITE

REFERENCES

1.) GEOLOGY PROVIDED BY FREEPORT–McMORAN CHINO MINES COMPANY.

150 0 150
SCALE FEET

PROJECT
FREEPORT-McMORAN COPPER & GOLD
CHINO MINES COMPANY

GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE
GEOLOGY OF POST-REMOVAL SURFACE AND SAMPLE LOCATIONS GROUNDHOG MINE SITE

Golder Associates
Tucson, Arizona

PROJECT No. 073–92553–05			FILE No. 0739255303A001	
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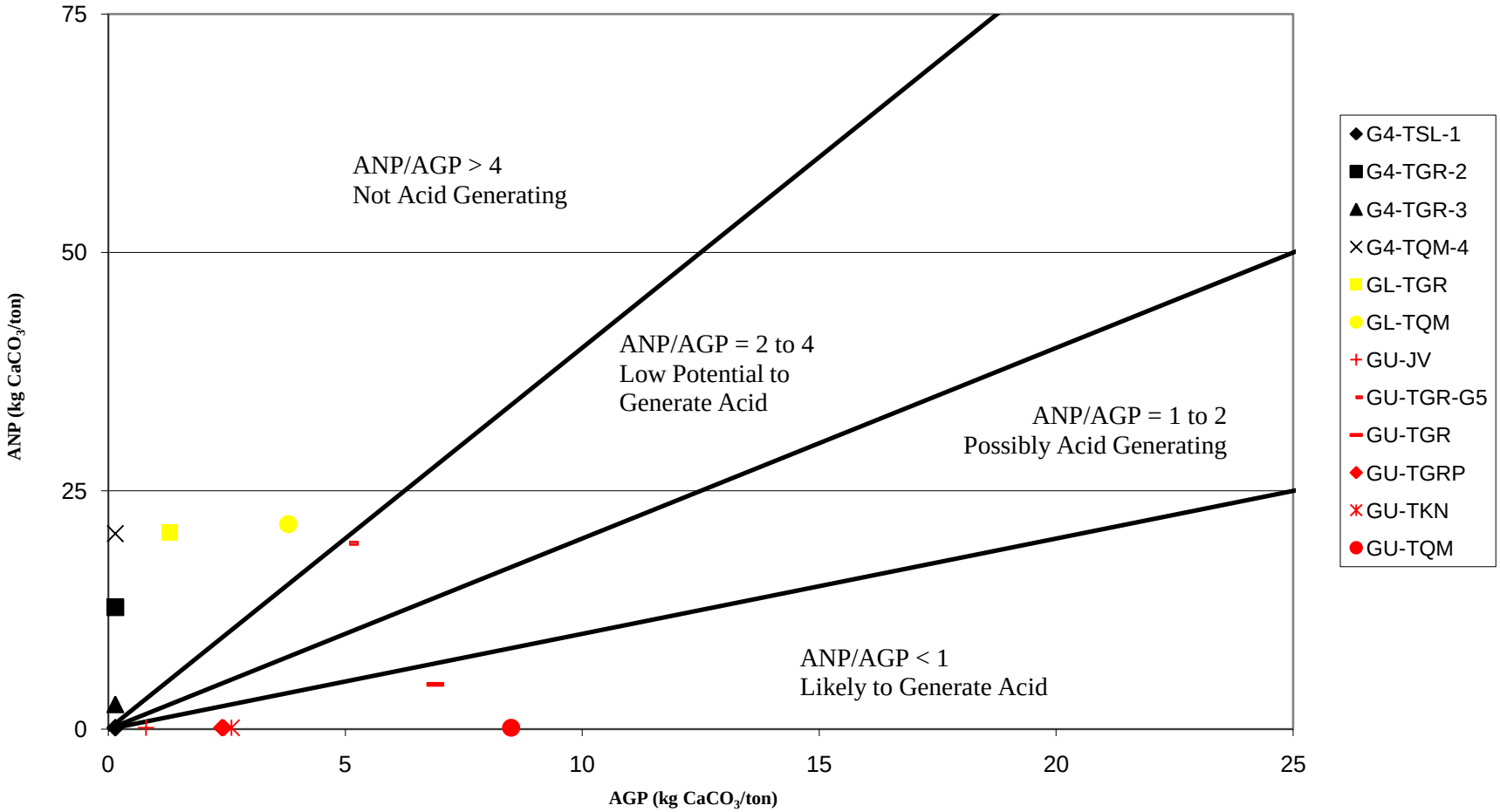
CHECK				
REVIEW				



Golder Associates Tucson, Arizona

TITLE

Groundhog Mine Site IRA
Acid-Neutralization Potential (ANP) vs Acid-Generation Potential (AGP)

CLIENT/PROJECT

CHINO MINES COMPANY

DRAWN	OM	DATE	2/9/07	JOB NO.	073-92553-03
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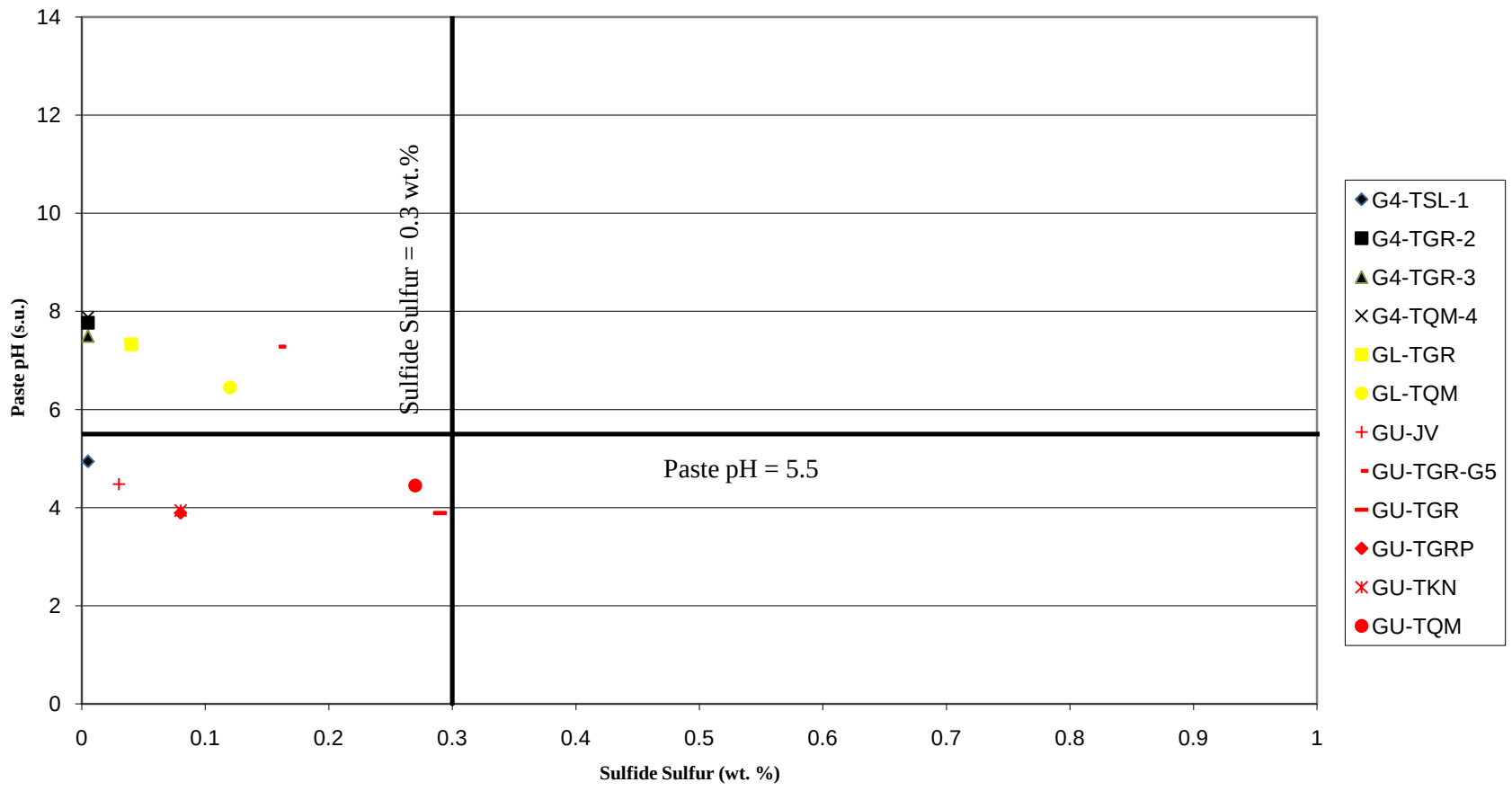
REVIEWED	EE	FILE NO.		FIGURE NO.	C-15

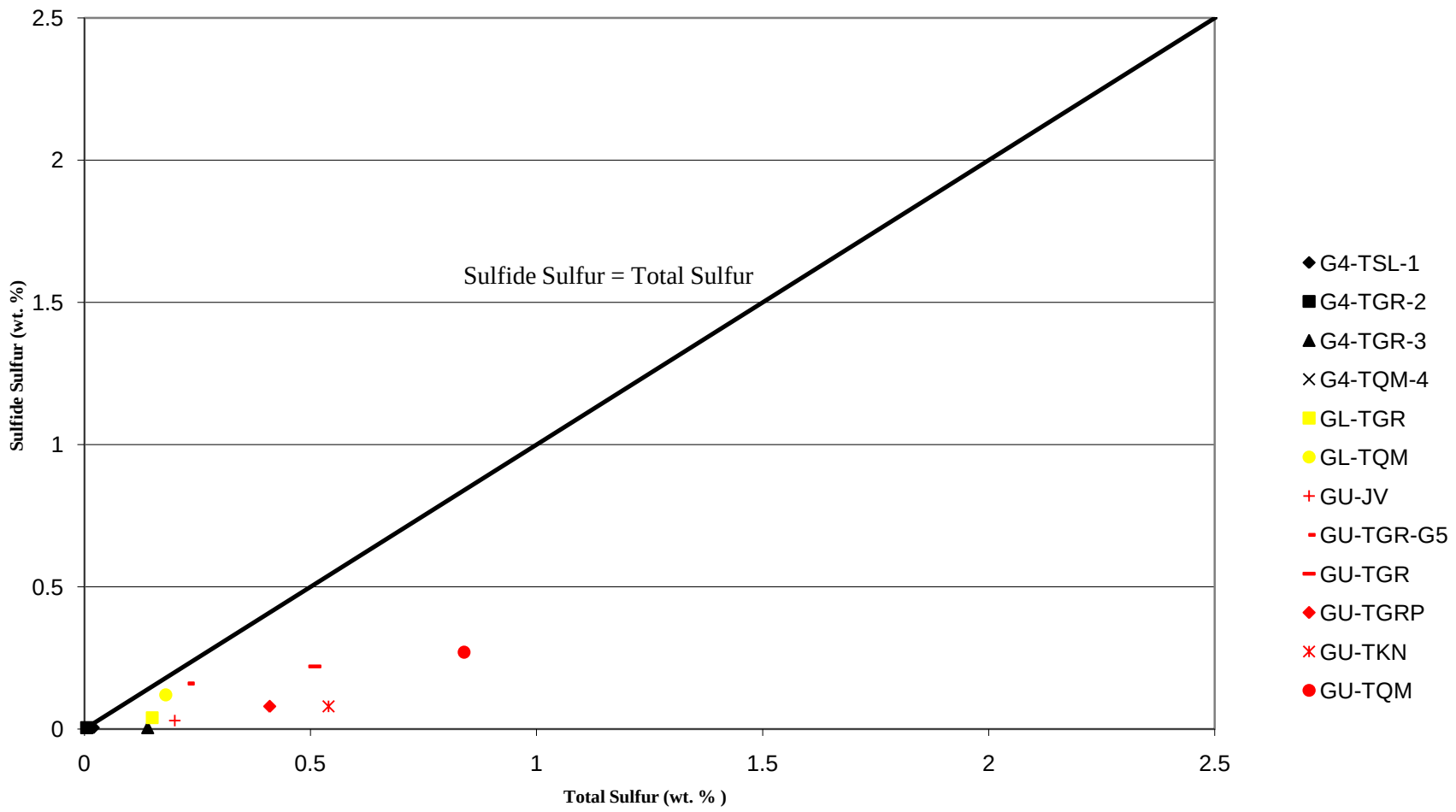


Golder Associates Tucson, Arizona

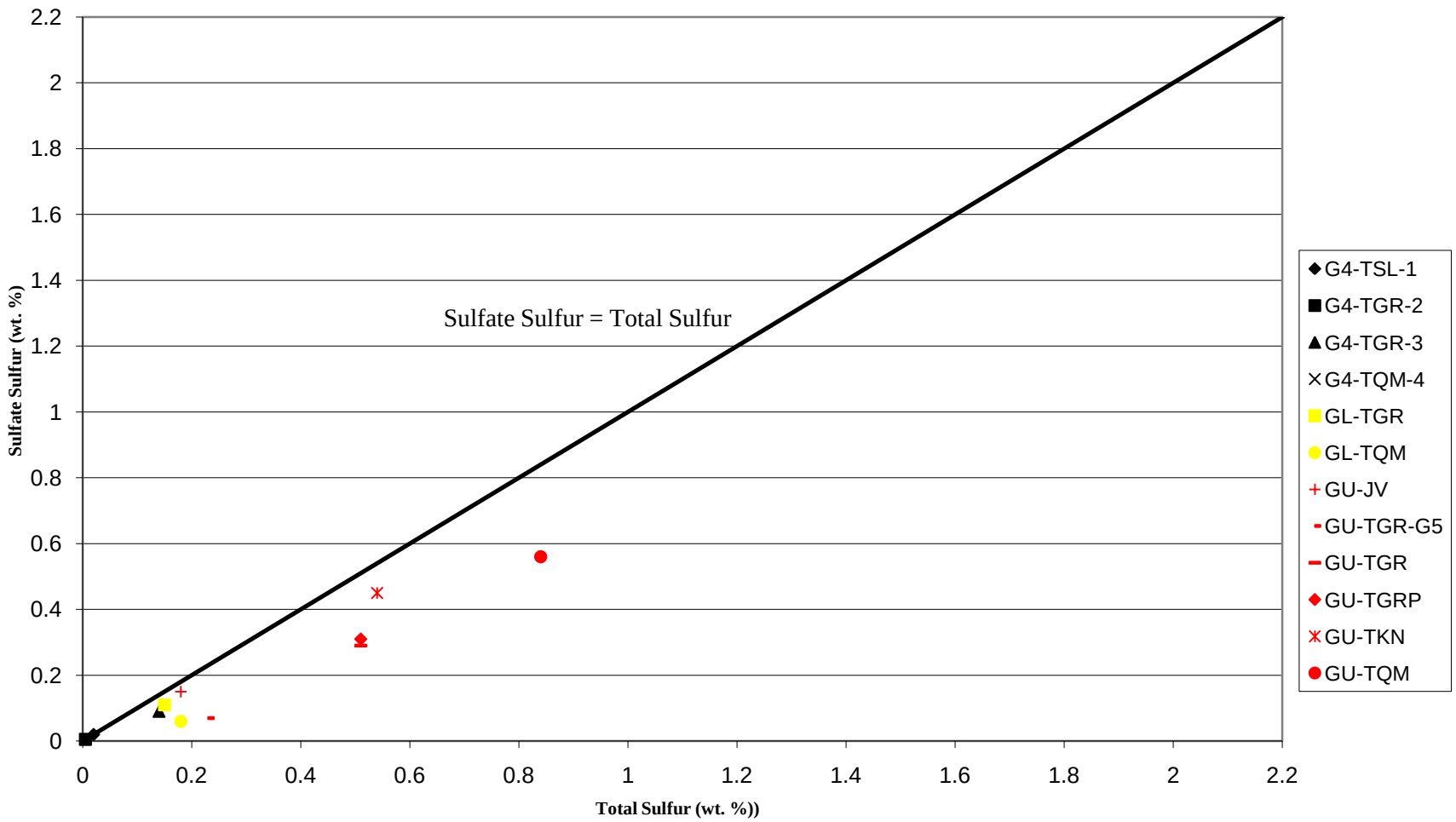
TITLE

Groundhog Mine Site IRA
Paste pH vs Sulfide Sulfur

CLIENT/PROJECT			
CHINO MINES COMPANY	DRAWN OM	DATE 2/9/07	JOB NO. 073-92553-03
	CHECKED JP	SCALE	DWG. NO.
	REVIEWED EE	FILE NO.	FIGURE NO. C-16



Golder Associates	TITLE **Groundhog Mine Site IRA Sulfide Sulfur vs Total Sulfur**		
CLIENT/PROJECT CHINO MINES COMPANY	DRAWN OM	DATE 2/9/07	JOB NO. 073-92553-03
	CHECKED JP	SCALE	DWG. NO.
	REVIEWED EE	FILE NO.	FIGURE NO. **C-17**

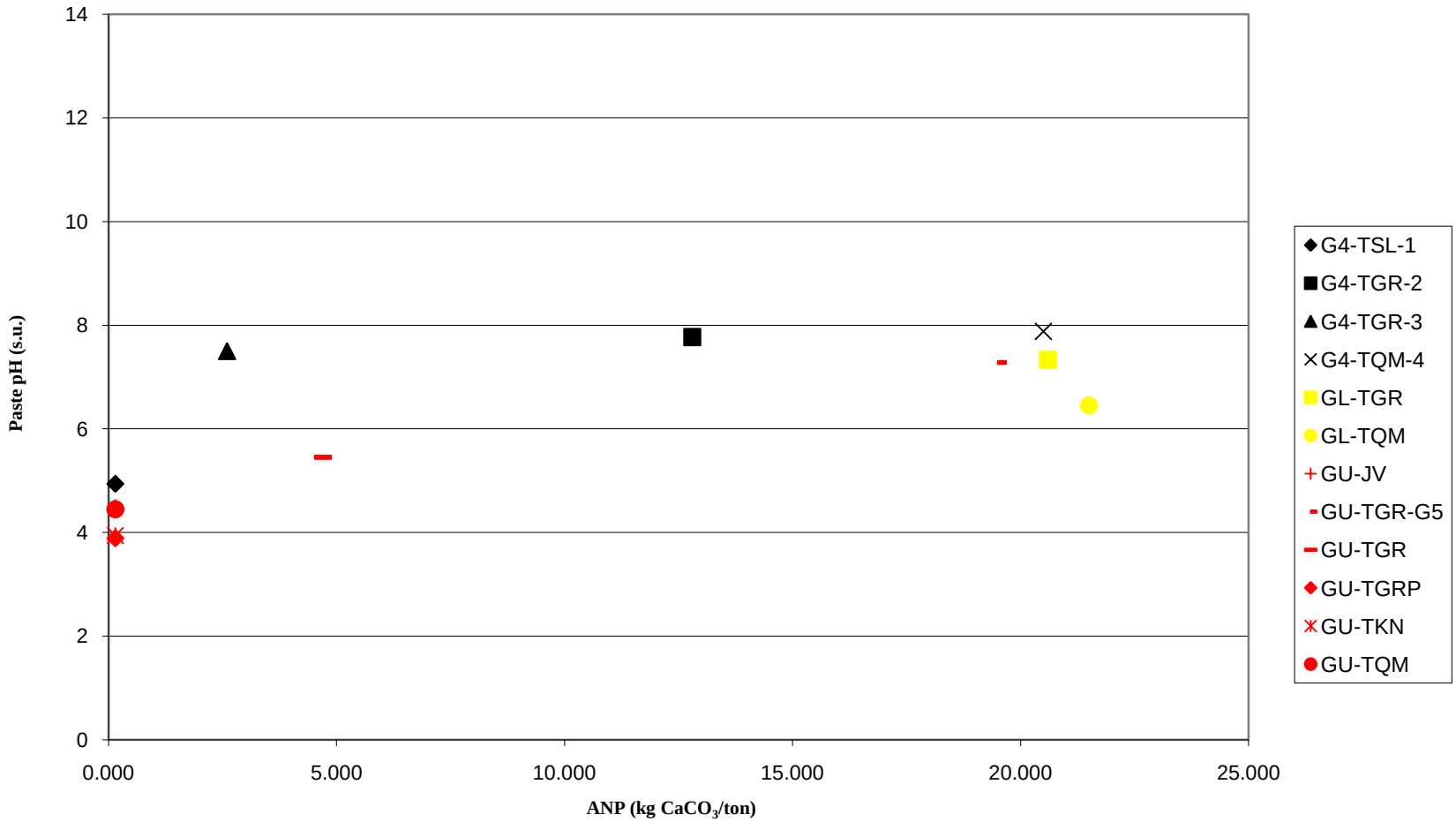


Golder Associates

TITLE

Groundhog Mine Site IRA
Sulfate Sulfur vs Total Sulfur

CLIENT/PROJECT	DRAWN	OM	DATE	2/9/07	JOB NO.	073-92553-03
CHINO MINES COMPANY	CHECKED	JP	SCALE		DWG. NO.	
	REVIEWED	EE	FILE NO.		FIGURE NO.	**C-18**



Golder Associates Tucson, Arizona

TITLE

Groundhog Mine Site IRA
Paste pH vs Acid-Neutralization Potential (ANP)

CLIENT/PROJECT	DRAWN	DATE	JOB NO.
CHINO MINES COMPANY	OM	2/9/07	073-92553-03
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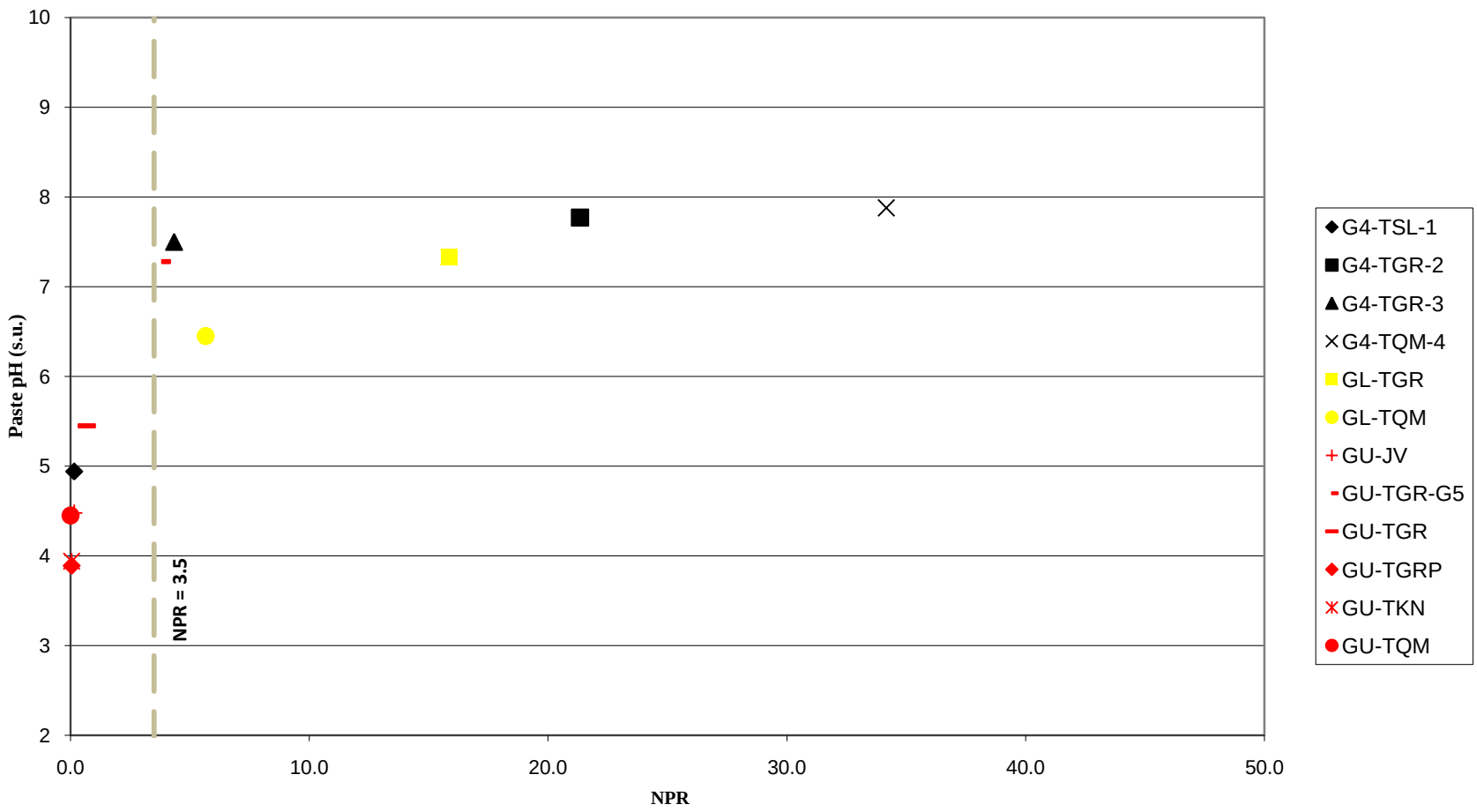
	REVIEWED EE	FILE NO.	FIGURE NO. C-19



Golder Associates

TITLE

Groundhog Mine Site IRA
Paste pH vs Neutralization Potential Ratio (NPR)

CLIENT/PROJECT	DRAWN	DATE	JOB NO.
CHINO MINES COMPANY	OM	2/9/07	073-92553-03
	CHECKED JP	SCALE	DWG. NO.
	REVIEWED EE	FILE NO.	FIGURE NO. C-20

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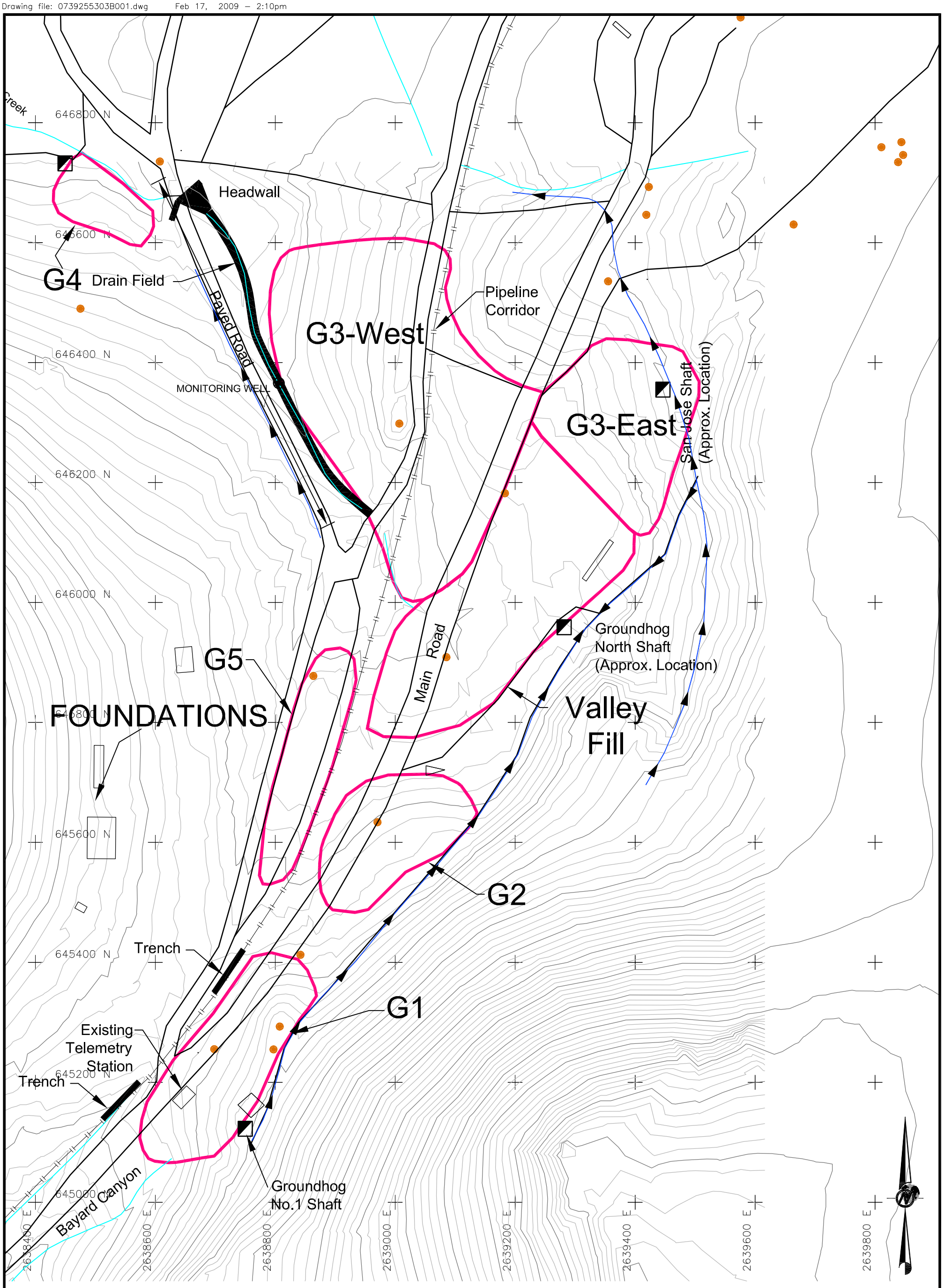

EXPLANATION

- Existing Diversion Ditches
- New Channels
- Power Poles

150 0 150
SCALE : 1" to 150' FEET

PROJECT

FREEPORT-McMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

GROUNDHOG PRE-REMOVAL SITE LOCATION MAP

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No. 0739255303B001	
DESIGN	JP	12/18/08	SCALE AS SHOWN	REV. A
CADD	ANV	12/22/08	FIGURE C-1	
CHECK	JP	12/22/08		
REVIEW		02/17/09		

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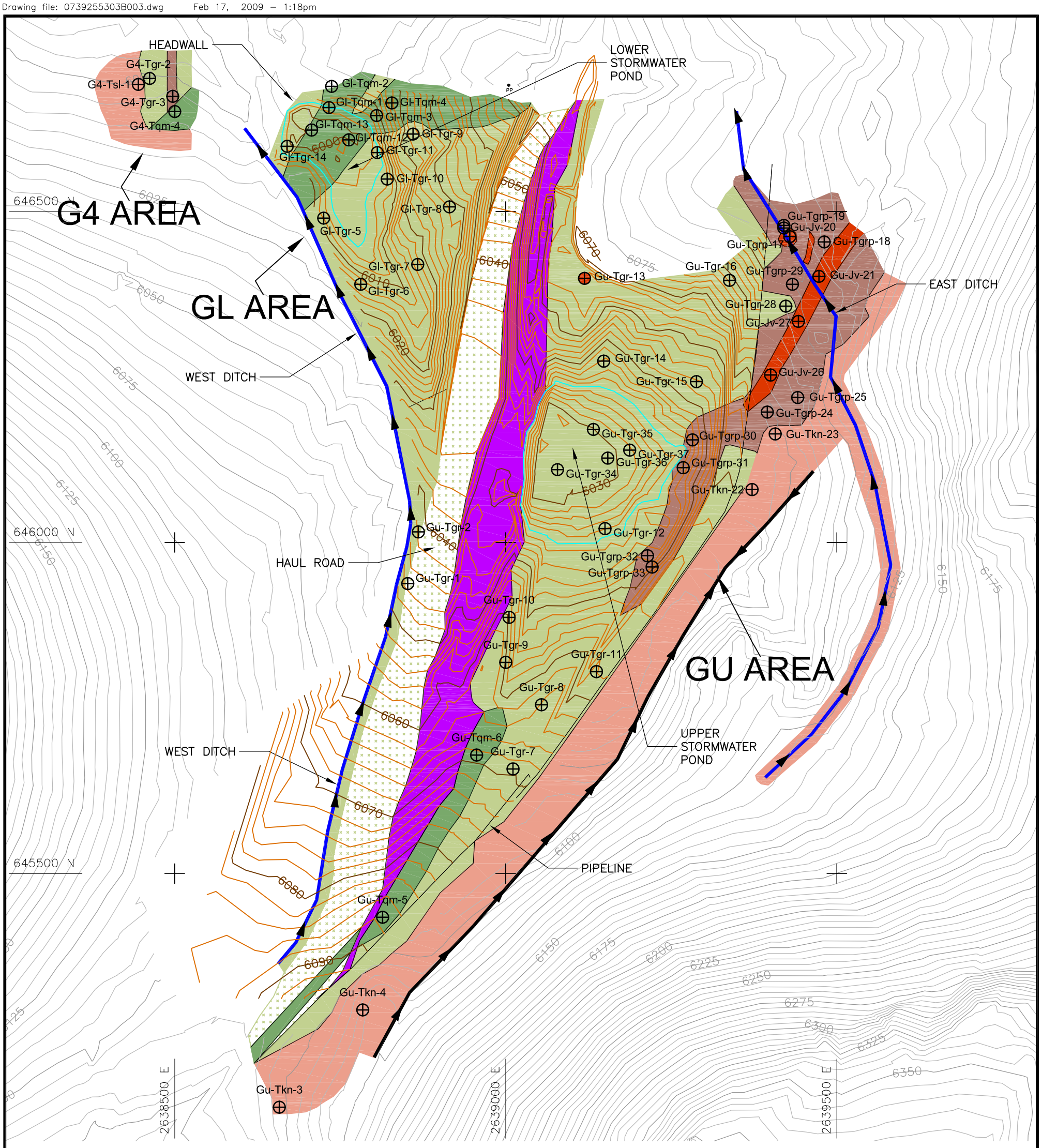

LEGEND

- 6025 — EXISTING GROUND CONTOURS
- 6080 — CONTOURS
- ⊕ — BEDROCK SURFACE SAMPLE LOCATIONS
- DIVERSION DITCHES

GEOLOGIC LEGEND

Tkn	KNEELING NUN TUFF FM OR SUGAR LUMP TUFF FM
Tqm	QUARTZ MONZONITE
Tgr	BIOTIZED GRANODIORITE
Tgr	PHYLLICALLY ALTERED GRANODIORITE
Tgr	JASPEROID VEIN – MINERALIZED AND LEACH CAP ALTERED GRANODIORITE
	PIPELINE CORRIDOR
Tgr	PROJECTED GRANODIORITE

REFERENCES

1.) GEOLOGY PROVIDED BY FREEPORT–McMORAN CHINO MINES COMPANY.

150 0 150

SCALE: 1" to 150' FEET

PROJECT

FREEPORT-McMORAN COPPER & GOLD
CHINO MINES COMPANY

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

GEOLOGY OF POST-REMOVAL SURFACE AND SAMPLE LOCATIONS GROUNDHOG MINE SITE

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-05			FILE No. 0739255303B003	
DESIGN	JP	07/17/08	SCALE AS SHOWN	REV. A
CADD	NIL	07/17/08		
CHECK	JP	01/08/09	FIGURE C-2	
REVIEW	JP	02/17/09		

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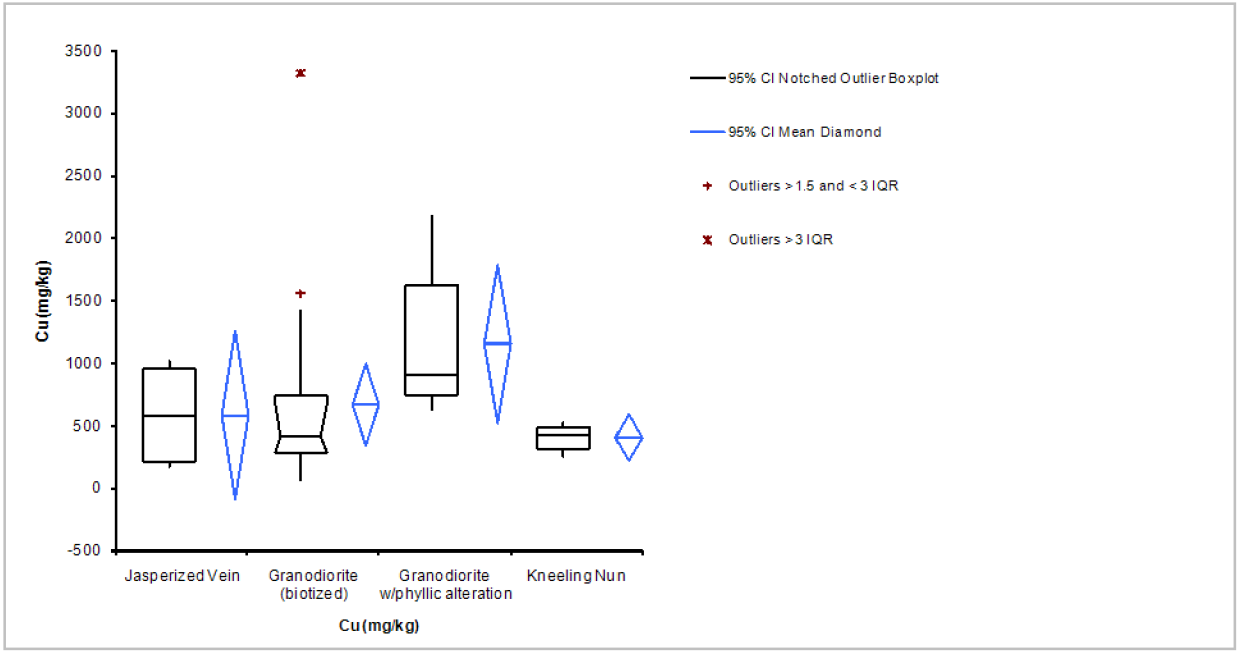
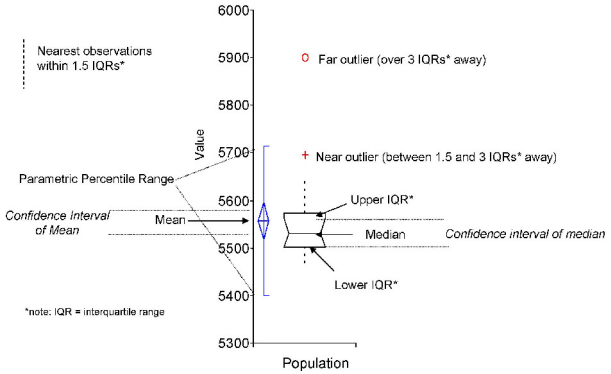


Cu (mg/kg)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	589.583	-83.746 to 1262.911	211.5758	423.1516
Granodiorite (biotized)	21	675.136	344.766 to 1005.507	158.3779	725.7789
Granodiorite w/phyllic alte	6	1156.647	526.635 to 1786.658	245.0851	600.3336
Kneeling Nun	4	409.623	224.828 to 594.417	58.0669	116.1339

Cu (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	167.93	219.443	582.415	- to -	962.112	1025.57	742.669
Granodiorite (biotized)	21	65.67	287.087	413.820	290.890 to 686.500	748.940	3320.31	461.853
Granodiorite w/phyllic alte	6	627.06	741.918	901.215	627.060 to 2181.310	1627.103	2181.31	885.184
Kneeling Nun	4	253.24	324.086	425.595	- to -	489.835	534.06	165.749

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

BOX AND WHISKER PLOT
COPPER
UPPER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
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CHECK	JP	12/23/08		
REVIEW		02/17/09		

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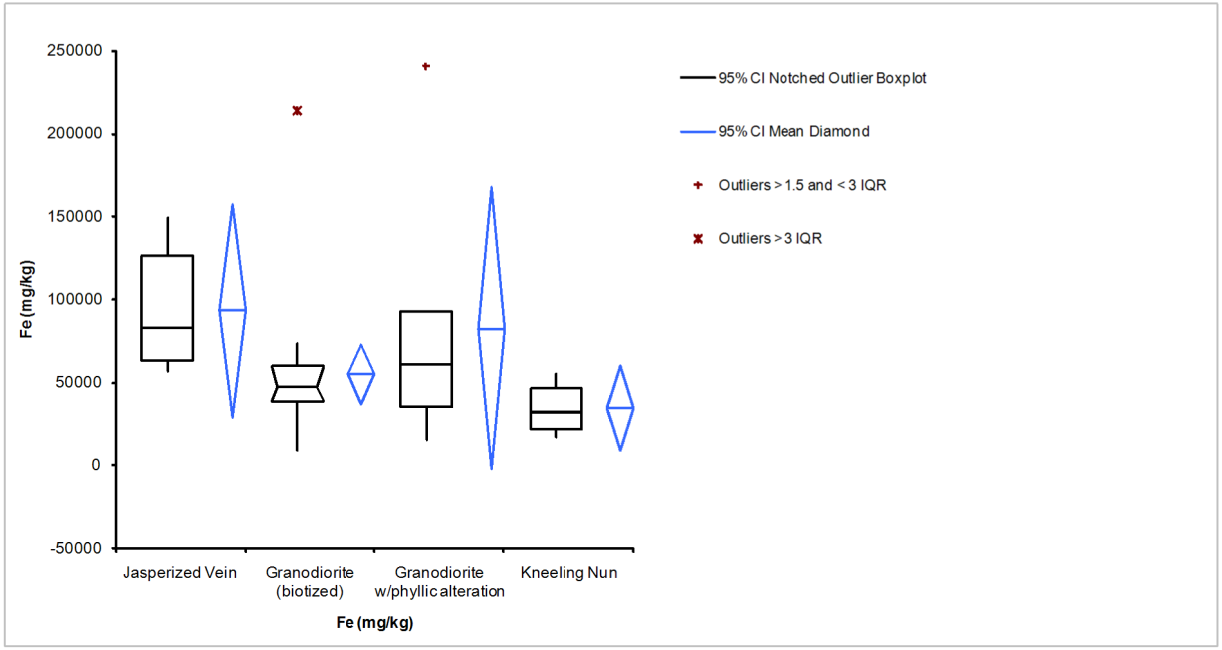
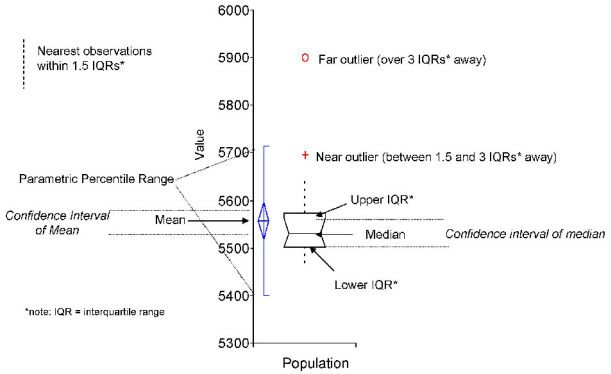


Fe (mg/kg)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	93083.670	28967.714 to 157199.626	20146.7553	40293.5107
Granodiorite (biotized)	21	54726.911	36519.261 to 72934.562	8728.6536	39999.7159
Granodiorite w/phyllic alte	6	82522.107	-2541.910 to 167586.123	33091.3518	81056.9269
Kneeling Nun	4	34203.603	8832.047 to 59575.158	7972.3450	15944.6900

Fe (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	56962.95	63667.488	83015.800	- to -	125855.809	149340.13	62188.322
Granodiorite (biotized)	21	9147.78	38786.990	47005.130	39179.170 to 59610.380	60038.663	213827.41	21251.673
Granodiorite w/phyllic alte	6	15231.07	35542.524	61236.925	15231.070 to 240320.390	93101.817	240320.39	57559.293
Kneeling Nun	4	17153.14	22095.611	32196.990	- to -	46980.465	55267.29	24884.854

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

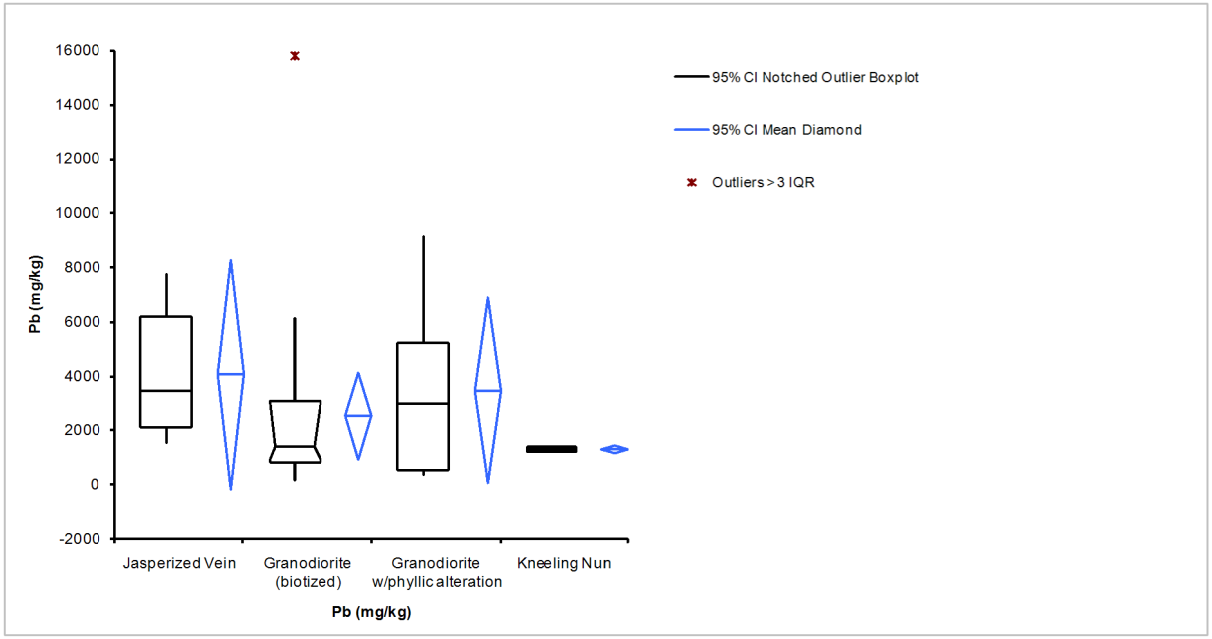
TITLE

BOX AND WHISKER PLOT
IRON
UPPER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-4	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

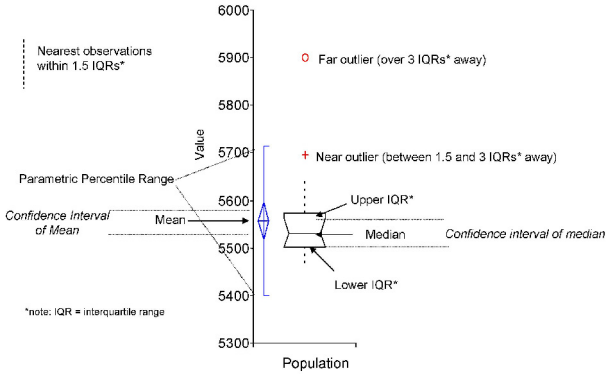
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:25pm



Pb (mg/kg)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	4052.983	-173.599 to 8279.564	1328.0922	2656.1844
Granodiorite (biotized)	21	2527.326	948.081 to 4106.572	757.0821	3469.3861
Granodiorite w/phyllic alte	6	3476.263	56.579 to 6895.947	1330.3153	3258.5938
Kneeling Nun	4	1300.110	1147.866 to 1452.354	47.8386	95.6773

Pb (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	1538.08	2132.055	3463.380	- to -	6170.444	7747.09	4038.389
Granodiorite (biotized)	21	158.86	809.860	1381.330	939.170 to 3052.650	3058.227	15783.75	2248.367
Granodiorite w/phyllic alte	6	360.03	525.378	2982.100	360.030 to 9147.830	5203.670	9147.83	4678.292
Kneeling Nun	4	1197.06	1223.235	1290.915	- to -	1380.050	1421.55	156.815

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

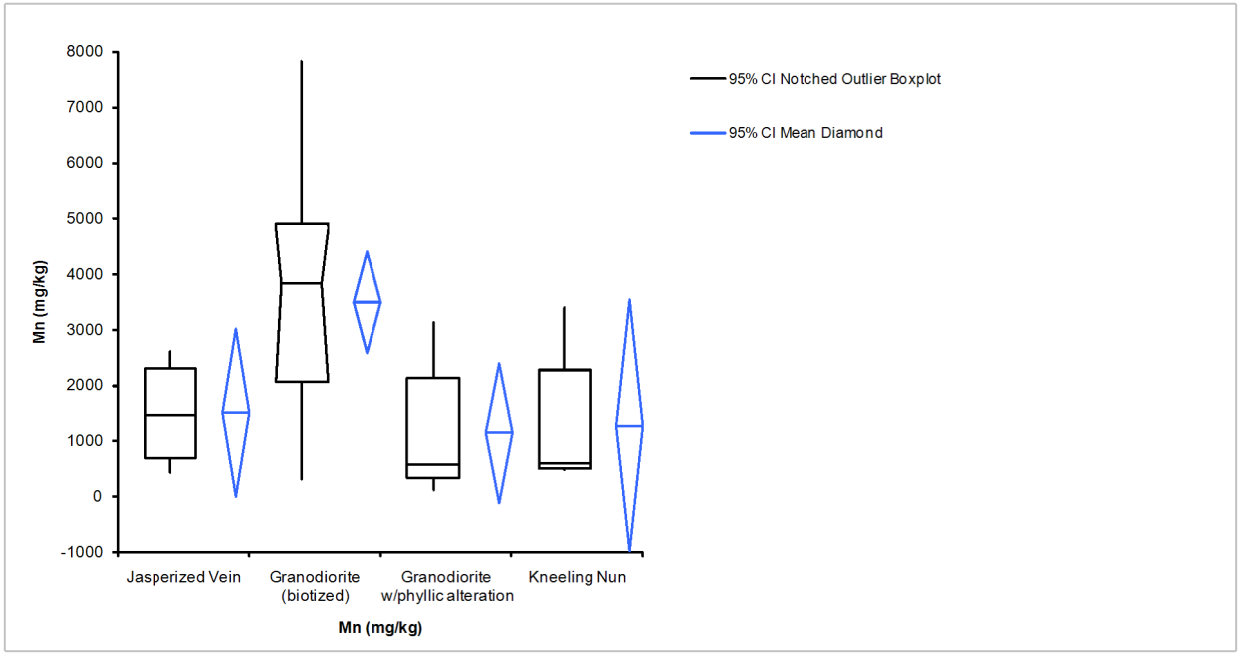
TITLE

BOX AND WHISKER PLOT
LEAD
UPPER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-5	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

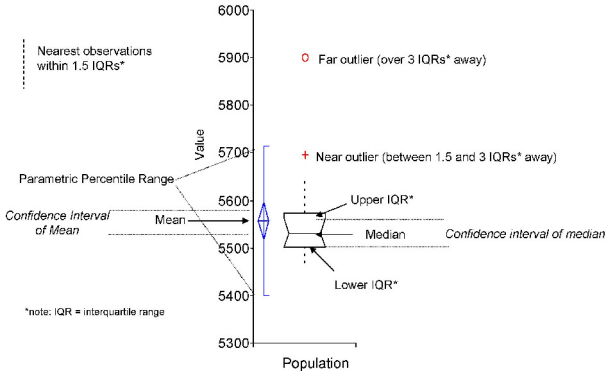
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:26pm



Mn (mg/kg)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	1486.970	-23.543 to 2997.483	474.6391	949.2781
Granodiorite (biotized)	21	3483.642	2576.104 to 4391.180	435.0692	1993.7374
Granodiorite w/phyllic alte	6	1128.943	-122.888 to 2380.775	486.9838	1192.8618
Kneeling Nun	4	1263.618	-994.664 to 3521.899	709.6055	1419.2110

Mn (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	419.07	690.649	1459.955	- to -	2292.296	2608.90	1601.647
Granodiorite (biotized)	21	296.94	2037.470	3820.780	2037.840 to 4804.160	4900.857	7813.78	2863.387
Granodiorite w/phyllic alte	6	111.71	338.906	574.625	111.710 to 3136.170	2110.237	3136.17	1771.331
Kneeling Nun	4	465.61	488.935	600.375	- to -	2259.381	3388.11	1770.446

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

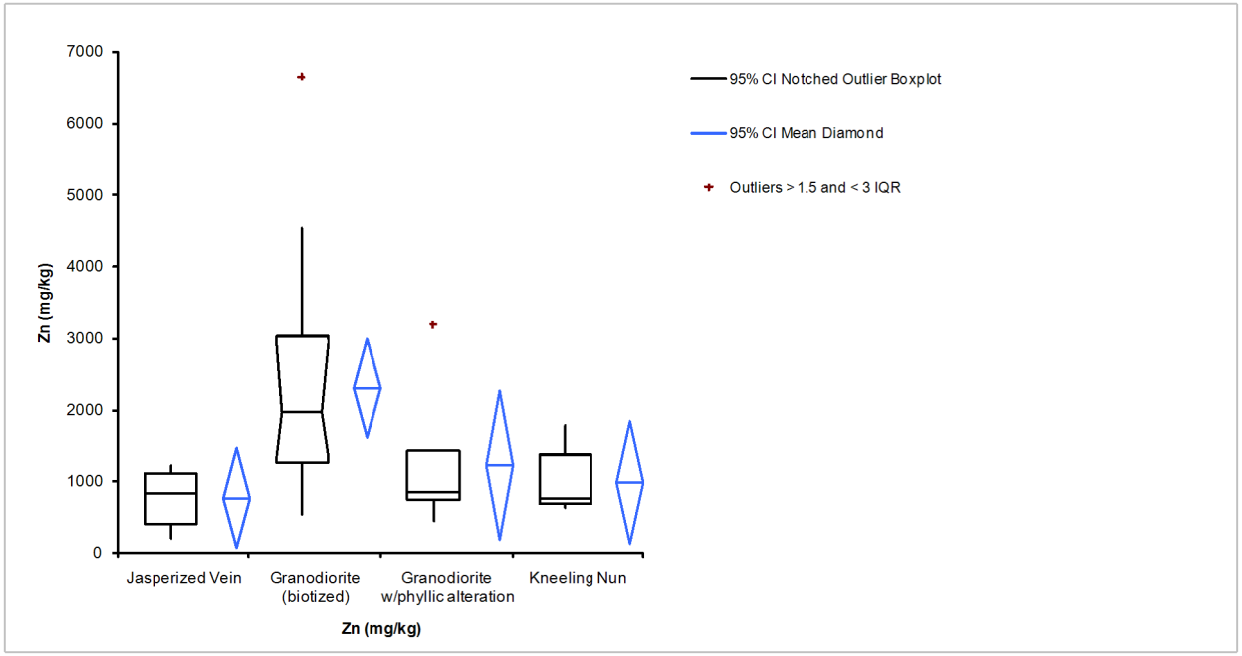
TITLE

BOX AND WHISKER PLOT MANGANESE UPPER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No. 07392553B003	
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-6	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

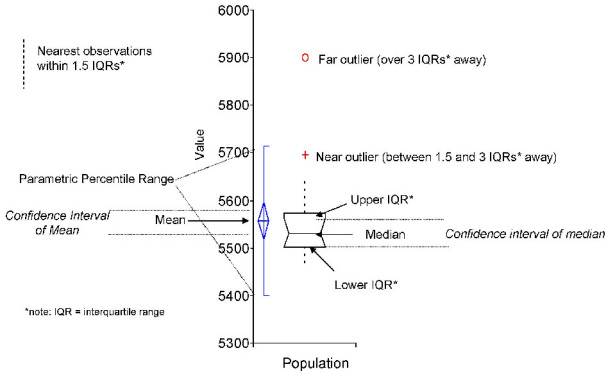
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:27pm



Zn (mg/kg)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	764.605	66.307 to 1462.903	219.4219	438.8437
Granodiorite (biotized)	21	2306.448	1618.533 to 2994.362	329.7827	1511.2541
Granodiorite w/phyllic alte	6	1226.458	182.003 to 2270.914	406.3111	995.2549
Kneeling Nun	4	979.705	121.292 to 1838.118	269.7336	539.4673

Zn (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	195.24	398.915	819.825	- to -	1111.888	1223.53	712.973
Granodiorite (biotized)	21	537.88	1251.503	1965.500	1322.940 to 2928.520	3016.200	6636.57	1764.697
Granodiorite w/phyllic alte	6	437.04	739.173	853.065	437.040 to 3183.980	1424.878	3183.98	685.705
Kneeling Nun	4	627.20	676.554	753.875	- to -	1358.133	1783.87	681.578

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

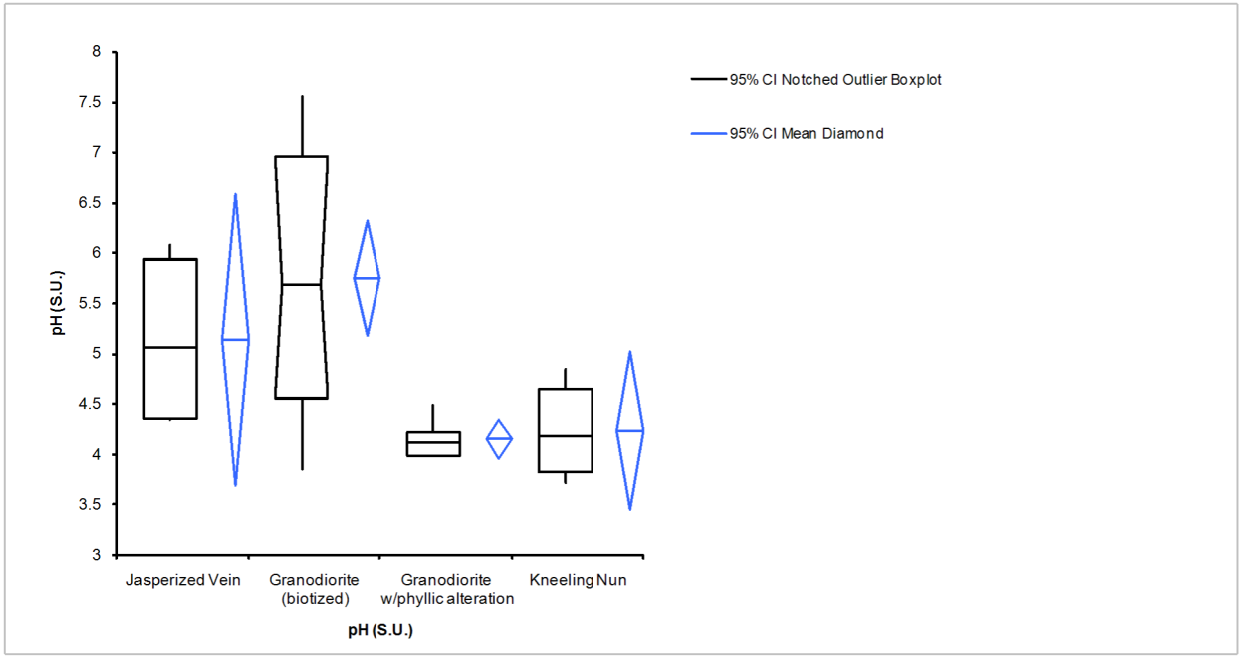
TITLE

BOX AND WHISKER PLOT
ZINC
UPPER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No. 07392553B003	
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-7	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

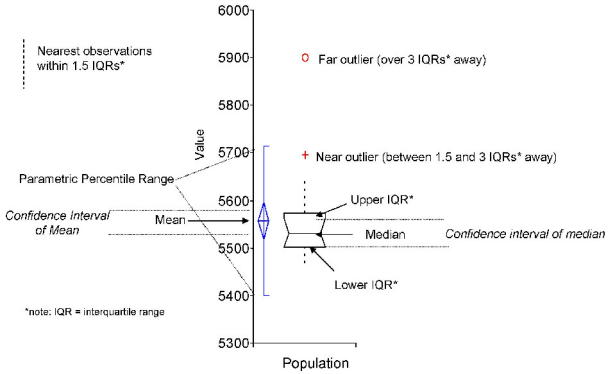
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:27pm



pH (S.U.)	n	Mean	95% CI	SE	SD
Jasperized Vein	4	5.135	3.686 to 6.584	0.4554	0.9108
Granodiorite (biotized)	21	5.747	5.170 to 6.323	0.2762	1.2658
diorite w/phyllic alteration	6	4.147	3.948 to 4.345	0.0771	0.1889
Kneeling Nun	4	4.233	3.448 to 5.017	0.2466	0.4931

pH (S.U.)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Jasperized Vein	4	4.34	4.353	5.060	- to -	5.943	6.08	1.590
Granodiorite (biotized)	21	3.85	4.553	5.680	4.620 to 6.890	6.957	7.56	2.403
diorite w/phyllic alteration	6	3.98	3.980	4.115	3.980 to 4.490	4.224	4.49	0.244
Kneeling Nun	4	3.72	3.828	4.180	- to -	4.654	4.85	0.826

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

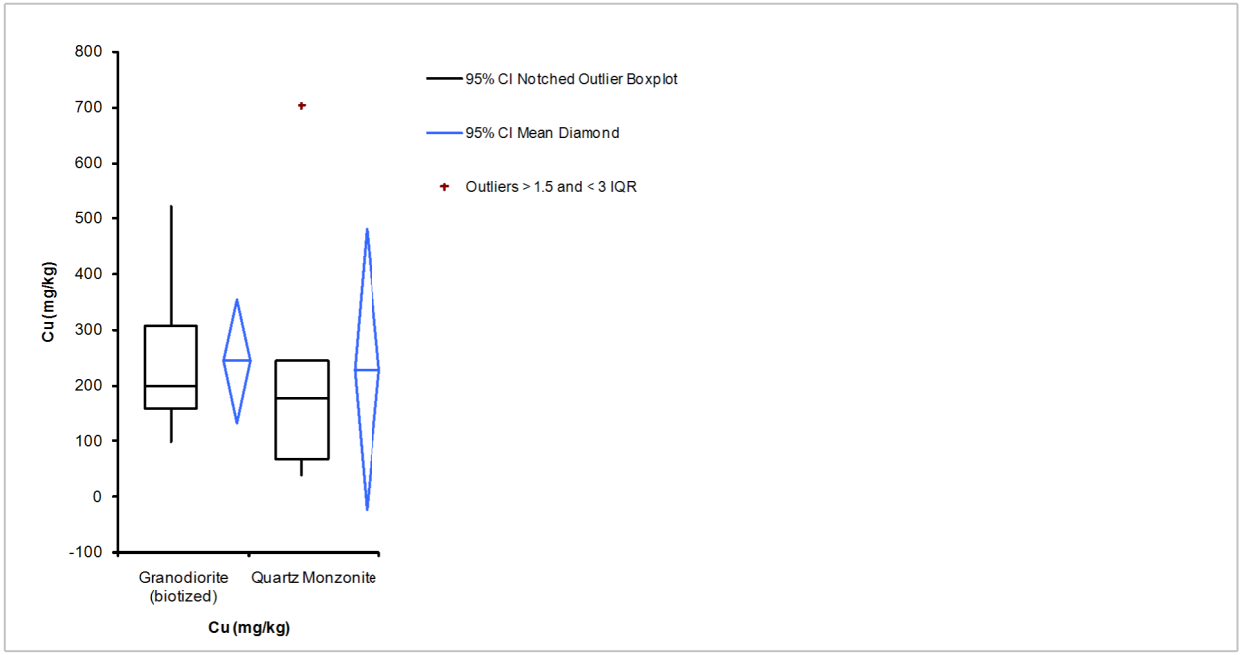
BOX AND WHISKER PLOT
Paste pH
UPPER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08		
CHECK	JP	12/23/08		
REVIEW		02/17/09		

FIGURE C-8

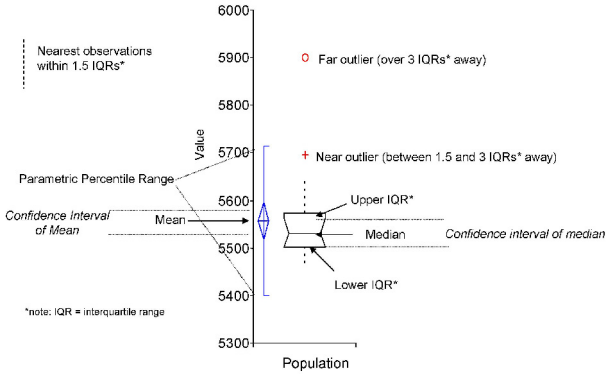
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:28pm



Cu (mg/kg)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	242.603	131.141 to 354.064	47.1369	133.3234
Quartz Monzonite	6	228.098	-25.061 to 481.258	98.4833	241.2339

Cu (mg/kg)	n	Min	1st Quartile	Mecian	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	98.63	159.549	197.875	98.630 to 520.970	305.458	520.97	145.909
Quartz Monzonite	6	39.25	68.107	176.450	39.250 to 701.870	245.343	701.87	177.236

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

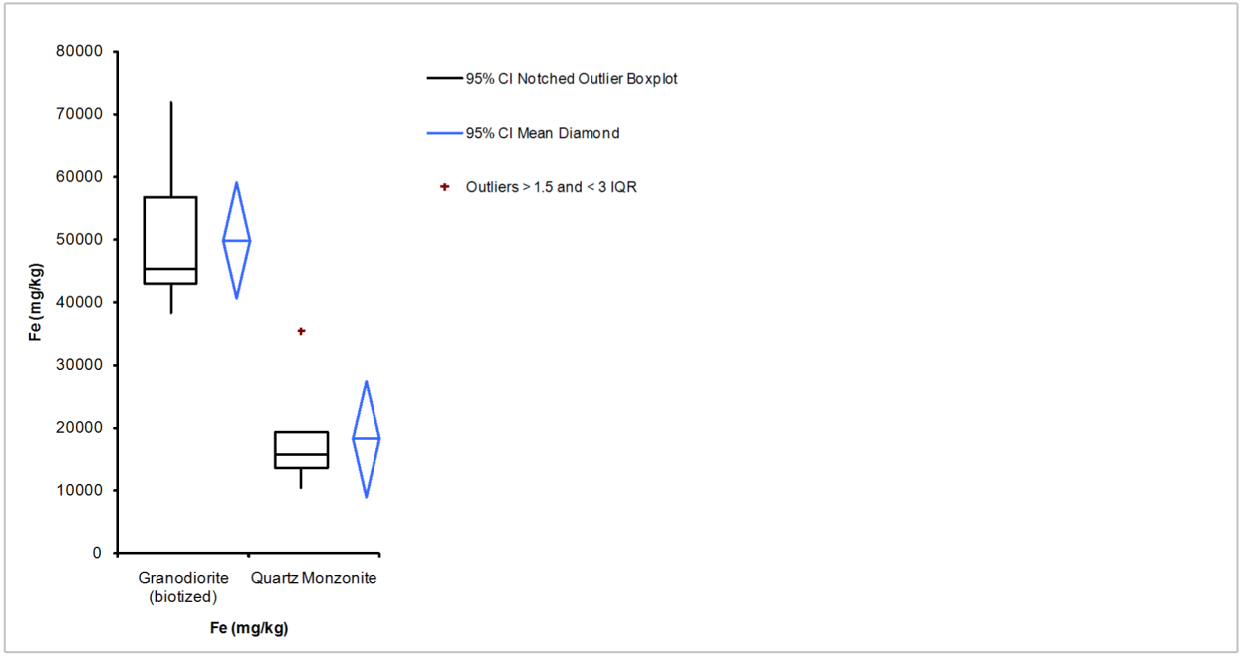
TITLE

BOX AND WHISKER PLOT
COPPER
LOWER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-9	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

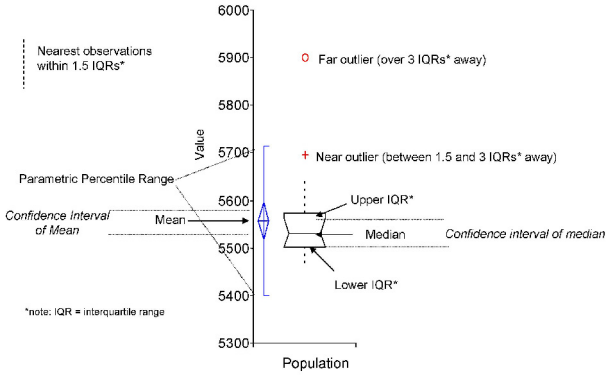
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:29pm



Fe (mg/kg)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	49862.479	40564.747 to 59160.210	3932.0128	11121.4117
Quartz Monzonite	6	18086.495	8790.875 to 27382.115	3616.1546	8857.7336

Fe (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	38301.81	42797.243	45242.190	38301.810 to 71875.480	56828.918	71875.48	14031.675
Quartz Monzonite	6	10293.90	13520.209	15695.060	10293.900 to 35329.330	19161.878	35329.33	5641.669

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

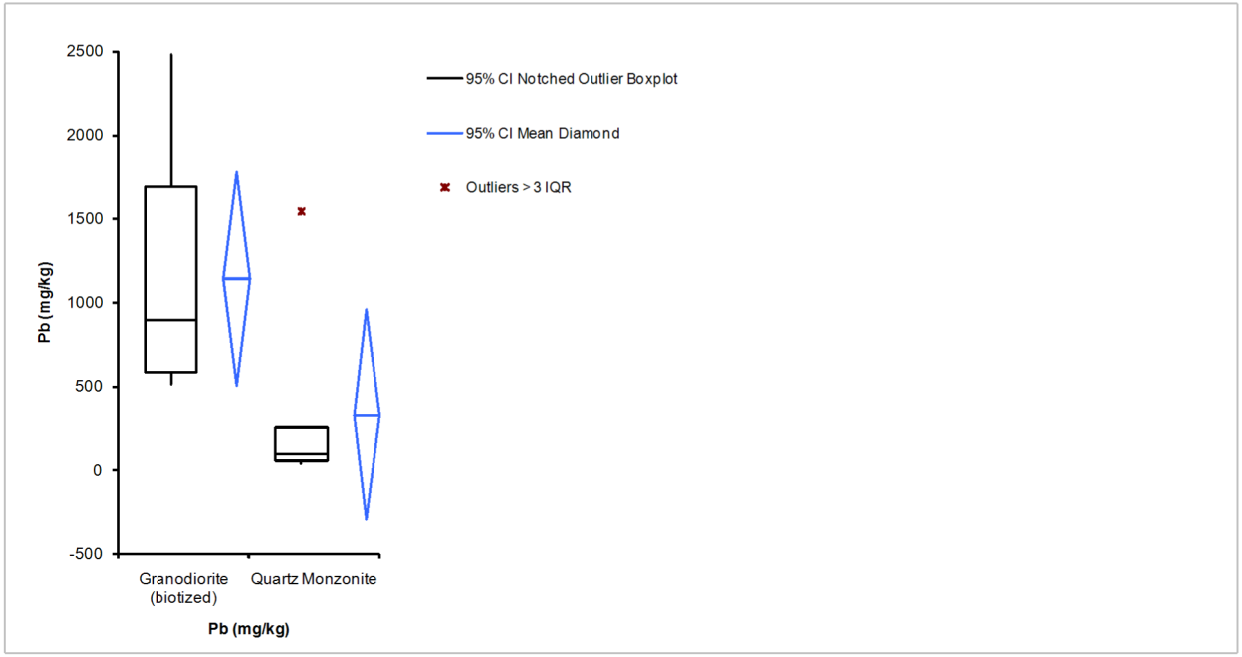
TITLE

BOX AND WHISKER PLOT
IRON
LOWER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No. 07392553B003	
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-10	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

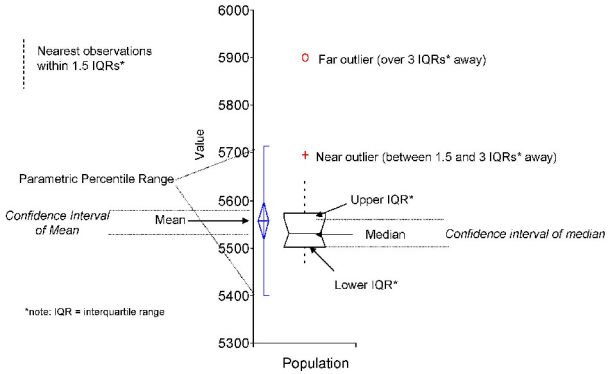
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:30pm



Pb (mg/kg)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	1141.320	501.658 to 1780.982	270.5134	765.1275
Quartz Monzonite	6	332.955	-291.774 to 957.684	243.0304	595.3004

Pb (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	514.32	579.910	895.685	514.320 to 2477.870	1686.740	2477.87	1106.830
Quartz Monzonite	6	42.69	61.564	100.755	42.690 to 1545.720	261.296	1545.72	199.732

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

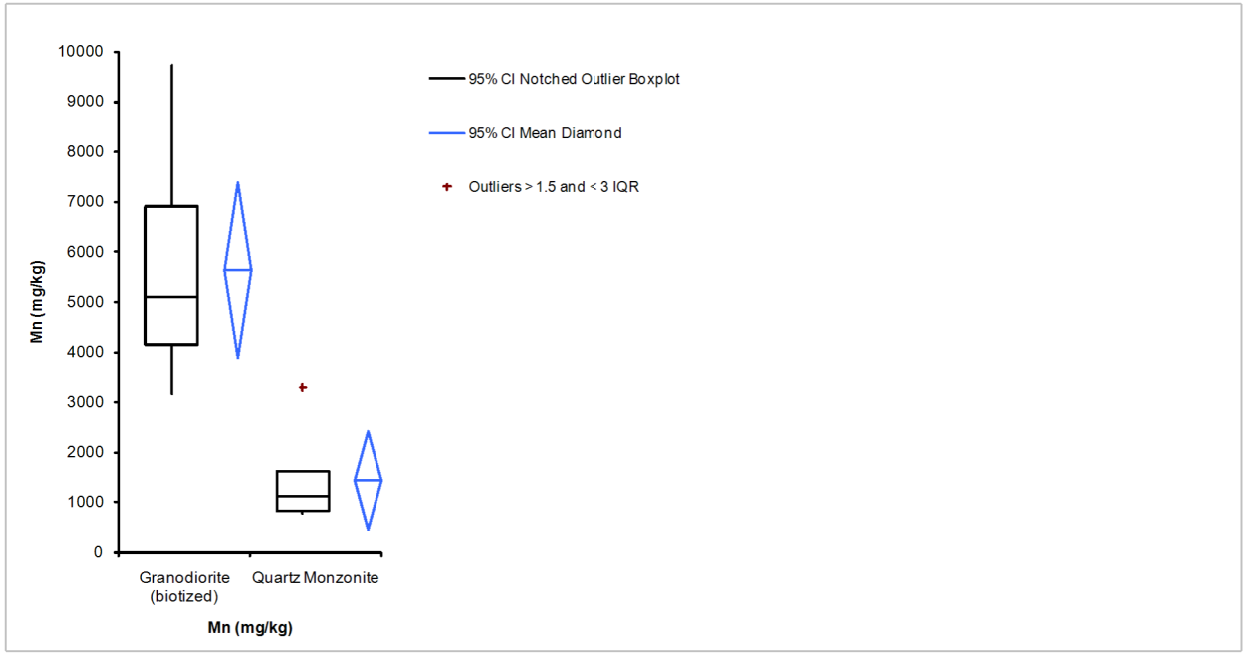
TITLE

BOX AND WHISKER PLOT
LEAD
LOWER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-11	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

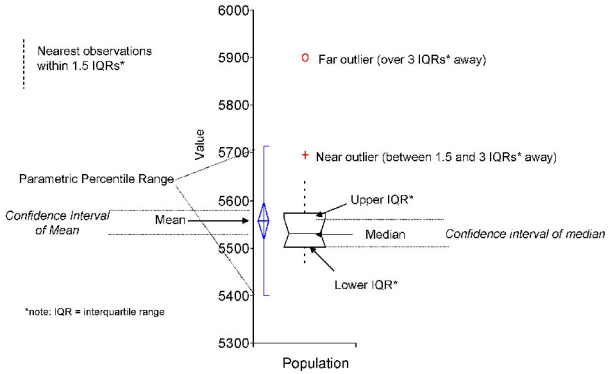
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:30pm



Mn (mg/kg)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	5631.103	3867.712 to 7394.493	745.7383	2109.2665
Quartz Monzonite	6	1435.713	446.205 to 2425.222	384.9356	942.8958

Mn (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	3159.91	4130.067	5092.825	3159.910 to 9716.860	6892.482	9716.86	2762.415
Quartz Monzonite	6	770.26	834.610	1127.025	770.260 to 3289.840	1612.184	3289.84	777.574

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

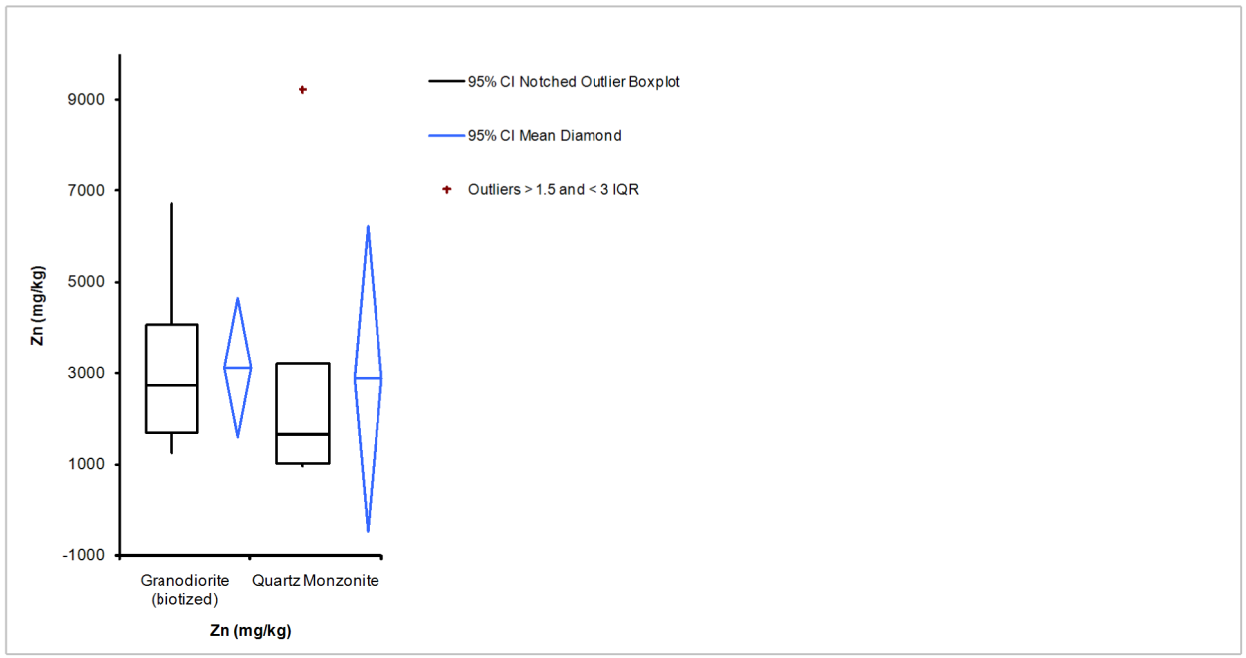
TITLE

BOX AND WHISKER PLOT MANGANESE LOWER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-12	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

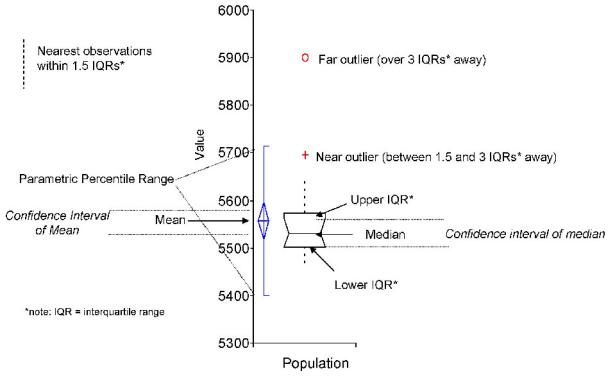
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:31pm



Zn (mg/kg)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	3104.733	1593.008 to 4616.457	639.3087	1808.2381
Quartz Monzonite	6	2863.227	-475.698 to 6202.151	1298.8986	3181.6387

Zn (mg/kg)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	1257.69	1695.508	2753.985	1257.690 to 6718.830	4044.360	6718.83	2348.853
Quartz Monzonite	6	955.86	1020.788	1667.265	955.860 to 9211.350	3197.632	9211.35	2176.844

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

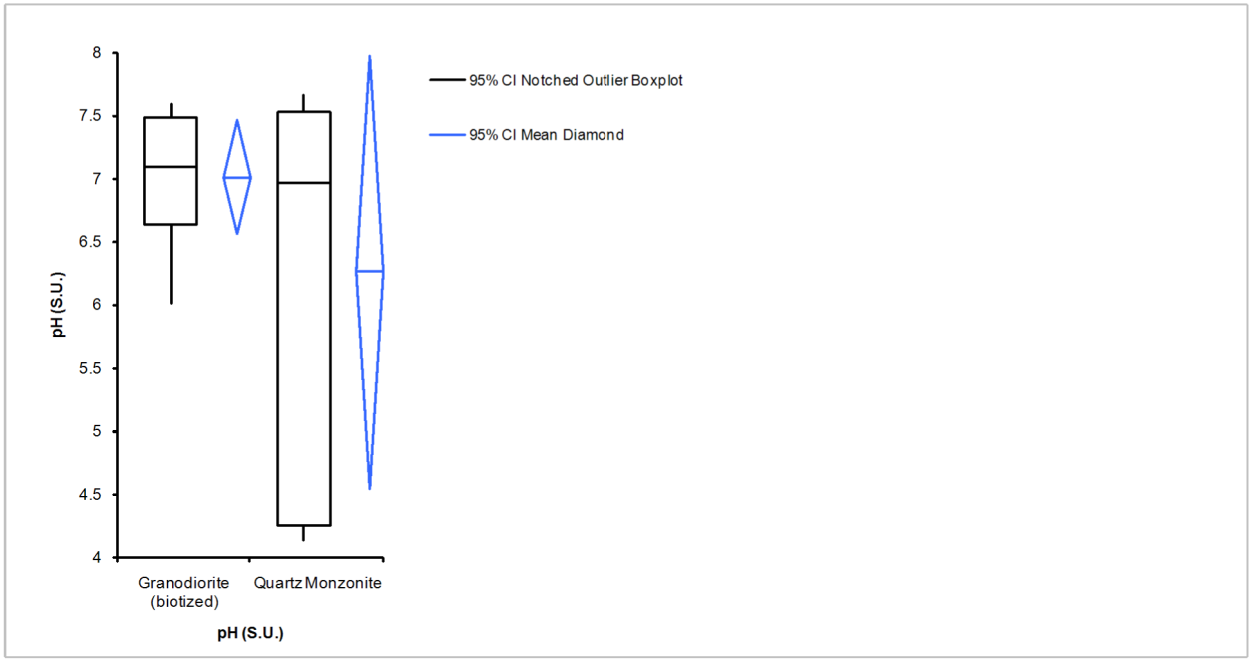
TITLE

BOX AND WHISKER PLOT
ZINC
LOWER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-13	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

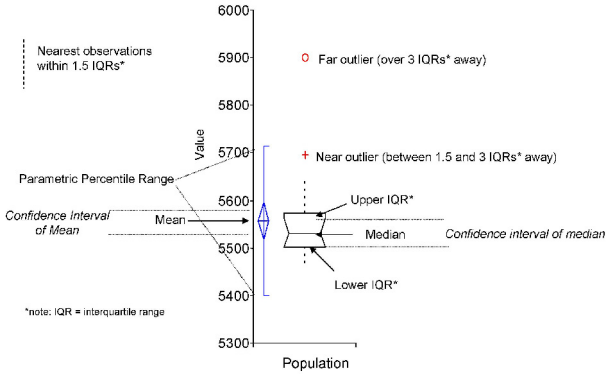
Drawing file: Box_Whiskers.dwg Feb 17, 2009 – 1:32pm



pH (S.U.)	n	Mean	95% CI	SE	SD
Granodiorite (biotized)	8	7.008	6.552 to 7.463	0.1928	0.5454
Quartz Monzonite	6	6.253	4.538 to 7.969	0.6675	1.6350

pH (S.U.)	n	Min	1st Quartile	Median	95% CI	3rd Quartile	Max	IQR
Granodiorite (biotized)	8	6.01	6.639	7.095	6.010 to 7.600	7.484	7.60	0.845
Quartz Monzonite	6	4.13	4.249	6.970	4.130 to 7.670	7.533	7.67	3.283

LEGEND



PROJECT

FREEPORT-MCMORAN COPPER & GOLD
CHINO OPERATIONS

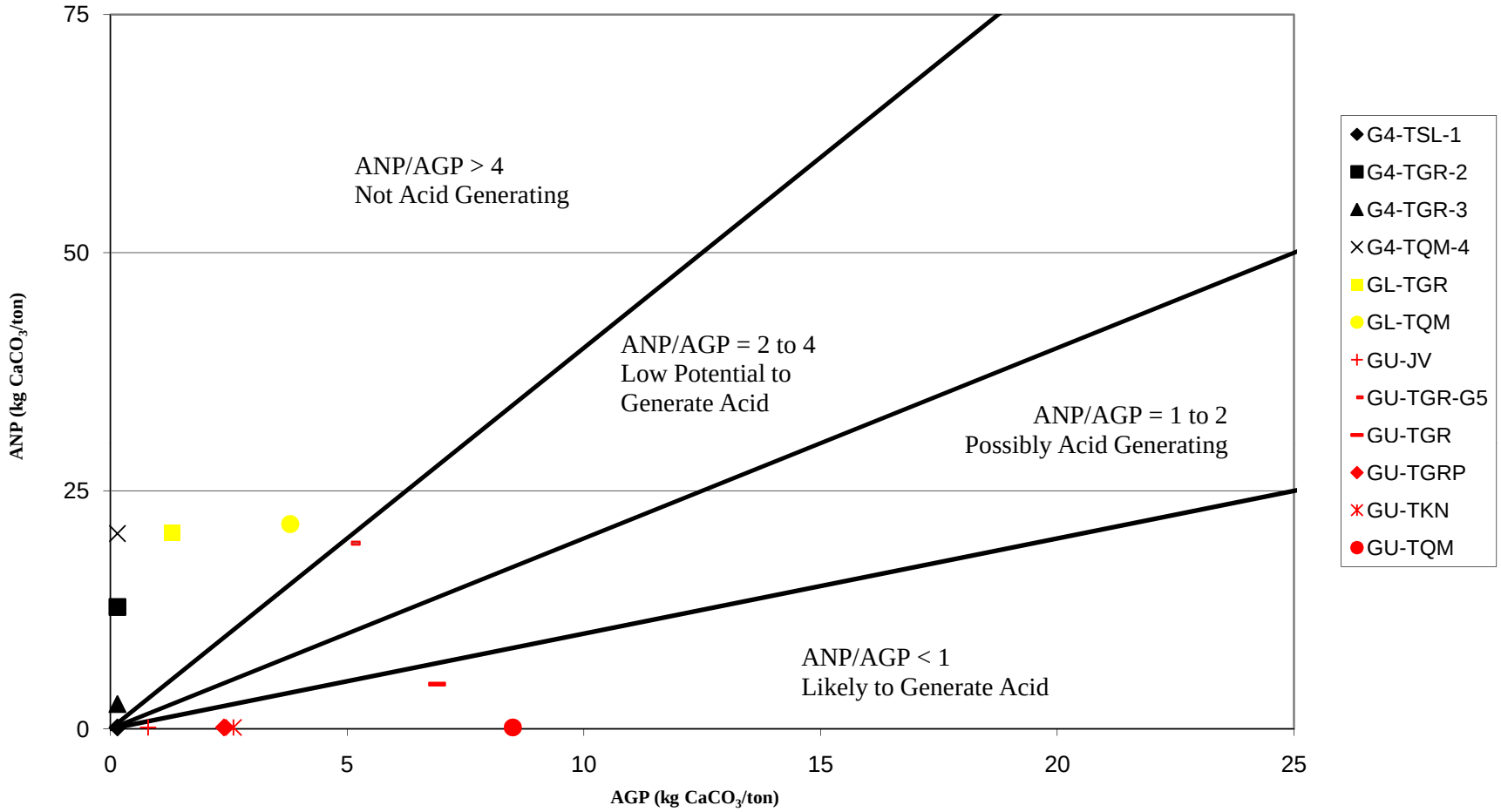
CHINO MINES COMPANY
GROUNDHOG IRA
GRANT COUNTY, NEW MEXICO

TITLE

BOX AND WHISKER PLOT
Paste pH
LOWER AREA

Golder Associates
Tucson, Arizona

PROJECT No. 073-92553-03			FILE No.	07392553B003
DESIGN	AB	12/23/08	SCALE NA	REV. A
CADD	AB	12/23/08	FIGURE C-14	
CHECK	JP	12/23/08		
REVIEW		02/17/09		

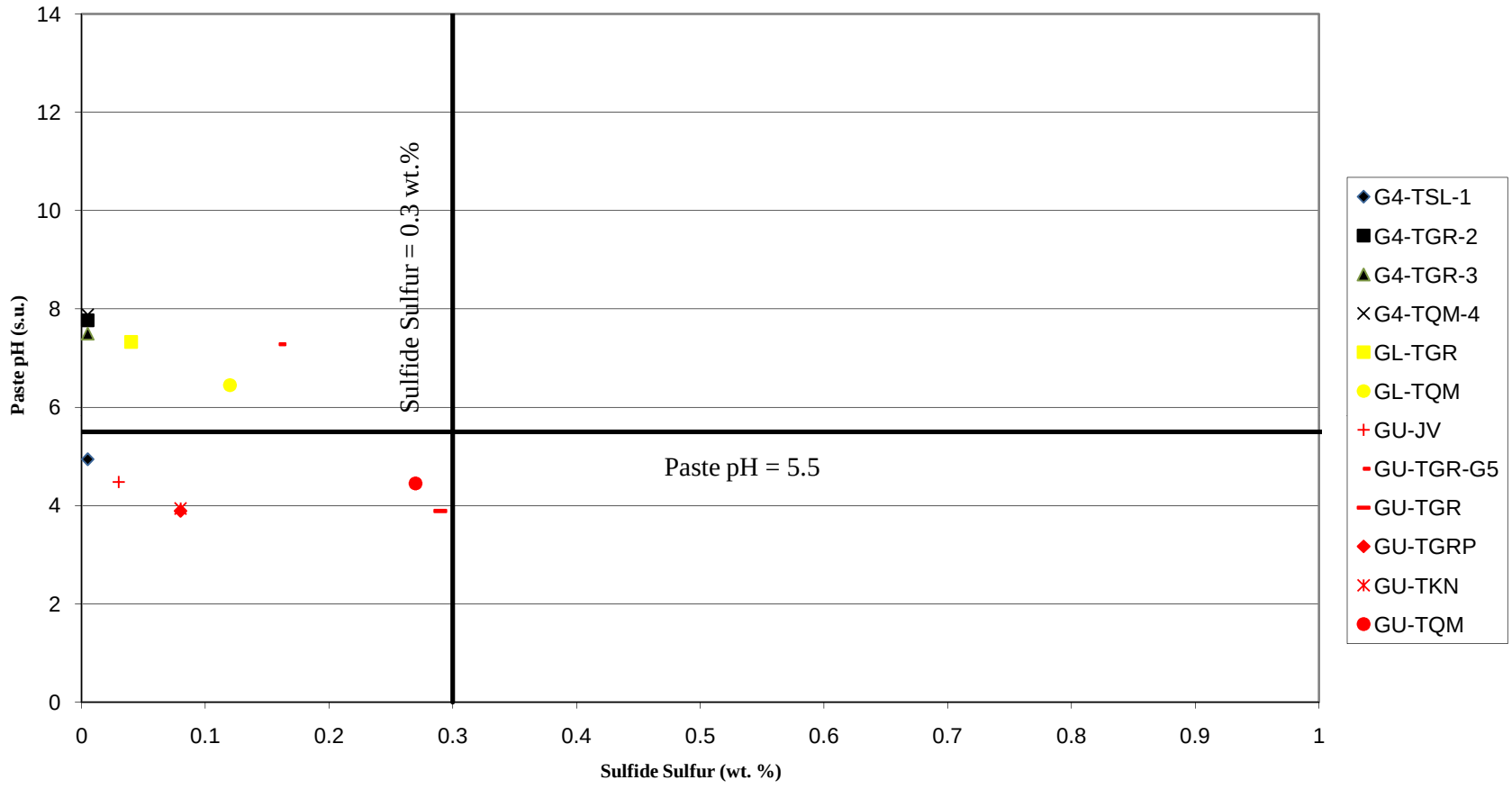


Golder Associates Tucson, Arizona

TITLE

Groundhog Mine Site IRA
Acid-Neutralization Potential (ANP) vs Acid-Generation Potential (AGP)

CLIENT/PROJECT	DRAWN	OM	DATE	2/19/09	JOB NO.	073-92553-03
CHINO MINES COMPANY	CHECKED	JP	SCALE		DWG. NO.	
	REVIEWED	EE	FILE NO.		FIGURE NO.	C-15

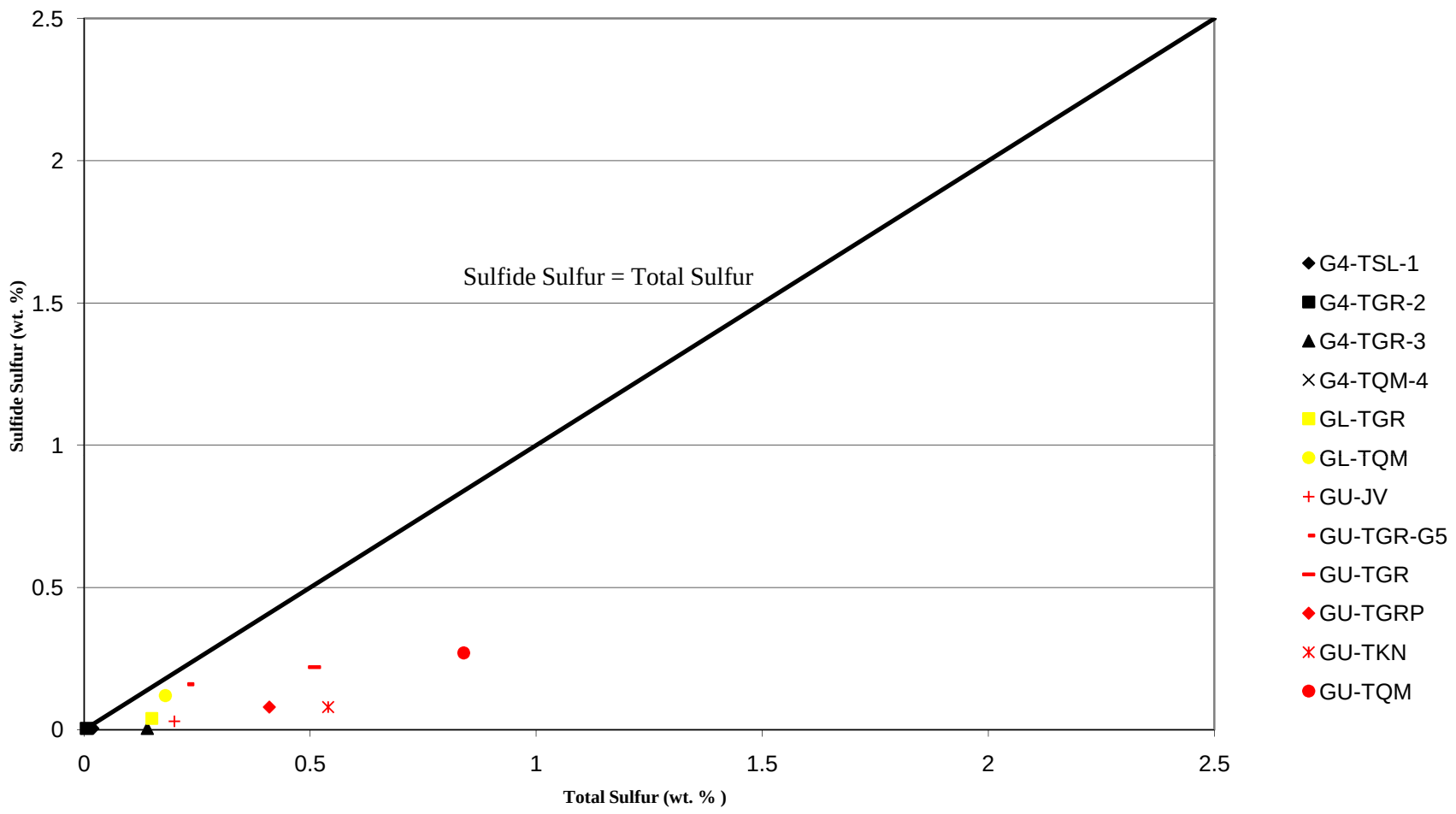


Golder Associates Tucson, Arizona

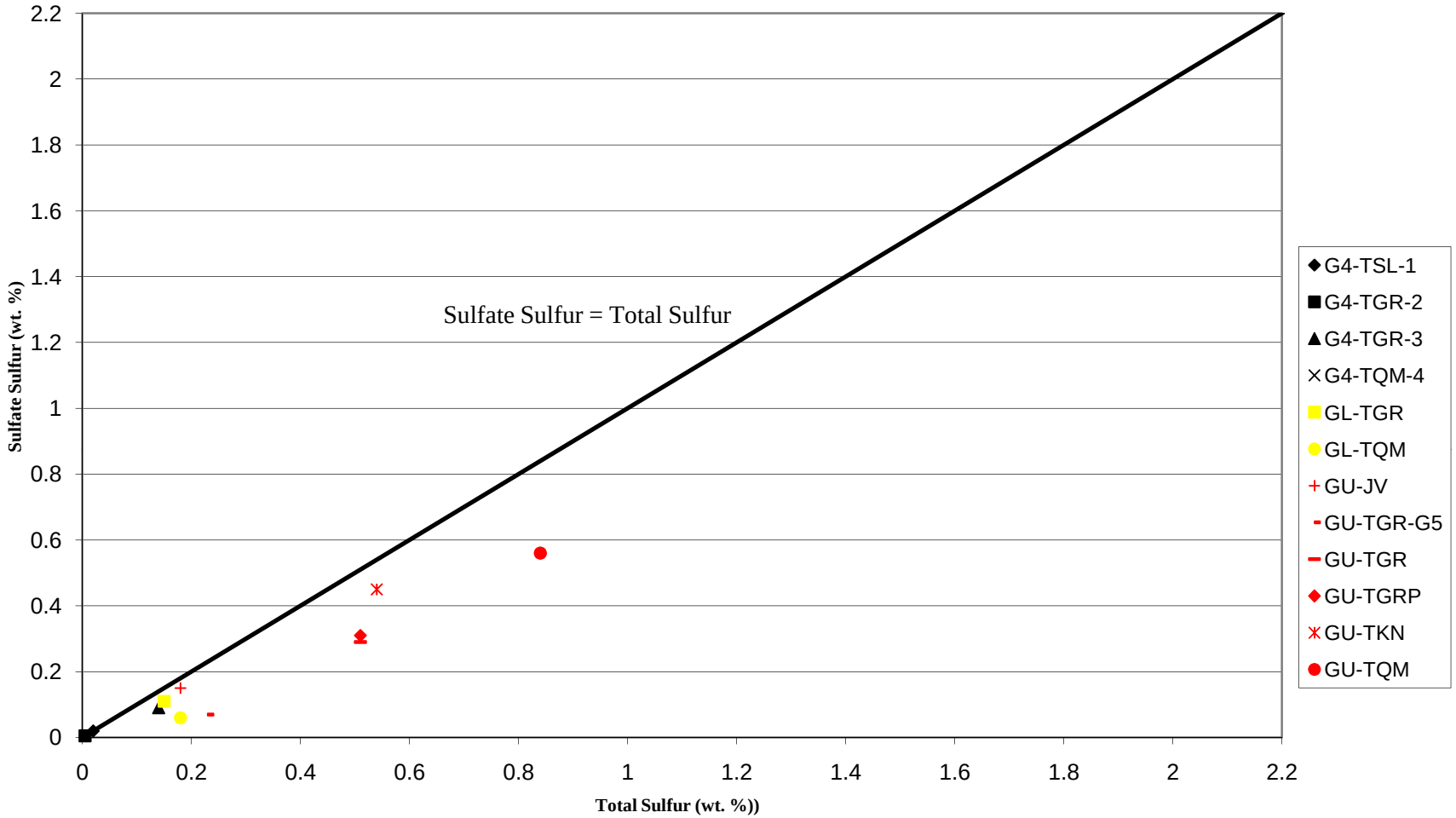
TITLE

Groundhog Mine Site IRA
Paste pH vs Sulfide Sulfur

CLIENT/PROJECT	DRAWN	DATE	JOB NO.
CHINO MINES COMPANY	OM	2/19/09	073-92553-03
	CHECKED JP	SCALE	DWG. NO.
	REVIEWED EE	FILE NO.	FIGURE NO. C-16



Golder Associates	TITLE	**Groundhog Mine Site IRA Sulfide Sulfur vs Total Sulfur**		
CLIENT/PROJECT CHINO MINES COMPANY	DRAWN OM	DATE 2/19/09	JOB NO. 073-92553-03	
	CHECKED JP	SCALE	DWG. NO.	
	REVIEWED EE	FILE NO.	FIGURE NO. **C-17**	

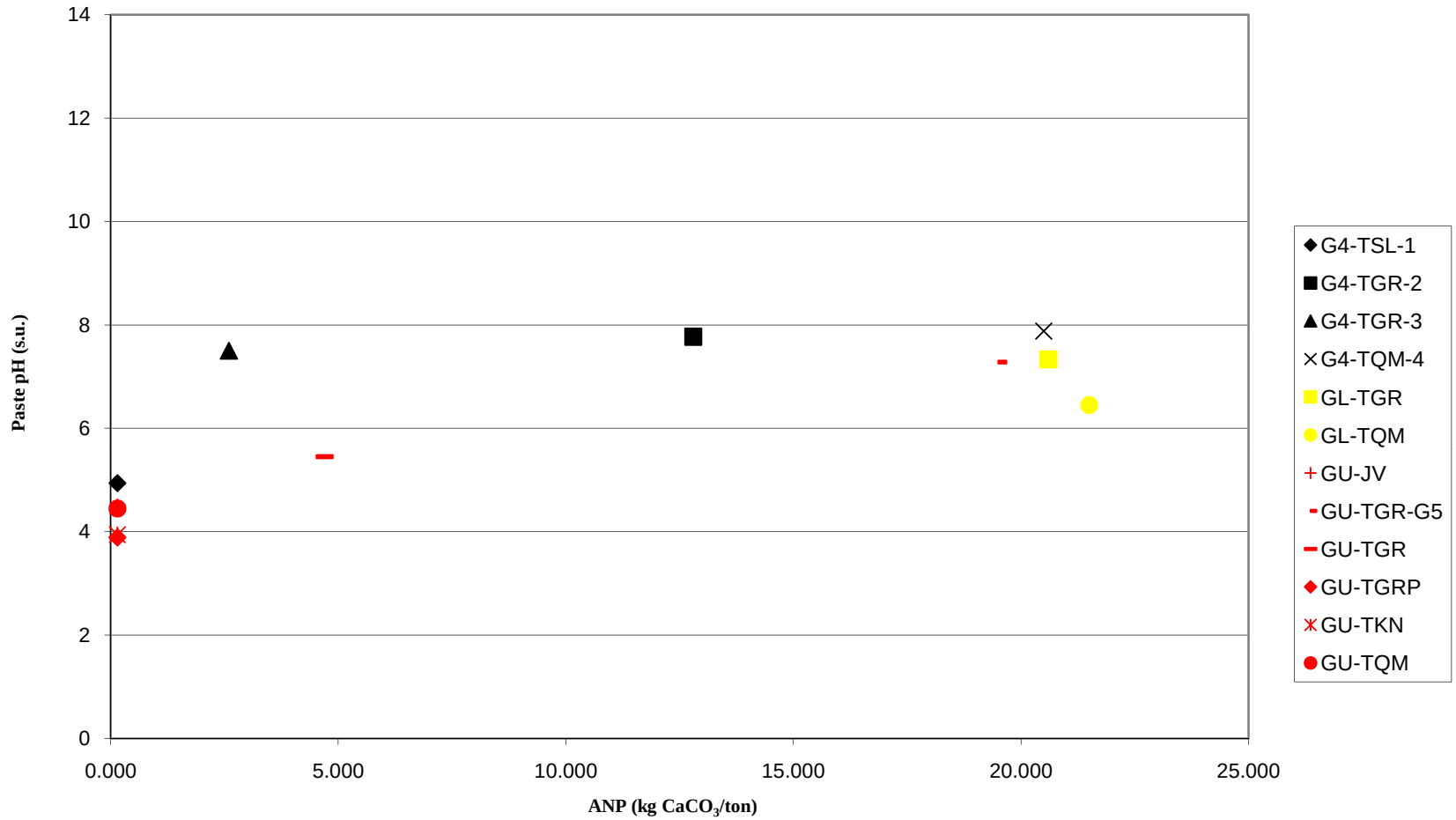


Golder Associates

TITLE

Groundhog Mine Site IRA
Sulfate Sulfur vs Total Sulfur

CLIENT/PROJECT	DRAWN	OM	DATE	2/19/09	JOB NO.	073-92553-03
CHINO MINES COMPANY	CHECKED	JP	SCALE		DWG. NO.	
	REVIEWED	EE	FILE NO.		FIGURE NO.	C-18

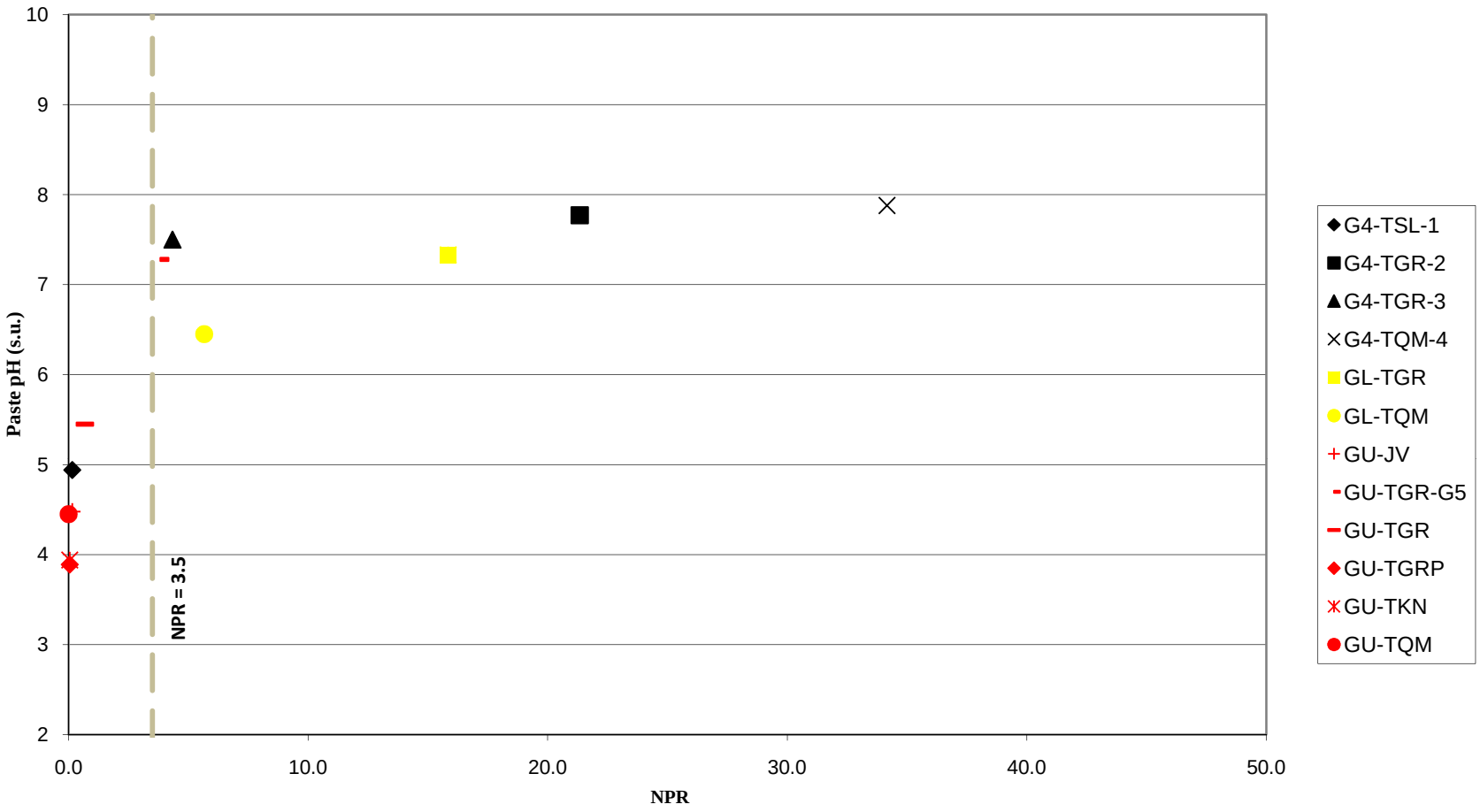


Golder Associates Tucson, Arizona

TITLE

Groundhog Mine Site IRA
Paste pH vs Acid-Neutralization Potential (ANP)

CLIENT/PROJECT	DRAWN	OM	DATE	2/19/09	JOB NO.	073-92553-03
CHINO MINES COMPANY	CHECKED	JP	SCALE		DWG. NO.	
	REVIEWED	EE	FILE NO.		FIGURE NO.	C-19



Golder Associates	TITLE: **Groundhog Mine Site IRA Paste pH vs Neutralization Potential Ratio (NPR)**		
CLIENT/PROJECT: CHINO MINES COMPANY	DRAWN: OM	DATE: 2/19/09	JOB NO.: 073-92553-03
	CHECKED: JP	SCALE:	DWG. NO.:
	REVIEWED: EE	FILE NO.:	FIGURE NO.: **C-20**

APPENDIX C

ATTACHMENT C.1
SAMPLE LOGS

SAMPLE LOG: G4-Tsl-1

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770813
Project No.:	073-92553-03	**UTM Northing:**	3630319

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1 1/2	Sugar Lump Tuff	Whitish to pinkish grey, slightly welded, ash flow tuff. Fine grain w/ pumice clasts, rounded to compressed lenses of ash tuff, developed soil on top.	Soft, silty sand

SAMPLE LOG: G4-Tgr-2

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770818
Project No.:	073-92553-03	**UTM Northing:**	3630322

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1.5	1	Biotized-Granodiorite	Granodiorite - white-gray Qh-ser-biotite altered to fine grain matrix - alterating envelope to fit mineralized vein to east 10 feet away. Some soil developed with abundant clay.	Clayey silt and sand

SAMPLE LOG: G4-Tgr-3

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770818
Project No.:	073-92553-03	**UTM Northing:**	3630322

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	2	Biotized-Granodiorite	Hematite red, clayey jasperoid vein 15 feet wide, totally altered to hematitie clay and quartz.. Mineralized vein (old shaft site).	Silty clay and sand

SAMPLE LOG: G4-Tqm-4

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770818
Project No.:	073-92553-03	**UTM Northing:**	3630322

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	2	Quartz Monzonite	Quartz Monzonite dike - post-mineralization dike. Gray green, medium to long grain porphyry. Large biotite phenocrysts. White feldspars going to clay. Soil developed on surface.	Coarse silty sand (decomposed granite)

SAMPLE LOG: GL-Tqm-4

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770930
Project No.:	073-92553-03	**UTM Northing:**	3630314

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Quartz Monzonite	Very soft weathered gray green quartz monzonite. About 1-1/2 inches of soil developed since exposure by stockpile removal. Post-mineralization dike.	Soft weathered sandy silt monzonite

SAMPLE LOG: GL-Tqm-1

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770901
Project No.:	073-92553-03	**UTM Northing:**	363031

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Quartz Monzonite	Very soft weathered gray green quartz monzonite. About 1-1/2 inches of soil developed since exposure by stockpile removal. Post-mineralization dike.	Soft weathered sandy silt monzonite

SAMPLE LOG: GL-Tqm-2

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770902
Project No.:	073-92553-03	**UTM Northing:**	3630321

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Quartz Monzonite	Very soft weathered gray green quartz monzonite. About 1-1/2 inches of soil developed since exposure by stockpile removal. Post-mineralization dike.	Soft weathered sandy silt monzonite

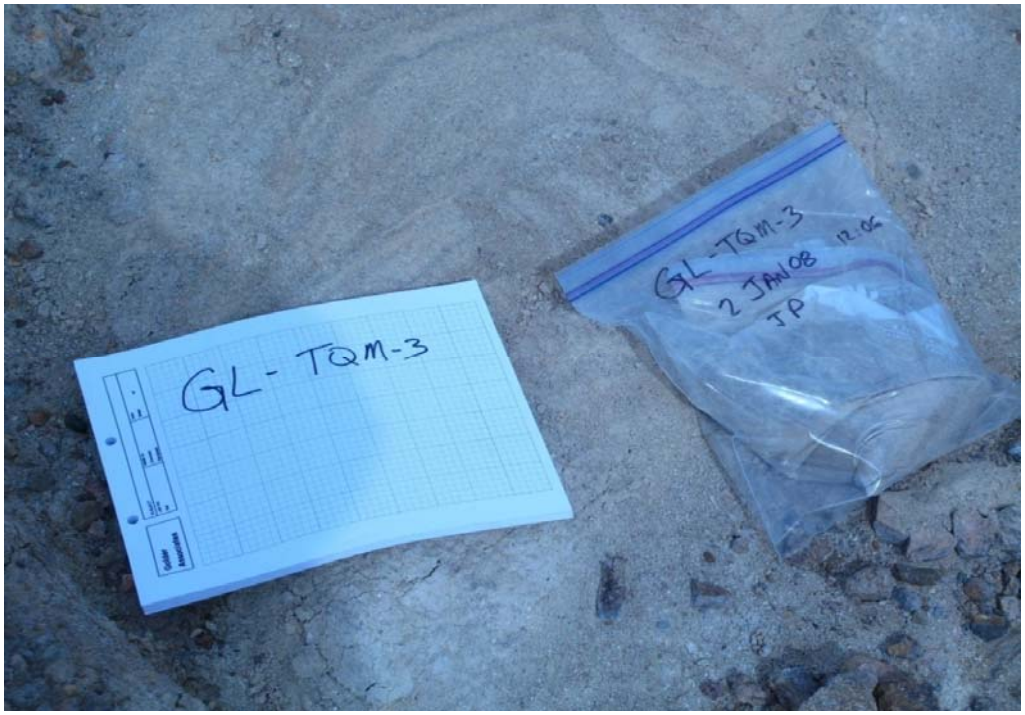
SAMPLE LOG: GL-Tqm-3

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770923
Project No.:	073-92553-03	**UTM Northing:**	3630308

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Quartz Monzonite	Very soft weathered gray green quartz monzonite. About 1-1/2 inches of soil developed since exposure by stockpile removal. Post-mineralization dike.	Soft weathered sandy silt monzonite



SAMPLE LOG: GL-Tgr-5

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770900
Project No.:	073-92553-03	**UTM Northing:**	3630260

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
0.5	2	Biotized granodiorite	Altered by quartz - sericite, Hematite stained veins in granodiorite. Fine grain whitish gray quartz-sericite altered. Trace fine grained secondary biotite hard surface.	Bedrock, decomposed

SAMPLE LOG: GL-Tgr-6

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770918
Project No.:	073-92553-03	**UTM Northing:**	3630230

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Biotized Granodiorite	Granodiorite - fine grain altered porphyry w/ secondary fine grained biotite replacing biotite phenocrysts. Serricite alterism in ground mass and in feldspar phenocrytsts. Minor black oxidized veinlets. (Manganese coating)	Vegetation, silty sand with clay.

SAMPLE LOG: GL-Tgr-7

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770944
Project No.:	073-92553-03	**UTM Northing:**	3630240

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Biotized Granodiorite	Granodiorite - fine grain altered porphyry w/ secondary fine grained biotite replacing biotite phenocrysts. Serricite alteration in ground mass and in feldspar phenocrysts. Minor black oxidized veinlets. (Manganese coating) Dark brown w/ organics developed soil horizon. Alteration caused weakening and weathering of rocks.	Vegetation, silty sand with clay, removed rocks

SAMPLE LOG: GL-Tgr-8

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770958
Project No.:	073-92553-03	**UTM Northing:**	3630267

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1.5	Biotized Granodiorite	Granodiorite - fine grain altered porphyry w/ secondary fine grained biotite replacing biotite phenocrysts. Sericite alteration in ground mass and in feldspar phenos. Black Manganese-oxide-coated veinlet surfaces and fractures. Knobby outcrop. Orthoclase alteration. Flooding increasing rock hardness .	Manganese stained bedrock knob, decomposed

SAMPLE LOG: GL-Tgr-9

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770940
Project No.:	073-92553-03	**UTM Northing:**	3630300

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1.5	1	Biotized Granodiorite	Very sericitized and clay altered fine grained granodiorite. Crumbly in hand. Forms erosional surface next to hard biotized +/- orthoclase Tgr. Soil developed in soft sericite and clay weathering.	Serricitic, soft, silty sand

SAMPLE LOG: GL-Tgr-10

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770929
Project No.:	073-92553-03	**UTM Northing:**	3630279

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1.5	Biotized Granodiorite	Granodiorite - fine grain altered porphyry w/ secondary fine grained biotite replacing biotite phenocrysts. Sericite alteration in ground mass and in feldspar phenocrysts. Minor black oxidized veinlets manganese coating). Some dark brown soil developed on surface, which was sampled.	Sandy clayey silt, moist

SAMPLE LOG: GL-Tgr-11

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770924
Project No.:	073-92553-03	**UTM Northing:**	3630291

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	2	Biotized Granodiorite	Granodiorite - fine grain altered porphyry w/ secondary fine grained biotite replacing biotite phenocryts. Sericite alteration in ground mass and in feldspar phenocrysts. Minor black oxidized veinlets (manganese coating). Minor weathering of surface.	Biotite, decomposed

SAMPLE LOG: GL-Tqm-12

Date: 4/30/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770907
Project No.:	073-92553-03	**UTM Northing:**	3630293

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	4	Quartz Monzonite	Clayey sediments on hillside below an old drain, likely pulled up by loader during sediment removal. Sample is upper 1-1/2 inch weathered quartz monzonite bedrock. Fabric of monzonite visible in cobbles. Duplicate sample collected.	Quartz monzonite, weathered bedrock with iron stained clay on upper 1/8th inch

SAMPLE LOG: GL-Tqm-13

Date: 4/30/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770890
Project No.:	073-92553-03	**UTM Northing:**	3630297

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
2	1	Quartz Monzonite	Same as Sample GL-Tqm-12, but sand texture. Upper 1 inch removed, tracks from Trackhoe.	Sand from weathered Tqm bedrock (Duplicate sample also collected)

SAMPLE LOG: GL-Tgr-14

Date: 4/30/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770879
Project No.:	073-92553-03	**UTM Northing:**	3630289

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
2	1	Biotized Granodiorite	Biotized granodiorite weathered bedrock, hard digging, cobbly sample. Mixed at upper 1/4 inch of surface with pond sediments.	Tgr fractured bedrock

SAMPLE LOG: GU-Tgr-1

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770944
Project No.:	073-92553-03	**UTM Northing:**	3630093

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
0.5	1	Biotized granodiorite	Granodiorite - fine grain altered prophyry w/ secondary fine grained biotite replacing biotite phenocrysts. Sericite alteration in groundmass and in feldspar phenos. Minor black oxidized veinlets (manganese coating). Site above haul road where old G5 was located. Area of sample was not covered by stockpile.	Sandy gravel

SAMPLE LOG: GU-Tgr-2

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770948
Project No.:	073-92553-03	**UTM Northing:**	3630117

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
0.5	1	Biotized granodiorite	Granodiorite - fine grain altered prophyry with secondary fine grained biotite replacing biotite phenocrysts. Sericite alteration in groundmass and in feldspar phenocrysts. Minor black oxidized veinlets (manganese coating). Site above haul road where old G5 was located. Area for sample was not covered by stockpile.	Sandy gravel

SAMPLE LOG: GU-TKn-3

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770892
Project No.:	073-92553-03	**UTM Northing:**	3629050

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1.5	2	Kneeling Nun Tuff FM	South of Telemetry Station; Welded ashflow pumice and Kneeling Nun rhyolite tuff, pinkish red tuff w/ pumice lenses, biotite phenocrysts. Yellow-orange iron staining on bedrock surface, residual stockpile clasts, from historic stockpile level. Sampling site has weathered Tkn. Duplicate sample collected.	Mix of clean washout and stained brown

SAMPLE LOG: GU-TKn-4

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770929
Project No.:	073-92553-03	**UTM Northing:**	3629896

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Kneeling Nun Tuff FM	South of Telemetry Station; Welded ashflow pumice and Kneeling Nun rhyolite tuff, pinkish red tuff w/ pumice lenses, biotite phenos. Yellow-orange iron staining on bedrock surface, residual stockpile clasts, from historic stockpile level. Sampling site has weathered Tkn.	Mix of clean washout and stained brown

SAMPLE LOG: GU-Tqm-5

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770937
Project No.:	073-92553-03	**UTM Northing:**	3629939

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Quartz Monzonite	Quartz monzonite dike cutting Tgr. Tqm is very soft weathered gray green quartz monzonite. Sample mixed with Tgr runoff.	Hard road bed

SAMPLE LOG: GU-Tqm-6

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770978
Project No.:	073-92553-03	**UTM Northing:**	3630015

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Quartz Monzonite	Quartz monzonite dike cutting Tgr. Tqm is very soft, weathered, gray green quartz monzonite.	

SAMPLE LOG: GU-Tgr-7

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770995
Project No.:	073-92553-03	**UTM Northing:**	3630009

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1.5	Biotized Granodiorite	Gray green fine grained to manganese secondary biotite altered granodiorite with sericite clay alteration overprint. Minor chlorite presesnt after biotite. Residual stockpile is present.	Gravel

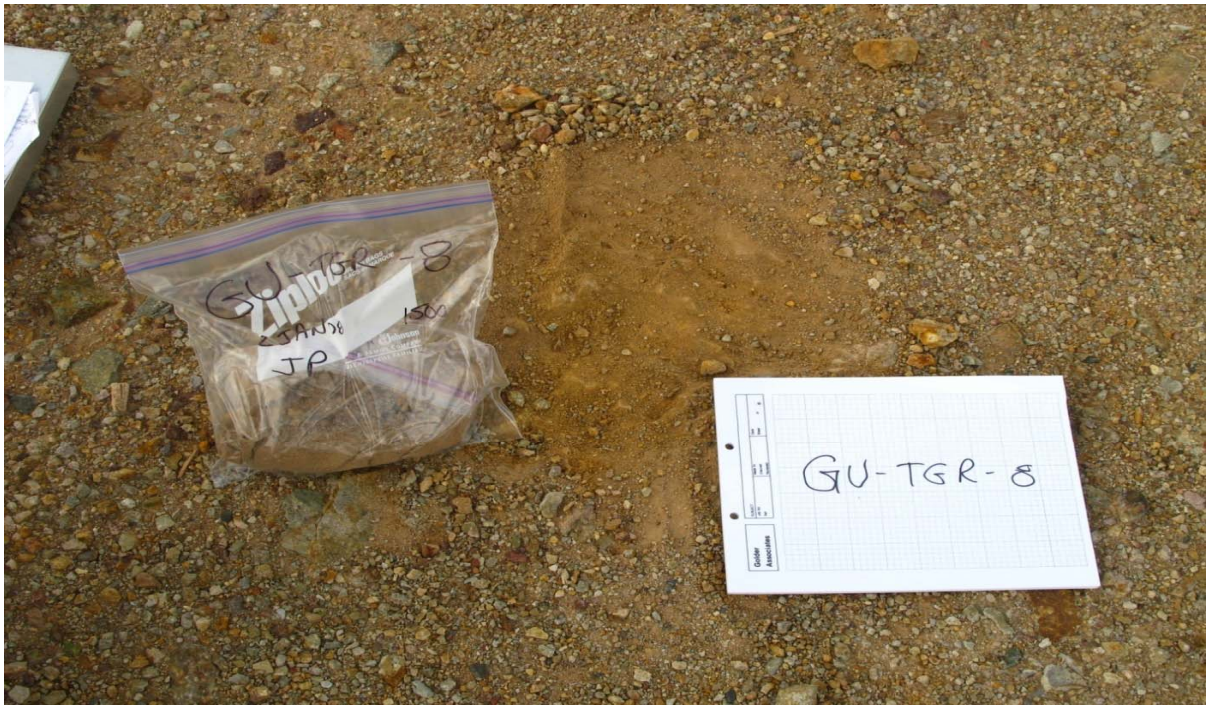
SAMPLE LOG: GU-Tgr-8

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771007
Project No.:	073-92553-03	**UTM Northing:**	3630039

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Biotized Granodiorite	Gray green fine grained to manganese secondary biotite altered granodiorite with sericite clay alteration overprint. Yellow orange staining, perhaps stockpile residual.	Sandy gravel



SAMPLE LOG: GU-Tgr-9

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770990
Project No.:	073-92553-03	**UTM Northing:**	3630058

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Biotized Granodiorite	Gray green secondary biotite altered fine grained to manganese granodiorite porphry. Weak clay alteration of feldspar phenocrysts.	Gravelly sand

SAMPLE LOG: GU-Tgr-10

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	770991
Project No.:	073-92553-03	**UTM Northing:**	3630079

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1.5	1	Biotized Granodiorite	Gray green secondary biotite altered fine grained manganese granodiorite porphyry, with clay alteration of feldspar phenocryts. Four inches of soil surface developed from bedrock in place to run off from above gradient. Represents 80% of Upper Groundhog.	Gravelly sand

SAMPLE LOG: GU-Tgr-11

Date: 1/2/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771032
Project No.:	073-92553-03	**UTM Northing:**	3630055

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description:*	*Textural Description*
1.5	1	Biotized Granodiorite	Gray green secondary biotite altered fine grained manganese granodiorite porphyry, with clay alteration of feldspar phenos. Area surrounding sample location is copper-oxide stained and jarosite-stained bedrock from historic stockpile.	Gravelly sand

SAMPLE LOG: GU-Tgr-12

Date: 1/10/2008

Client: Freeport McMoRan
Project: GH post--removal sampling
Project No.: 073-92553-03

Location: Groundhog Mine
UTM Easting: 771034
UTM Northing: 3630121

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	
1	1	Biotized Granodiorite	Leach cap sericite quartz altered vein greater than 15 feet wide. Red orange stained clay and sericite, iron rich. Weathered surface developed on vein. Tgr (+/- sericite alt. overprint), biotized altered on each side of vein. Iron-oxide veining intense within bigger vein.	Gravelly sand

SAMPLE LOG: GU-Tgr-13

Date: 1/10/2008

Client: Freeport McMoRan
Project: GH post--removal sampling
Project No.: 073-92553-03

Location: Groundhog Mine
UTM Easting: 771021
UTM Northing: 3630236

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Description*
1	1.5	Biotized Granodiorite	Leach cap sericite quartz altered vein greater than 15 feet wide. Red orange stained clay and sericite, iron rich. Weathered surface developed on vein. Tgr (+/- sericite alt. overprint), biotized altered on each side of vein. Iron-oxide veining intense within bigger vein.	Stained with iron, silty sand with gravel

SAMPLE LOG: GU-Tgr-14

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771031
Project No.:	073-92553-03	**UTM Northing:**	3630198

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Description*
1.5	1	Biotized Granodiorite	Very weathered sericite overprinted secondary biotite granodiorite surface rock. Crumbles in hand.	Crumbly Tgr weathered gravel

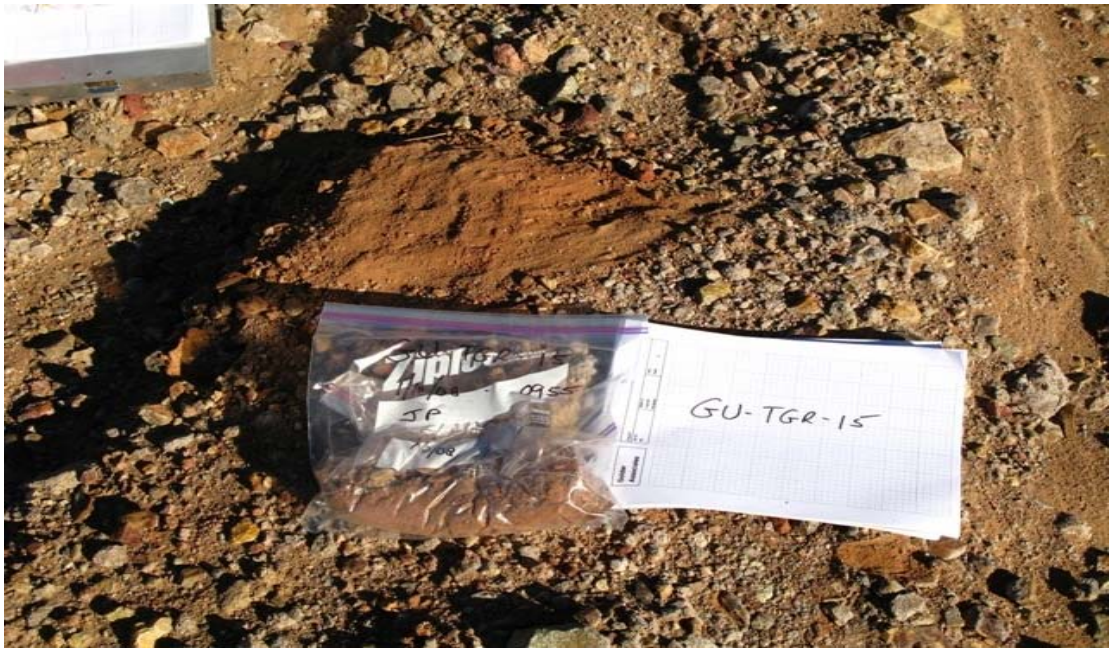
SAMPLE LOG: GU-Tgr-15

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771074
Project No.:	073-92553-03	**UTM Northing:**	3630190

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Description*
1.5	1	Biotized Granodiorite	Weathered sericite overprinted secondary biotite granodiorite surface rock. Crumbles in hand. This area cut by 1 foot or less iron-oxide coated veins	Crumbly Tgr weathered gravel



SAMPLE LOG: GU-Tgr-16

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771088
Project No.:	073-92553-03	**UTM Northing:**	3630237

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Description*
1.5	1.5	Biotized Granodiorite	TKn forming hard biotized granodiorite w/ friable zones. Iron-oxide veining nearby. (Duplicate sample collected)	Crumbly Tgr weathered gravel

SAMPLE LOG: GU-Tgr$_p$-17

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771115
Project No.:	073-92553-03	**UTM Northing:**	3630258

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Phyllically altered granodiorite	Leach Cap phyllic altered granodiorite. Red and black manganese oxide vein coated. Three to 11 inches of dark brown soil developed on Scraped rock. Loose chrysocalla present form phyllic Tgr and nearby Jasperoid vein.	Silty sand with gravel

SAMPLE LOG: GU-Tgr$_p$-18

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771131
Project No.:	073-92553-03	**UTM Northing:**	3630256

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Phyllically altered granodoirite	Leach Cap phyllic altered granodiorite. Red and black manganese oxide vein coated. Three to 11 inches of dark brown soil developed on Scraped rock. Loose chrysocalla present form phyllic Tgr and nearby Jasperoid vein.	Silty sand with gravel

SAMPLE LOG: GU-Tgr$_p$-19

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771112
Project No.:	073-92553-03	**UTM Northing:**	3630263

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Phyllically altered granodiorite	Leach Cap phyllic altered granodiorite. Red and black manganese oxide vein coated. Three to 11 inches of dark brown soil developed on Scraped rock. Loose chrysocalla present form phyllic Tgr and nearby Jasperoid vein.	Silty sand with gravel

SAMPLE LOG: GU-JV-20

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771112
Project No.:	073-92553-03	**UTM Northing:**	3630262

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Jasper Vein	North to south running Jasperoid vein. Ends at major San Jose shaft. Jasperoid vein very red iron-oxide stained, coated. Very silicified Tgr.	Jasper rock chips and minor soil

SAMPLE LOG: GU-JV-21

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771129
Project No.:	073-92553-03	**UTM Northing:**	3630240

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Jasper Vein	Thirty-foot wide jasperoid vein in Tgr phyllic zone. San Jose shaft on this vein. Strong Hematite-iron oxide coating on very silicified rock. Not covered historically by stockpile. Some Chrysocalla noted. Organics present on rock.	Jasper rock chips and minor soil

SAMPLE LOG: GU-TKn-22

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771106
Project No.	073-92553-03	**UTM Northing:**	3630141

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Kneeling Nun Tuff FM	Light brown welded tuff unit within the Kneeling Nun (more probably Sugar Lump tuff) formation at contact w/ Tgr. Remnant bricks present. Duplicate sample collected.	Powdery weathered tuff (silt/sand)

SAMPLE LOG: GU-TKn-23

Date: 1/10/2008

Client: Freeport McMoRan
Project: GH post--removal sampling
Project No. 073-92553-03

Location: Groundhog Mine
UTM Easting: 771111
UTM Northing: 3630167

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1		Kneeling Nun Tuff FM	Light brown welded tuff unit, Kneeling Nun (more probaby Sugar Lump tuff) formation right on contact w/ phyllic Tgr and manganese shaft Vn area. Chrysocalla pieces present.	Powdery weathered tuff (silt/sand)

SAMPLE LOG: GU-Tgr$_p$-24

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771107
Project No.	073-92553-03	**UTM Northing:**	3630177

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Phyllically altered granodiorite	Very seriticized fine grained granodiorite with +/- Hematite Jarosite geodite. Some weathered TKn from above has washed down onto sample site.	Gravelly sand

SAMPLE LOG: GU-Tgr$_p$-25

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771121
Project No.	073-92553-03	**UTM Northing:**	3630184

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Phyllically altered granodiorite	Very sericitized fine grained granodiorite with +/- Hematite Jarosite geodite. Very weathered into sand 3 inches deep, friable underneath.	Sand

SAMPLE LOG: GU-JV-26

Date: 1/10/2008

Client: Freeport McMoRan
Project: GH post--removal sampling
Project No. 073-92553-03

Location: Groundhog Mine
UTM Easting: 771108
UTM Northing: 3630194

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
0.5	2	Jasper Vein	As in San Jose jasperoid vein, but right above Adit. Chrysocalla veining present.	Vein above adit

SAMPLE LOG: GU-JV-27

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771120
Project No.	073-92553-03	**UTM Northing:**	3630219

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
0.5	2	Jasper Vein	As in San Jose jasperoid vein, slightly weathered, between Adit and drift opening in phyllically altered Tgr (very friable, sandy, and weathered.	Vein above adit

SAMPLE LOG: GU-JV-28

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771114
Project No.:	073-92553-03	**UTM Northing:**	3630226

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
0.5	2	Biotized Graniodiorite	Sericite overprinted biotite altered granodiorite. Formerly a valley and cliff. Rough, friable, weathered surface. Some weathered Jasperoid material washed down on top.	Sandy gravel

SAMPLE LOG: GU-Tgr$_p$-29

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771117
Project No.:	073-92553-03	**UTM Northing:**	3630236

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
0.5		Physically altered granodiorite	Very clay-altered Leach Cap Tgr. Deep clay-soil horizon developed. Bedrock not reached. White specks of metal salts (?)	Silt sand and gravel

SAMPLE LOG: GU-Tgr$_p$-30

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771073
Project No.:	073-92553-03	**UTM Northing:**	3630163

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	3	Physically altered granodiorite	Quartz greater than sericite altered granodiorite, white gray fine grained and veins of hematite, extension of Meg shaft vein but pointed more westerly. Former cliff. Sample collected by breaking off rock.	Rock chips from outcrop

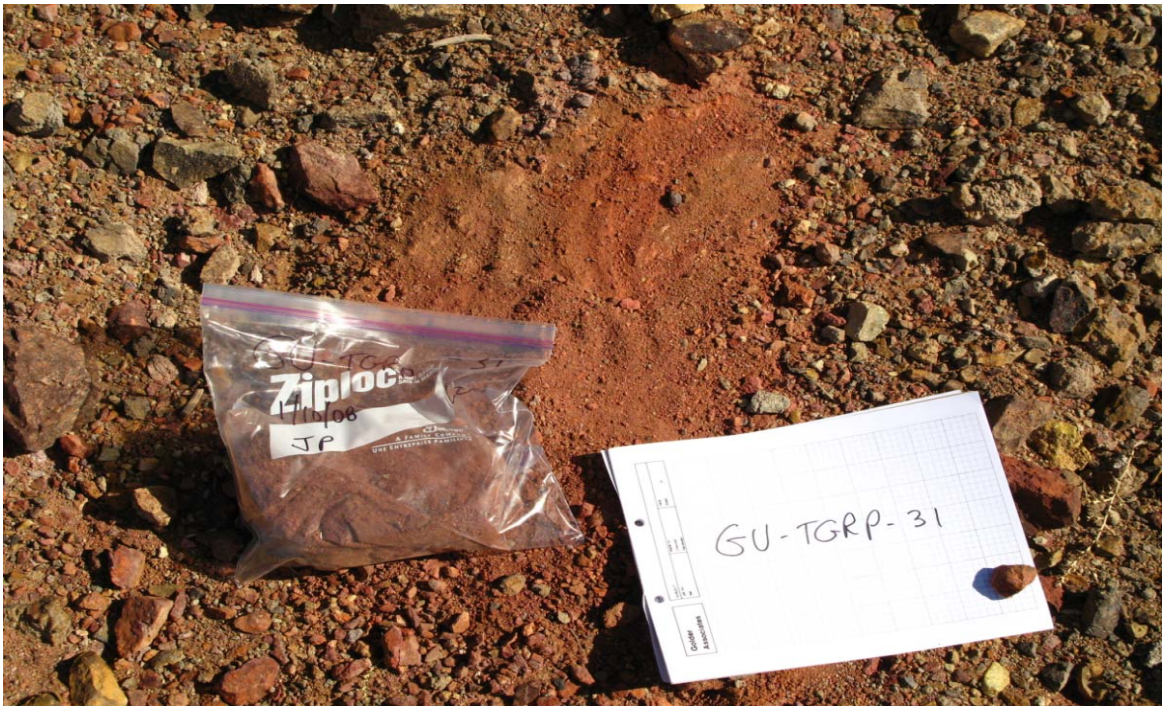
SAMPLE LOG: GU-Tgr$_p$-31

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771069
Project No.:	073-92553-03	**UTM Northing:**	3630150

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	1	Physically altered granodiorite	Quartz less than sericite altered Leach Cap vein. Vein southern extension of Meg Adit. Jasperized vein, but with less silica alteration. Weathered, friable surface.	Gravelly sand



SAMPLE LOG: GU-Tgr$_p$-32

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771054
Project No.:	073-92553-03	**UTM Northing:**	3630109

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	3	Physically altered granodioraite	Phyllic (sericite less than quartz) altered fine grained granodiorite with Hematite leach cap veining through sericite altered groundmass with variable silica alterations. Jasperized vein, but with less silica alteration.	Rock chips from outcrop

SAMPLE LOG: GU-Tgr$_p$-33

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771056
Project No.:	073-92553-03	**UTM Northing:**	3630104

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1	3	Physically altered granodiorite	Very clay, altered phyllic granodiorite - yellow, has absorbed jarosite from historic stockpile. Breaks off in hand.	Sandy gravel weathered bedrock

SAMPLE LOG: GU-Tgr-34

Date: 4/30/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771008
Project No.:	073-92553-03	**UTM Northing:**	3630141

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
2	1	Biotized Graniodiorite	Black, hard biotite-altered granodiorite. Fresh at sample location, but iron-stained in adjacent zones.	Pond bottom, churned by trackhoes

SAMPLE LOG: GU-Tgr-35

Date: 4/30/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771024
Project No.:	073-92553-03	**UTM Northing:**	3630160

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1.5	2	Biotized Graniodiorite	Black, hard biotite-altered granodiorite. Fresh at sample location, but iron-stained in adjacent zones.	Sandy gravel

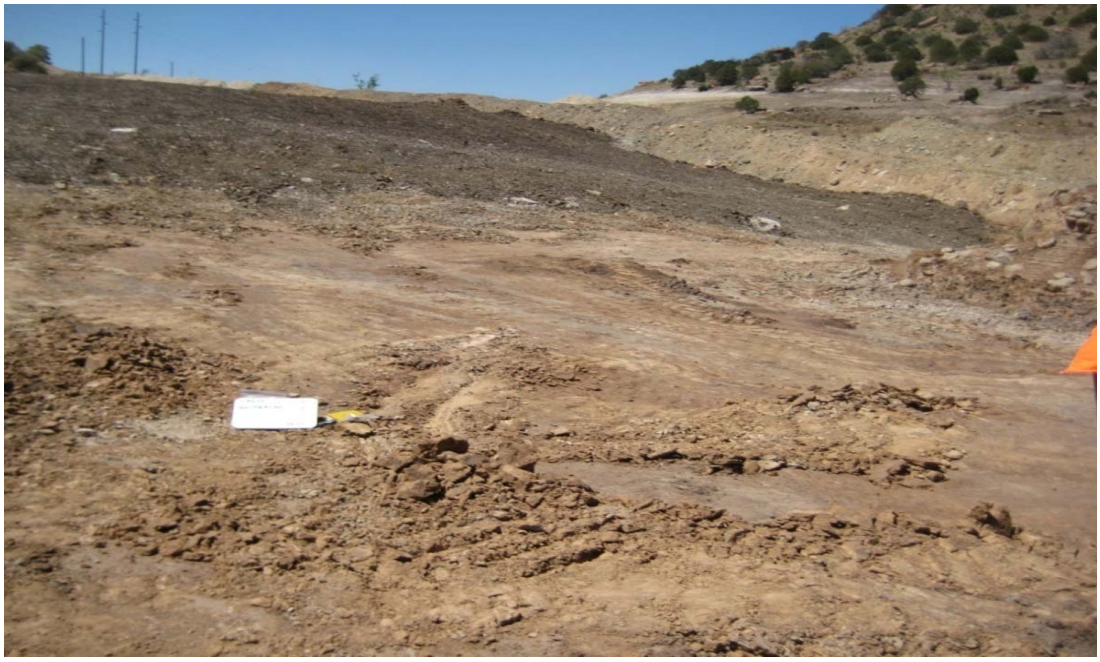
SAMPLE LOG: GU-Tgr-36

Date: 4/30/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771031
Project No.:	073-92553-03	**UTM Northing:**	3630147

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
1.5	2	Biotized Graniodiorite	Black, hard biotite-altered granodiorite. Fresh at sample location, but secondary iron-staining in soil matrix.	Sandy gravel, secondary iron staining



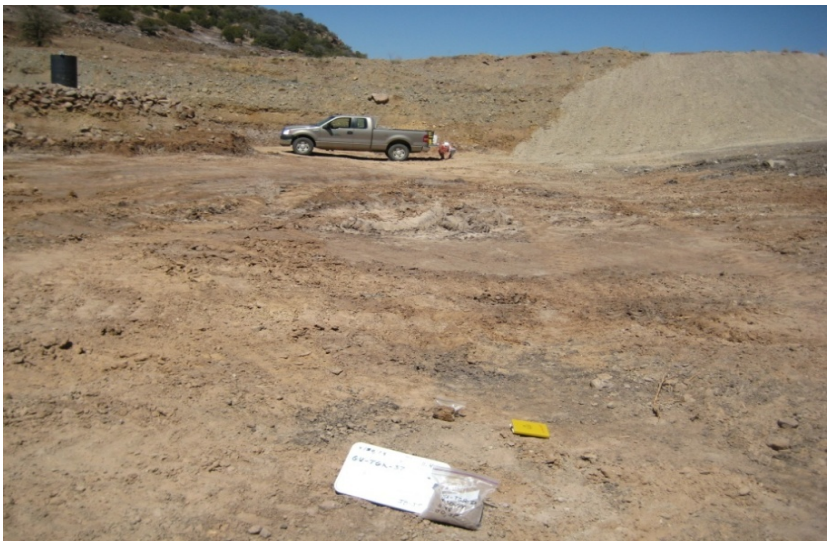
SAMPLE LOG: GU-Tgr-37

Date: 1/10/2008

Client:	Freeport McMoRan	**Location:**	Groundhog Mine
Project:	GH post--removal sampling	**UTM Easting:**	771041
Project No.:	073-92553-03	**UTM Northing:**	3630151

Lithology:

Depth (in.)	*Area (sf)*	*Geologic Unit*	*Mineralogical Description*	*Textural Description*
2	1	Biotized Graniodiorite	Tgr - not clearly bedrock, mixed with some other materials (strongly cemented waste rock - derived sediments?). Rock fragments are Tgr, but churned by equipment tracks.	TGR mixed with other materials



APPENDIX C

ATTACHMENT C.2
XRF ANALYSIS

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TABLE

Table C.2-1 Results of XRF Analyses, Groundhog Mine IRA Site

1.0 INTRODUCTION

X-Ray Fluorescence (XRF) analyses of 55 soil samples from the Groundhog Mine Interim Removal Action (IRA) site were performed in Golder Associate Inc. (Golder's) XRF field laboratory in Hurley, New Mexico. The methodologies for sample analysis are summarized below. XRF analytical results are listed in Table C.2-1.

2.0 XRF SAMPLE PREPARATION

Sample preparation followed guidelines set forth in Environmental Protection Agency (EPA) Method 6200 (EPA, 1998). The general procedure was as follows:

1. The bag of soil was shaken and rolled to mix material that may have separated after sample collection.
2. Typically, soils from the Groundhog site were dry and sandy; thus, sample drying was not required. If moisture was present, the samples were placed in dry, clean, non-metal pans and air-dried for 24 hours. The drying pans were placed in a secure location without wind or other disturbance. The drying pans were placed with ample room between each sample so that moving one pan did not contaminate another sample.
3. The dried soil was disaggregated by screening through a U.S. Standard No. 60 sieve (250 micrometers [μm]). The soil passing through the No. 60 sieve was further processed for analysis. The soil sample portions larger than 250 μm were not analyzed.
4. The sub-250 μm fraction of each soil sample was placed into a new polypropylene sample cup using a new, clean plastic spoon, and covered with Mylar film to complete the sample preparation for XRF analysis. The sample ID and round number were written on the side of the cup. Material left over after collecting the required volumes was discarded in onsite stockpiles of excavated soils that were ultimately loaded and hauled to the placement area on Chino property.
5. The XRF samples were analyzed following the protocol specified in Section 3.6. After XRF analysis, a minimum of 5% of the samples were placed in individually zippered plastic bags and shipped to an analytical laboratory for split sample analysis. The remaining samples were archived in the field laboratory.
6. Cross-contamination was minimized as the follows: a) drying pans, when necessary, were either disposed after each use or, if non-disposable, were washed with detergent, rinsed with tap water, and given a final rinse with distilled water; and b) sieves were thoroughly brushed and then, when necessary, blown with dry compressed air. If any soil remained on the sieve after the compressed air cleansing, the sieve was washed with soap and water and dried before reuse.
7. The required equipment for on-site sample preparation included personal protection equipment and sample processing equipment. Personal protection equipment consisted of disposable lab gloves, safety goggles, and N-95 particulate masks. Sample processing equipment included polypropylene sample cups, Mylar film, disposable plastic sampling spoons, drying trays, commercial grade microwave oven, handheld US Standard No. 60 sieves, decontamination brushes, and canned compressed air, as appropriate.

3.0 XRF CALIBRATION AND VERIFICATION

Each soil sample was analyzed using an Innov-X Model A-4000S portable XRF unit (Innov-X). Calibration and standardization of the Innov-X were completed in accordance with EPA Method 6200 (EPA, 1998) and the manufacturer's recommendations.

3.1 Effective Energy Fundamental Parameters Calibrations

In advance of project startup, an Effective Energy Fundamental Parameters Calibration was completed by the manufacturer of the Innov-X unit. The XRF was calibration curve was subsequently adjusted to maximize accuracy of measured concentrations of copper in the range of 4,500 milligrams per kilogram (mg/kg) copper. This calibration was performed to maximize accuracy of ongoing confirmation sampling on the Smelter Tailing Soils Investigation Unit. Calibration adjustment was not performed for samples collected from the Groundhog Mine site, as XRF was used only as a screening analysis for compositing strategy.

3.2 Energy Calibration Checks

An energy calibration check was run each day that analyses were performed upon startup of the Innov-X unit, in accordance with the manufacturer's recommendations. This energy calibration check required a 60-second count time on a pure-element sample to ensure the instrument was running within resolution and stability tolerances. If this check failed on the first attempt, the pure-element sample was re-aligned on the instrument and re-analyzed. There were no instances when the energy calibration check failed more than once.

3.3 Instrument Blanks

An instrument blank was analyzed each working day before soil samples were analyzed, and at a rate of at least once per every 20 soil samples. The instrument blank consisted of a National Institute of Standards and Technology (NIST) lithium carbonate sample prepared in a sample cup with a Mylar film cover. The NIST blank was analyzed using a 60-second count time. If copper was detected above the method detection limit (MDL, which was a variable concentration), the Standard Operating Procedure (SOP) required additional cleaning of the Innov-X unit and instrument blank. Then, the blank was re-tested for 60 seconds. There were no instances when the instrument blank test failed more than once.

3.4 Precision Runs

A precision run was completed each working day prior to analyzing soil samples. Precision runs were completed by analyzing three distinct laboratory standards a minimum of seven consecutive times each, using 60-second count times. The laboratory standards were soil samples with known copper concentrations of 3,020 mg/kg, 5,030 mg/kg, and 7,730 mg/kg, respectively. The laboratory standards were prepared in sample cups with Mylar film covers. The resuls of the precision runs are discussed in the data validation section below.

3.5 Calibration Verification Checks

Calibration verification checks were completed at a rate of at least one per 20 samples. In addition, precision runs were considered to be initial calibration verification checks. Calibration verification checks were completed by analyzing the NIST blank and each of the three laboratory standards, also called standard reference materials (SRMs). The SRMs contained concentrations of 3,020 mg/kg, 5,030 mg/kg, and 7,730 mg/kg copper. If analysis of the NIST blank rendered copper results below the MDLs and analysis of the 5,030-mg/kg copper standard rendered results within 20 percent of the standard, then the calibration was considered acceptable. There were no instances when the calibration was considered unacceptable.

3.6 XRF Analysis

The XRF analyses were completed in accordance with EPA Method 6200 (EPA, 1998) and recommendations provided by the manufacturer of the Innov-X XRF unit.

The XRF instrument exposes the prepared samples to X-ray and gamma-ray sources which cause fluorescence of energy shells within the elements being analyzed. 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.

Golder used the same Innov-X Model A-4000S portable XRF unit for each sample that was analyzed for the Groundhog Mine IRA. This instrument uses an X-Ray tube 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 handling and health and safety procedures commonly associated with radioactive source materials.

In compliance with New Mexico Administrative Code (NMAC) 20.3.2 - 20.3.4, Golder developed a Radiation Safety Program for use, maintenance, and storage of the Innov-X XRF unit. Golder operated the XRF unit under Radioactive Materials License DM442-000. In compliance with NMAC, Golder has designated a Radiation Safety Officer (RSO) that was responsible for the proper operation and maintenance of the instrument during this project. The RSO was responsible for authorizing each operator of the Innov-X unit, and ensuring each operator was properly instructed and competent in the safe, proper operation of the unit. The RSO's responsibilities within the Radiation Safety Program included development of emergency procedures, performing radiation surveys, and providing proper notices in the building where the XRF was in use.

Each operator of the Innov-X unit wore a radiation badge while the unit was in use. The RSO was responsible for collecting badges on a quarterly basis and submitting them for analysis to determine if operators had been exposed to potentially unhealthy levels of radiation. Results of analyses on the radiation badges did not indicate any elevated exposures to radiation.

The XRF instrument was decontaminated daily prior to use. Decontamination was accomplished by dry-wiping the instrument with a soft cloth, and/or airbrushing the instrument.

The Innov-X XRF instrument automatically generated a plus or minus (+/-) value for each copper result. This +/- value represents the predicted level of accuracy for a given result. Typically, the +/- value decreases (i.e. the instrument's predicted accuracy increases) as the sample run time increases. However, there is a point of diminishing return where increased run times deliver results that are only marginally more accurate. Based on manufacturer's recommendations, run times of 60 seconds were used for all soil samples and calibration verifications. Therefore, the +/- value generated by the Innov-X instrument represents the predicted level of accuracy for a given sample after a 60-second run time.

The Innov-X instrument automatically recorded results, +/- values, and analytical date and time as they were generated. Additionally, the instrument recorded data for each sample that were entered by the operator during XRF analyses, such as sample ID, location ID, and sample round. Following each analytical event, the data were downloaded from the instrument in the form of comma-separated value (CSV) files. These CSV data files were converted to Microsoft Excel files in the field office.

3.7 XRF Results

The results of XRF analyses for the Groundhog Mine site are provided in Table C.2-1.

EPA recommends a minimum of 5 percent of the samples analyzed by XRF will be submitted for independent analysis (EPA, 1998). Of the 55 samples that were analyzed by XRF for the Groundhog Mine IRA, 4 (or 7 percent) were split for laboratory analysis.

The split samples that were shipped to SVL were the same aliquots of the samples analyzed with the Innov-X instrument. Upon completion of XRF analysis, the split sample was placed in a zippered plastic bag and shipped under chain of custody to SVL for laboratory analysis. Laboratory reports from SVL are included in Attachment C.1.

ATTACHMENT C.2

TABLE

TABLE C.2-1
RESULTS OF XRF ANALYSES
GROUNDHOG MINE IRA SITE

Analysis Date / Time	Sample ID	QA	Cd	Cd +/-	Co	Co +/-	Cu	Cu +/-	Fe	Fe +/-	Pb	Pb +/-	Mn	Mn +/-	Zn	Zn +/-
1/18/08 10:34	G4-TS1-1		<LOD	67.36	<LOD	187.34	162.09	12.96	27153.15	285.2	105.23	6.31	1109.03	60.09	471.73	14.75
1/18/08 10:36	G4-TGR-2 (biotized)		<LOD	70.44	<LOD	230.64	152.05	13.51	38894.73	391.09	411.06	11.97	1448.07	71.51	506.64	15.91
1/18/08 10:38	G4-TGR-3 (vein)		<LOD	83.76	<LOD	522.78	195.08	17.68	149994.92	1479.75	789.31	19.75	833.68	98.86	666.57	21.6
1/18/08 10:40	G4-TQM-4		<LOD	69.76	<LOD	212.03	43.58	10.67	33793.29	343.91	19.63	4.13	810.33	57.04	355.89	13.08
1/18/08 10:42	GL-TQM-1		<LOD	67.82	<LOD	147.11	70.73	10.87	17692.11	206.22	120.73	6.53	1029.12	55.38	1220.71	23.75
1/18/08 10:50	GL-TQM-2		<LOD	76.25	<LOD	233.7	701.87	25.44	35329.33	388.12	1545.72	26.36	3289.84	106.39	9211.35	101.5
1/18/08 10:52	GL-TQM-3		<LOD	65.2	<LOD	141.82	167.58	12.61	17179.22	196.62	144.53	6.83	1224.93	57.36	1026.69	21.05
1/18/08 10:54	GL-TQM-4		<LOD	63.53	<LOD	127.13	39.25	9.36	14210.9	168.87	42.69	4.36	840.46	47.79	955.86	19.72
1/18/08 10:56	GL-TGR-5		<LOD	75.13	<LOD	330.64	285.8	18.05	71875.48	699.69	2477.87	35.76	4529.09	129.11	2558.64	41.82
1/18/08 10:58	GL-TGR-6	Split	<LOD	71.89	<LOD	245.24	156.87	13.87	43454.07	432.94	514.32	13.54	3845.05	108.88	1470.82	28.28
1/18/08 11:00	GL-TGR-7		<LOD	73.77	<LOD	236.66	217.75	15.51	38301.81	400.84	520.36	13.94	3159.91	100.96	1257.69	26.52
1/18/08 11:01	GL-TGR-8		<LOD	73.21	<LOD	270.62	163.3	14.74	52622.53	514.52	872.05	18.2	7324.24	153.27	4584.96	58.45
1/18/08 11:03	GL-TGR-9		<LOD	70.64	<LOD	237.11	98.63	12.33	42328.08	414.54	663.28	15.12	4918.65	119.56	2010.07	33.16
1/18/08 11:05	GL-TGR-10		<LOD	73.38	<LOD	250.4	319.5	17.76	45166.2	453.59	951.32	19.12	5267	128.8	3287.52	46.82
1/18/08 11:06	GL-TGR-11		<LOD	76.65	<LOD	300.4	178	15.54	59833.48	594.48	919.32	19.47	6288.02	147.87	2949.33	45.31
1/18/08 11:08	GU-TGR-1		<LOD	70.31	<LOD	216.57	116.65	12.41	35687.17	361.56	158.86	7.64	2140.06	81.27	658.37	17.89
1/18/08 11:33	GU-TGR-2		<LOD	69.74	<LOD	223.04	290.89	15.94	39179.17	381.79	428.73	11.86	2379.56	84.33	1108.63	23.25
1/18/08 11:35	GU-TKN-3		<LOD	72.91	<LOD	277.64	423.27	19.45	55267.29	534.84	1421.55	24.16	521.59	60.36	762.1	20.34
1/18/08 11:37	GU-TKN-3 Dup	Duplicate	<LOD	72.09	<LOD	269.54	427.37	19.13	52749.91	503.92	1627.01	25.69	727.35	62.9	837.33	20.93
1/18/08 11:38	GU-TKN-4	Split	<LOD	70.83	<LOD	214.68	253.24	15.58	35378.91	356.36	1197.06	20.82	3388.11	98.68	1783.87	30.7
1/18/08 11:46	GU-TQM-5		<LOD	74.03	<LOD	251.94	706.11	24.54	42344.55	434.67	4709.23	54.16	1232.38	72.68	1550.61	30.29
1/18/08 11:48	GU-TQM-6		<LOD	72.97	<LOD	230.74	385.79	18.78	37742.3	389.82	2951.54	38.21	917.67	63.9	732.49	19.82
1/18/08 11:50	GU-TGR-7		<LOD	77.16	<LOD	279.7	1068.43	30.98	49317.88	513.68	6135.22	69.05	2036.73	92.04	1883.02	35.48
1/18/08 11:52	GU-TGR-8		<LOD	53.35	210.82	38.2	279.48	13.3	11687.75	140.03	1101.88	17.13	396.95	34.31	537.88	13.94
1/18/08 11:53	GU-TGR-9		<LOD	54.39	170.56	34.41	144.69	11.06	9147.78	121.15	1966.66	24.51	296.94	31.57	564.76	14.36
1/18/08 11:55	GU-TGR-10		<LOD	70.54	<LOD	219.17	339.2	17.22	35954.09	364	939.17	18.28	2037.84	80.15	1411.96	27.13
1/18/08 11:57	GU-TGR-11		<LOD	73.83	<LOD	263.75	1428.99	34.07	48120.56	482.76	3304.17	42.04	3004.43	101.56	3191.56	46.85
1/18/08 11:58	GU-TGR-12		<LOD	72.21	<LOD	227.8	227.05	15.68	38002.63	385.83	1066.27	19.95	1200.27	68.05	4525.59	56.71
1/30/08 14:42	GU-TGR-13		<LOD	95.16	1097.81	233.66	413.82	25.96	213827.41	2300.57	3069.38	50.22	825.54	124.99	4184.28	70
1/30/08 14:44	GU-TGR-14		<LOD	71.14	<LOD	248.94	65.67	11.68	46607.38	450.55	1381.33	22.98	4356.97	114.16	1322.94	26.2
1/30/08 14:45	GU-TGR-15		<LOD	86.4	<LOD	370.1	1553.77	41.84	73062.41	792.08	15783.75	167.41	4602.07	147.77	1998.64	41.09
1/30/08 14:47	GU-TGR-16		<LOD	75.49	<LOD	284.98	572.27	22.67	55314.77	550.48	3052.65	40.43	3878.93	116.26	1006.79	24.26
1/30/08 14:49	GU-TGR-16 Dup	Duplicate	<LOD	72.27	<LOD	267.78	477.15	19.99	53171.79	510.46	779.9	16.89	3429.11	104.95	923.69	22.1
1/30/08 14:51	GU-TGR-17		<LOD	74.5	<LOD	290.87	873.82	27.09	59610.38	581.87	1748.51	27.89	7813.78	162.6	3693.83	51.7
1/30/08 14:53	GU-TGR-18		<LOD	79.68	<LOD	346.45	3320.31	58.36	73587.91	740.03	6128.6	70.86	5884.28	152.32	6636.57	83.11
1/30/08 14:55	GU-TGR-19		<LOD	73.88	<LOD	295.29	538.79	21.74	60895.23	585.04	1645.47	26.58	4713.62	125.14	2227.73	37.11
1/30/08 14:58	GU-JV-20		<LOD	79.5	<LOD	384.16	291.56	18.51	92977.76	899.68	1538.08	27.16	2608.9	109.36	955.59	24.46
1/30/08 15:00	GU-JV-21	Split	<LOD	82.67	<LOD	511.63	167.93	17.05	149340.13	1447.25	2963.62	43.32	419.07	90.47	195.24	12.44

TABLE C.2-1
RESULTS OF XRF ANALYSES
GROUNDHOG MINE IRA SITE

Analysis Date / Time	Sample ID	QA	Cd	Cd +/-	Co	Co +/-	Cu	Cu +/-	Fe	Fe +/-	Pb	Pb +/-	Mn	Mn +/-	Zn	Zn +/-
1/30/08 15:02	GU-TKN-22		<LOD	69.77	<LOD	196.33	534.06	20.34	29015.07	308.35	1259.88	21.64	679.16	53.76	627.2	17.8
1/30/08 15:04	GU-TKN-22 Dup	Duplicate	<LOD	68.81	<LOD	199.58	719.82	22.97	30953.95	320.81	1272.9	21.58	660.94	53.52	534.13	16.46
1/30/08 15:06	GU-TKN-23		<LOD	66.63	<LOD	144.82	427.92	17.66	17153.14	201.13	1321.95	21.23	465.61	42.6	745.65	18.41
1/30/08 15:08	GU-TGRP-24		<LOD	84.34	<LOD	385.08	752.36	29.01	79718.31	840.64	9147.83	103.46	2016.97	106.15	907.05	26.06
1/30/08 15:26	GU-TGRP-25		<LOD	61.39	<LOD	128.84	876.67	22.34	15231.07	172.72	540.41	12.04	111.71	29.34	766.64	17.62
1/30/08 15:28	GU-JV-26		<LOD	78.95	<LOD	347.5	873.27	29.15	73053.84	736.75	7747.09	85.52	1070.86	82.98	684.06	21.58
1/30/08 15:30	GU-JV-27		<LOD	74.6	<LOD	288.41	1025.57	28.96	56962.95	555.19	3963.14	47.83	1849.05	86.18	1223.53	26.79
1/30/08 15:32	GU-TGR-28		<LOD	74.04	<LOD	278.12	351.96	18.35	55551.52	540.12	949.58	19.18	5581.4	134.6	1965.5	34.23
1/30/08 15:34	GU-TGR-29		<LOD	74.07	<LOD	311.9	476.77	20.98	67035.82	644.37	1742.99	27.96	3099.92	106.75	1847.38	33.7
1/30/08 15:36	GU-TGRP-30	Split	<LOD	70.28	<LOD	223.96	2181.31	40.26	37389.02	374.74	360.03	11.11	359.56	48.77	437.04	16.21
1/30/08 15:45	GU-TGRP-31		<LOD	71.43	<LOD	251.39	925.76	26.63	45878.37	449.55	2640.62	34.98	741.65	61.19	799.08	20.75
1/30/08 15:47	GU-TGRP-32		<LOD	92.85	<LOD	712.72	627.06	29.48	240320.39	2530.93	3323.58	52.33	407.6	122.16	1264.96	33.59
1/30/08 15:48	GU-TGRP-33		<LOD	80.1	<LOD	356.4	1576.72	38.73	76595.48	769.57	4845.11	59.58	3136.17	116.64	3183.98	50.41
5/5/08 13:47	GL-TQM-12		<LOD	61.9	<LOD	106.18	203.84	12.85	10293.9	135.48	80.78	5.24	1459.67	57.47	2113.82	30.56
5/5/08 14:03	GL-TQM-13		<LOD	63.54	<LOD	126.06	185.32	12.88	13813.51	166.43	63.28	4.95	770.26	46.62	2650.93	35.83
5/5/08 14:07	GL-TGR-14		<LOD	77.25	<LOD	263.96	520.97	22.67	45318.18	478.13	2212.04	33.26	9716.86	186.63	6718.83	80.53
5/5/08 14:10	GU-TGR-34		<LOD	72.45	<LOD	240.09	355.48	18.12	41008.23	416.05	1152.04	21.12	5094.25	125.1	2879.39	42.64
5/5/08 14:15	GU-TGR-35		<LOD	73.62	<LOD	237.64	676.74	23.25	41962.55	422.75	551.24	14.07	5188	125.83	2375.8	37.84
5/5/08 14:17	GU-TGR-36		<LOD	70.99	<LOD	246.05	396.58	18.45	46699.27	450.12	251.46	9.41	4804.16	119.29	2928.52	42.05
5/5/08 14:20	GU-TGR-37		76.28	24.35	<LOD	254.28	686.5	23.19	47005.13	458.89	515.89	13.51	3820.78	108.55	1486.26	28.55

Notes: All results reported in milligrams/kilogram (mg/kg)
QA = Quality Assurance Sample
<LOD = Less than Limit Of Detection (10 - 150 mg/kg)

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
G4-TS1-1	W800071-01	Solid	02-Jan-08	PP	07-Jan-08
G4-TGR-2	W800071-02	Solid	02-Jan-08	PP	07-Jan-08
G4-TGR-3	W800071-03	Solid	02-Jan-08	PP	07-Jan-08
G4-TQM-4	W800071-04	Solid	02-Jan-08	PP	07-Jan-08
GL-TQM-1	W800071-05	Solid	02-Jan-08	PP	07-Jan-08
GL-TQM-2	W800071-06	Solid	02-Jan-08	PP	07-Jan-08
GL-TQM-3	W800071-07	Solid	02-Jan-08	PP	07-Jan-08
GL-TQM-4	W800071-08	Solid	02-Jan-08	PP	07-Jan-08
GL-TGR-5	W800071-09	Solid	02-Jan-08	PP	07-Jan-08
GL-TGR-6	W800071-10	Solid	02-Jan-08	PP	07-Jan-08
GL-TGR-7	W800071-11	Solid	02-Jan-08	PP	07-Jan-08
GL-TGR-8	W800071-12	Solid	02-Jan-08	PP	07-Jan-08
GL-TGR-9	W800071-13	Solid	02-Jan-08	PP	07-Jan-08
GL-TGR-10	W800071-14	Solid	02-Jan-08	PP	07-Jan-08
GL-TGR-11	W800071-15	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-1	W800071-16	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-2	W800071-17	Solid	02-Jan-08	PP	07-Jan-08
GU-TKN-3	W800071-18	Solid	02-Jan-08	PP	07-Jan-08
GU-TKN-3DUP	W800071-19	Solid	02-Jan-08	PP	07-Jan-08
GU-TKN-4	W800071-20	Solid	02-Jan-08	PP	07-Jan-08
GU-TQM-5	W800071-21	Solid	02-Jan-08	PP	07-Jan-08
GU-TQM-6	W800071-22	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-7	W800071-23	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-8	W800071-24	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-9	W800071-25	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-10	W800071-26	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-11	W800071-27	Solid	02-Jan-08	PP	07-Jan-08
GU-TGR-12	W800071-28	Solid	02-Jan-08	PP	07-Jan-08

The complete report includes pages for each sample; a full QC report, and a notes page.

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Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **G4-TS1-1**
SVL Sample ID: **W800071-01 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	4.99	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **G4-TGR-2**
SVL Sample ID: **W800071-02 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.54	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **G4-TGR-3**
SVL Sample ID: **W800071-03 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.23	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **G4-TQM-4**
SVL Sample ID: **W800071-04 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.60	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TQM-1**
SVL Sample ID: **W800071-05 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.67	pH Units					10-Jan-08	BJF

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TQM-2**
SVL Sample ID: **W800071-06 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.52	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TQM-3**
SVL Sample ID: **W800071-07 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	4.26	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TQM-4**
SVL Sample ID: **W800071-08 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.32	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TGR-5**
SVL Sample ID: **W800071-09 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.17	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TGR-6**
SVL Sample ID: **W800071-10 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.60	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Laboratory Director

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TGR-7**
SVL Sample ID: **W800071-11 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.53	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TGR-8**
SVL Sample ID: **W800071-12 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	6.01	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Laboratory Director

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Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TGR-9**
SVL Sample ID: **W800071-13 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	6.56	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TGR-10**
SVL Sample ID: **W800071-14 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.42	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GL-TGR-11**
SVL Sample ID: **W800071-15 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.02	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-1**
SVL Sample ID: **W800071-16 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.56	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-2**
SVL Sample ID: **W800071-17 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.36	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TKN-3**
SVL Sample ID: **W800071-18 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	3.72	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TKN-3DUP**
SVL Sample ID: **W800071-19 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	3.85	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TKN-4**
SVL Sample ID: **W800071-20 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	3.98	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TQM-5**
SVL Sample ID: **W800071-21 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	4.04	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TQM-6**
SVL Sample ID: **W800071-22 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	5.03	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-7**
SVL Sample ID: **W800071-23 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	5.68	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-8**
SVL Sample ID: **W800071-24 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	4.62	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-9**
SVL Sample ID: **W800071-25 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	6.58	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-10**
SVL Sample ID: **W800071-26 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.09	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-11**
SVL Sample ID: **W800071-27 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	4.42	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Client Sample ID: **GU-TGR-12**
SVL Sample ID: **W800071-28 (Solid)**

Sample Report Page 1 of 1

Sampled: 02-Jan-08
Received: 07-Jan-08
Sampled By: PP

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
Classical Chemistry Parameters									
ASA 9	**Paste pH**	7.32	pH Units					10-Jan-08	BJF

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800071**
Reported: 16-Jan-08 13:01

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Classical Chemistry Parameters									
ASA 9	Paste pH	pH Units	7.15	7.25	98.6	97 - 103	W802143	10-Jan-08	
ASA 9	Paste pH	pH Units	7.05	7.25	97.2	97 - 103	W802145	10-Jan-08	

Quality Control - DUPLICATE Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Analyzed	Notes
Classical Chemistry Parameters									
ASA 9	Paste pH	pH Units	5.00	4.99	0.2	20	W802143	10-Jan-08	

Notes and Definitions

LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable. sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable

W800071

SVL ANALYTICAL

CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

Page ____ of ____

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt: 5.5°C

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: Chino Mines Co.
Contact: Pam Pinson
Address: P.O Box 7
Phone Number: 505-537-4213
FAX Number: 505-537-8012
E-mail: pamela-pinson@fmi.com

Invoice Sent To: Chino Mines Co.
Contact: Pam Pinson
Address: P.O. Box 7
Phone Number: Same
FAX Number: Same
PO#: G -003

Project Name: Groundhog Post Removal
Sampler's Signature: Pam Pinson

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

Analyses Required: Call Trish for cost coding

Comments: *will e-mail analyte requirements Pam
Jen Pepe (Golder) also contact person

	Sample ID (Please take care to distinguish between: 1 and I, 2 and Z, 5 and S, Ø and O. Thanks!)	Collection Date	Collection Time	Collected by: (Init.)	Misc. Matrix Type (From Table 1)	Misc. No. of Containers	Preservative(s) Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	XRF*	Rush Instructions (Days)	Comments
1	G4-TSI-1	1/2/08	11:19	A										X		HOLD ALL SAMPLES AFTER XRF for FURTHER ANALYSIS
2	G4-TGR-2		11:26											X		
3	G4-TGR-3		11:34											X		
4	G4-TQM-4		11:44											X		
5	GL-TQM-1		11:58											X		
6	GL-TQM-2		12:00											X		
7	GL-TQM-3		12:06											X		
8	GL-TQM-4		12:10											X		
9	GL-TGR-5		12:25											X		
10	GL-TGR-6		12:30											X		

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			Flores	01/07/08	13:15

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

W800071

CHAIN OF CUSTODY RECORD

Page ____ of ____

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FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt: 5.5°C

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other_____

Report to Company: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____
E-mail: _____

Invoice Sent To: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____
PO#: _____

Project Name: _____
Sampler's Signature: _____

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

Please take care to distinguish between:
1 and I
2 and Z
5 and S
Ø and O
Thanks!

	Sample ID	Collection Date	Collection Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	Analyses Required: * XRF	Rush Instructions (Days)	Comments
1	GL-TGR-7	1-2-08	12:45													*
2	GL-TGR-8	↓	12:50													HOLD ALL
3	GL-TGR-9		12:55													SAMPLES AFTER
4																XRF for
5																FURTHER
6																ANALYSIS
7																
8																
9																
10																

Relinquished by:	Date:	Time:	Received by:	Date: 1/07/08	Time: 13:12
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

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W800071

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SVL JOB #

TEMP on Receipt: 7.1°C

CHAIN OF CUSTODY RECORD

Page ____ of ____

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

Report to Company: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____
E-mail: _____

Invoice Sent To: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____
PO#: _____

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other_____

Project Name: _____
Sampler's Signature: _____

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

Please take care to distinguish between:
1 and I
2 and Z
5 and S
Ø and O
Thanks!

	Sample ID	Collection Date	Collection Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	XRF*	Rush Instructions (Days)	Comments
1	GL-TGR-10	1-2-08	13:00													*
2	GL-TGR-11		13:05													HOLD ALL
3	GU-TGR-1		13:50													SAMPLES AFTER
4	GU-TGR-2		13:55													XRF for
5	GU-TKN-3		14:10													FURTHER
6	GU-TKN-3DUP		14:10													ANALYSIS
7	GU-TKN-4		14:20													
8	GU-TQM-5		14:30													
9	GU-TQM-6		14:42													
10	GU-TGR-7		14:50													

Relinquished by:	Date:	Time:	Received by:	Date: 01/07/08	Time: 1315
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

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SVL-COC 9/05

W800071

CHAIN OF CUSTODY RECORD

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Page ____ of ____

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt: 7.1°C

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: Chino Mines Co
Contact: Pam Pinson
Address: PO Box 7
Phone Number: Same →
FAX Number: Same
E-mail: pamela pinson@fmi.com

Invoice Sent To: Chino Mines Co
Contact: Pam Pinson
Address: PO Box 7
Phone Number: 505-537-4213
FAX Number: 537-~~8102~~ 8012
PO#: G 003

Project Name: Groundhog Post Removal
Sampler's Signature: Pam Pinson

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

Analyses Required: XRF*

Comments: *Will e-mail analyte requirements. Pam call Trish Potter for cost coding

	Sample ID	Collection Date	Collection Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	Rush Instructions (Days)	Comments
1	GU-TGR-8	1-2-08	15:00												
2	GU-TGR-9	↓	15:05												HOLD ALL SAMPLES FOR XRF for FURTHER ANALYSIS
3	GU-TGR-10	↓	15:10												
4	GU-TGR-11	↓	15:20												
5	GU-TGR-12	↓	15:25												
6															
7	GH-RB-1	↓	17:00					✓							
8	GH-RB-1	↓	17:00				✓								
9															
10															

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by: C. Flores	Date: 01/07/08	Time: 13:15

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

PDF 01/08/08

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Sample Receipt Confirmation

WORK ORDER

W800071

Client: **Freeport McMoRan - Chino Mines**
Project: **Chino Routine**
Project Manager: **Christine Meyer**

Report To:
Freeport McMoRan - Chino Mines
Pam Pinson
PO Box 7
Hurley, NM 88043
Phone: 505-537-4213
Fax: 505-537-8012

Invoice To:
Freeport McMoRan Corp.
Accounts Payable Dept.
PO Box 13308
Phoenix, AZ 85002-3308
Phone :602-366-8200
Fax: -

Date Due: **21-Jan-08** **(10 day TAT)** Date Received: **07-Jan-08 13:15**

Default Cooler Temp: 5.5°C Q6 Cooler Temp. >6 C **No**
Custody Seals **No** Containers Intact **Yes** COC/Labels Agree **Yes** Preservation Confirmed **No** Received On Ice **Yes**

New Cooler Temp: 7.1°C Q6 Cooler Temp. >6 C **Yes**
Custody Seals **No** Containers Intact **Yes** COC/Labels Agree **Yes** Preservation Confirmed **No** Received On Ice **Yes**

Analysis	Comments	Removed Analyte
W800071-01 **G4-TS1-1 [Solid] 02-Jan-08 11:19 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-02 **G4-TGR-2 [Solid] 02-Jan-08 11:26 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-03 **G4-TGR-3 [Solid] 02-Jan-08 11:34 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-04 **G4-TQM-4 [Solid] 02-Jan-08 11:44 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-05 **GL-TQM-1 [Solid] 02-Jan-08 11:58 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-06 **GL-TQM-2 [Solid] 02-Jan-08 12:00 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-07 **GL-TQM-3 [Solid] 02-Jan-08 12:06 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-08 **GL-TQM-4 [Solid] 02-Jan-08 12:10 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-09 **GL-TGR-5 [Solid] 02-Jan-08 12:25 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-10 **GL-TGR-6 [Solid] 02-Jan-08 12:30 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-11 **GL-TGR-7 [Solid] 02-Jan-08 12:45 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-12 **GL-TGR-8 [Solid] 02-Jan-08 12:50 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-13 **GL-TGR-9 [Solid] 02-Jan-08 12:55 Mountain**		
Bucking Room Sample Prep pH Paste		

Samples will be disposed 30 days from report date (45 for soils). Longer archiving must be requested.
Please contact Crystal Sevy (208-784-1258) if you have questions regarding the receipt of these samples

Printed: 1/7/2008 3:20:42PM

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Sample Receipt Confirmation

WORK ORDER

W800071

Client: **Freeport McMoRan - Chino Mines**
Project: **Chino Routine**
Project Manager: **Christine Meyer**

Analysis	Comments	Removed Analyte
W800071-14 **GL-TGR-10 [Solid] 02-Jan-08 13:00 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-15 **GL-TGR-11 [Solid] 02-Jan-08 13:05 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-16 **GU-TGR-1 [Solid] 02-Jan-08 13:50 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-17 **GU-TGR-2 [Solid] 02-Jan-08 13:55 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-18 **GU-TKN-3 [Solid] 02-Jan-08 14:10 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-19 **GU-TKN-3DUP [Solid] 02-Jan-08 14:10 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-20 **GU-TKN-4 [Solid] 02-Jan-08 14:20 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-21 **GU-TQM-5 [Solid] 02-Jan-08 14:30 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-22 **GU-TQM-6 [Solid] 02-Jan-08 14:42 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-23 **GU-TGR-7 [Solid] 02-Jan-08 14:50 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-24 **GU-TGR-8 [Solid] 02-Jan-08 15:00 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-25 **GU-TGR-9 [Solid] 02-Jan-08 15:05 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-26 **GU-TGR-10 [Solid] 02-Jan-08 15:10 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-27 **GU-TGR-11 [Solid] 02-Jan-08 15:20 Mountain**		
Bucking Room Sample Prep pH Paste		
W800071-28 **GU-TGR-12 [Solid] 02-Jan-08 15:25 Mountain**		
Bucking Room Sample Prep pH Paste		

Work Order Comments:

Reviewed By KG Date 1/7/08

Samples will be disposed 30 days from report date (45 for soils). Longer archiving must be requested.
Please contact Crystal Sevy (208-784-1258) if you have questions regarding the receipt of these samples

Printed: 1/7/2008 3:20:42PM

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
GU-TGRP-24	W800158-01	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-25	W800158-02	Solid	10-Jan-08	JP	11-Jan-08
GU-JV-26	W800158-03	Solid	10-Jan-08	JP	11-Jan-08
GU-JV-27	W800158-04	Solid	10-Jan-08	JP	11-Jan-08
GU-TGR-28	W800158-05	Solid	10-Jan-08	JP	11-Jan-08
GU-TGR-29	W800158-06	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-30	W800158-07	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-31	W800158-08	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-32	W800158-09	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-33	W800158-10	Solid	10-Jan-08	JP	11-Jan-08
GU-TGR-13	W800158-11	Solid	10-Jan-08	JP	11-Jan-08
GU-TGR-14	W800158-12	Solid	10-Jan-08	JP	11-Jan-08
GU-TGR-15	W800158-13	Solid	10-Jan-08	JP	11-Jan-08
GU-TGR-16	W800158-14	Solid	10-Jan-08	JP	11-Jan-08
GU-TGR-16-DUP	W800158-15	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-17	W800158-16	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-18	W800158-17	Solid	10-Jan-08	JP	11-Jan-08
GU-TGRP-19	W800158-18	Solid	10-Jan-08	JP	11-Jan-08
GU-JV-20	W800158-19	Solid	10-Jan-08	JP	11-Jan-08
GU-JV-21	W800158-20	Solid	10-Jan-08	JP	11-Jan-08
GU-TKN-22	W800158-21	Solid	10-Jan-08	JP	11-Jan-08
GU-TKN-22-DUP	W800158-22	Solid	10-Jan-08	JP	11-Jan-08
GU-TKN-23	W800158-23	Solid	10-Jan-08	JP	11-Jan-08

The complete report includes pages for each sample; a full QC report, and a notes page.

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-24**
SVL Sample ID: **W800158-01 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.49	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-25**
SVL Sample ID: **W800158-02 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	3.98	pH Units				W804061	BJF	22-Jan-08	

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Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-JV-26**
SVL Sample ID: **W800158-03 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.37	pH Units				W804061	BJF	22-Jan-08	

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Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-JV-27**
SVL Sample ID: **W800158-04 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.34	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGR-28**
SVL Sample ID: **W800158-05 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	5.56	pH Units				W804061	BJF	22-Jan-08	

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Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGR-29**
SVL Sample ID: **W800158-06 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.64	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-30**
SVL Sample ID: **W800158-07 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.12	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-31**
SVL Sample ID: **W800158-08 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.20	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-32**
SVL Sample ID: **W800158-09 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.11	pH Units				W804061	BJF	22-Jan-08	

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Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-33**
SVL Sample ID: **W800158-10 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	3.98	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGR-13**
SVL Sample ID: **W800158-11 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.74	pH Units				W804061	BJF	22-Jan-08	

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Larry Drew
Technical Director

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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGR-14**
SVL Sample ID: **W800158-12 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	7.22	pH Units				W804061	BJF	22-Jan-08	

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Larry Drew
Technical Director

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Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGR-15**
SVL Sample ID: **W800158-13 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	5.48	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGR-16**
SVL Sample ID: **W800158-14 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.04	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGR-16-DUP**
SVL Sample ID: **W800158-15 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.03	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-17**
SVL Sample ID: **W800158-16 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	6.89	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-18**
SVL Sample ID: **W800158-17 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	6.45	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TGRP-19**
SVL Sample ID: **W800158-18 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	6.82	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-JV-20**
SVL Sample ID: **W800158-19 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	6.08	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-JV-21**
SVL Sample ID: **W800158-20 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	5.75	pH Units				W804061	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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PO Box 7
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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TKN-22**
SVL Sample ID: **W800158-21 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.85	pH Units				W804062	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TKN-22-DUP**
SVL Sample ID: **W800158-22 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	5.09	pH Units				W804062	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
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Work Order: **W800158**
Reported: 24-Jan-08 10:42

Client Sample ID: **GU-TKN-23**
SVL Sample ID: **W800158-23 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Jan-08
Received: 11-Jan-08
Sampled By: JP

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.38	pH Units				W804062	BJF	22-Jan-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W800158**
Reported: 24-Jan-08 10:42

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Classical Chemistry Parameters									
ASA 9	Paste pH	pH Units	7.10	7.25	97.9	97 - 103	W804061	22-Jan-08	
ASA 9	Paste pH	pH Units	7.10	7.25	97.9	97 - 103	W804062	22-Jan-08	

Quality Control - DUPLICATE Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Analyzed	Notes
Classical Chemistry Parameters									
ASA 9	Paste pH	pH Units	4.57	4.49	1.8	20	W804061	22-Jan-08	

Notes and Definitions

LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable

W800158

CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt:

Report to Company: Chino Mines
Contact: Pam Pinson
Address: PO Box 5
Hurley NM 88041
Phone Number: 505 537 4213
FAX Number:
E-mail:

Invoice Sent To: Chino Mines
Contact: Pam Pinson
Address:
Phone Number:
FAX Number:
PO#: G12526/003

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Project Name: Grandhog Mine Site
Sampler's Signature: Pam Pinson

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

Please take care to distinguish between:
1 and I
2 and Z
5 and S
Ø and O
Thanks!

	Sample ID	Collection Date	Collection Time	Collected by: (Init.)	Misc. Matrix Type (From Table 1)	Misc. No. of Containers	Preservative(s) Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	Analyses Required	Rush Instructions (Days)	Comments
1	GU-TGRP-24	11/10/09	1125	JP	3	1										See attached instructions
2	GU-TGRP-25	↓	1130	↓	↓	↓										
3	GU-JV-26		1135													
4	GU-JV-27		1145													
5	GU-TGR-28		1150													
6	GU-TGR-29		1200													
7	GU-TGRP-30		1210													
8	GU-TGRP-31		1220													
9	GU-TGRP-32		1230													
10	GU-TGRP-33	↓	1235	↓	↓	↓										

Relinquished by: Pam Pinson	Date: 11/10/08	Time: 2:00pm	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL ANALYTICAL

CHAIN OF CUSTODY RECORD

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Page 1 of 2

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt:

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: Chino Mines Co.
Contact: Pam Pinson
Address: P.O. Box 7
Hurley NM 88041
Phone Number: See next page
FAX Number:
E-mail: [illegible]

Invoice Sent To: Pam Pinson
Contact: Chino Mines
Address: See next page
Phone Number:
FAX Number:
PO#: G125 26-003

Project Name: Groundhog Mine Set
Sampler's Signature: Pam Pinson

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

Please take care to distinguish between:
1 and I
2 and Z
5 and S
Ø and O
Thanks!

	Sample ID	Collection Date	Collection Time	Collected by: (Init.)	Misc. Matrix Type (From Table 1)	Misc. No. of Containers	Preservative(s) Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	Analyses Required	Rush Instructions (Days)	Comments
1	GU-TGR-13	1/10/09	0940	JP	3	1										Paste pH & sample preparation for XRF at Chino. Instructions attached
2	GU-TGR-14	1/10/09	0950	JP												
3	GU-TGR-15	1/10/09	9:55	JP												
4	GU-TGR-16		10:05	JP												
5	GU-TGR-16-Dup		10:05	JP												
6	GU-TGRp-17		10:25	JP												
7	GU-TGRp-18		10:30	JP												
8	GU-TGRp-19		10:35	JP												
9	GU-JV-20		10:45	JP												
10	GU-JV-21			JP												

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Pam Pinson	1-10-09	2:00pm			
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

CHAIN OF CUSTODY RECORD

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FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt:

Report to Company: Chino Mines
Contact: Pam Pinson
Address: P.O. Box 7
Hurley NM 88041
Phone Number: 505-537-4213
FAX Number: 892
E-mail: pamela_pinson@tmi.com

Invoice Sent To: Pam Pinson
Contact: Chino Mines
Address:
Phone Number:
FAX Number:
PO#: G12526-003

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Project Name: Groundhog Mine Site
Sampler's Signature: Pam Pinson

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

	Sample ID	Collection			Misc.		Preservative(s)							Analyses Required									Rush Instructions (Days)	Comments
	Please take care to distinguish between: 1 and I, 2 and Z, 5 and S, Ø and O. Thanks!	Date	Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)											See attached instructions
1	GU-TKN-22	1/10/09	1105	JA	3	1																		
2	GU-TKN-22 Dup	↓	1105	↓	↓	↓																		
3	GU-TKN-23	↓	1115	↓	↓	↓																		
4																								
5																								
6																								
7																								
8																								
9																								
10																								

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Pam Pinson	1-10-09	2:00pm			
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SG-1006	W801532-01	Solid	04-Feb-08	08-Apr-08
WG-2010	W801532-02	Solid	07-Feb-08	08-Apr-08
WG-2020	W801532-03	Solid	07-Feb-08	08-Apr-08
R2-SG-1019	W801532-04	Solid	22-Feb-08	08-Apr-08
SG-1037	W801532-05	Solid	26-Feb-08	08-Apr-08
R2-NG-2019	W801532-06	Solid	10-Mar-08	08-Apr-08
R2-NG-2009	W801532-07	Solid	10-Mar-08	08-Apr-08
R1-SG-1056	W801532-08	Solid	10-Mar-08	08-Apr-08
R1-SG-1046	W801532-09	Solid	10-Mar-08	08-Apr-08
NG-5101	W801532-10	Solid	17-Mar-08	08-Apr-08
NG-5082	W801532-11	Solid	17-Mar-08	08-Apr-08
NG-5111	W801532-12	Solid	17-Mar-08	08-Apr-08
5044-NG	W801532-13	Solid	25-Mar-08	08-Apr-08
5027-NG	W801532-14	Solid	25-Mar-08	08-Apr-08
5068-NG	W801532-15	Solid	25-Mar-08	08-Apr-08
5045-NG-R3	W801532-16	Solid	31-Mar-08	08-Apr-08
5038-NG	W801532-17	Solid	03-Apr-08	08-Apr-08
5008-NG	W801532-18	Solid	03-Apr-08	08-Apr-08
GU-TGRP-30	W801532-19	Solid	—	08-Apr-08
GU-TKN-4	W801532-20	Solid	—	08-Apr-08
GU-JV-21	W801532-21	Solid	—	08-Apr-08
GL-TGR-6	W801532-22	Solid	—	08-Apr-08

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested.
Sample preparation is defined by the client as per their Data Quality Objectives.
The complete report includes pages for each sample, a full QC report, and a notes section.

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **SG-1006**
SVL Sample ID: **W801532-01 (Solid)**

Sample Report Page 1 of 1

Sampled: 04-Feb-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	735	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	15500	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	19.0	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **WG-2010**
SVL Sample ID: **W801532-02 (Solid)**

Sample Report Page 1 of 1

Sampled: 07-Feb-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	2730	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	17800	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	36.7	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **WG-2020**
SVL Sample ID: **W801532-03 (Solid)**

Sample Report Page 1 of 1

Sampled: 07-Feb-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	571	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	17700	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	17.6	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
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Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **R2-SG-1019**
SVL Sample ID: **W801532-04 (Solid)**

Sample Report Page 1 of 1

Sampled: 22-Feb-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	587	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	15000	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	17.2	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **SG-1037**
SVL Sample ID: **W801532-05 (Solid)**

Sample Report Page 1 of 1

Sampled: 26-Feb-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	107	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	13200	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	11.3	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **R2-NG-2019**
SVL Sample ID: **W801532-06 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	2940	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	20200	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	50.7	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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PO Box 7
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Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **R2-NG-2009**
SVL Sample ID: **W801532-07 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	548	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	12600	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	15.4	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **R1-SG-1056**
SVL Sample ID: **W801532-08 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	3040	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	19900	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	41.6	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **R1-SG-1046**
SVL Sample ID: **W801532-09 (Solid)**

Sample Report Page 1 of 1

Sampled: 10-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	2120	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	14600	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	40.7	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **NG-5101**
SVL Sample ID: **W801532-10 (Solid)**

Sample Report Page 1 of 1

Sampled: 17-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	2490	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	20000	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	43.3	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **NG-5082**
SVL Sample ID: **W801532-11 (Solid)**

Sample Report Page 1 of 1

Sampled: 17-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	442	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	14600	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	16.9	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
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Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **NG-5111**
SVL Sample ID: **W801532-12 (Solid)**

Sample Report Page 1 of 1

Sampled: 17-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	385	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	13000	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	14.6	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **5044-NG**
SVL Sample ID: **W801532-13 (Solid)**

Sample Report Page 1 of 1

Sampled: 25-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	4180	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	17500	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	60.4	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **5027-NG**
SVL Sample ID: **W801532-14 (Solid)**

Sample Report Page 1 of 1

Sampled: 25-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	381	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	21500	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	16.3	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **5068-NG**
SVL Sample ID: **W801532-15 (Solid)**

Sample Report Page 1 of 1

Sampled: 25-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	327	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	11800	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	12.9	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **5045-NG-R3**
SVL Sample ID: **W801532-16 (Solid)**

Sample Report Page 1 of 1

Sampled: 31-Mar-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	4300	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	20100	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	52.9	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **5038-NG**
SVL Sample ID: **W801532-17 (Solid)**

Sample Report Page 1 of 1

Sampled: 03-Apr-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	368	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	10400	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	13.0	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **5008-NG**
SVL Sample ID: **W801532-18 (Solid)**

Sample Report Page 1 of 1

Sampled: 03-Apr-08
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	3790	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	17000	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	44.3	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **GU-TGRP-30**
SVL Sample ID: **W801532-19 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	1930	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	28000	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	211	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **GU-TKN-4**
SVL Sample ID: **W801532-20 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	192	mg/kg	1.00	0.29		W815106	DG	14-Apr-08	
EPA 6010B	**Iron**	21400	mg/kg	6.0	1.2		W815106	DG	14-Apr-08	
EPA 6010B	**Lead**	865	mg/kg	0.75	0.26		W815106	DG	14-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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PO Box 7
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Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **GU-JV-21**
SVL Sample ID: **W801532-21 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	153	mg/kg	1.00	0.29		W815108	DG	15-Apr-08	
EPA 6010B	**Iron**	84400	mg/kg	6.0	1.2		W815108	DG	15-Apr-08	
EPA 6010B	**Lead**	1350	mg/kg	0.75	0.26		W815108	DG	15-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Client Sample ID: **GL-TGR-6**
SVL Sample ID: **W801532-22 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 08-Apr-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Copper**	164	mg/kg	1.00	0.29		W815108	DG	15-Apr-08	
EPA 6010B	**Iron**	27600	mg/kg	6.0	1.2		W815108	DG	15-Apr-08	
EPA 6010B	**Lead**	449	mg/kg	0.75	0.26		W815108	DG	15-Apr-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods								
EPA 6010B	Copper	mg/kg	<1.00	0.29	1.00	W815106	14-Apr-08	
EPA 6010B	Copper	mg/kg	<1.00	0.29	1.00	W815108	15-Apr-08	
EPA 6010B	Iron	mg/kg	<6.0	1.2	6.0	W815106	14-Apr-08	
EPA 6010B	Iron	mg/kg	<6.0	1.2	6.0	W815108	15-Apr-08	
EPA 6010B	Lead	mg/kg	<0.75	0.26	0.75	W815106	14-Apr-08	
EPA 6010B	Lead	mg/kg	<0.75	0.26	0.75	W815108	15-Apr-08	

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods									
EPA 6010B	Copper	mg/kg	95.3	100	95.3	80 - 120	W815106	14-Apr-08	
EPA 6010B	Copper	mg/kg	98.8	100	98.8	80 - 120	W815108	15-Apr-08	
EPA 6010B	Iron	mg/kg	934	1000	93.4	80 - 120	W815106	14-Apr-08	
EPA 6010B	Iron	mg/kg	932	1000	93.2	80 - 120	W815108	15-Apr-08	
EPA 6010B	Lead	mg/kg	89.4	100	89.4	80 - 120	W815106	14-Apr-08	
EPA 6010B	Lead	mg/kg	91.4	100	91.4	80 - 120	W815108	15-Apr-08	

Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Copper	mg/kg	833	735	100	97.9	75 - 125	W815106	14-Apr-08	M3
EPA 6010B	Copper	mg/kg	136	21.5	100	115	75 - 125	W815108	15-Apr-08	
EPA 6010B	Iron	mg/kg	21500	15500	1000	R > 4S	75 - 125	W815106	14-Apr-08	M3
EPA 6010B	Iron	mg/kg	24500	21500	1000	R > 4S	75 - 125	W815108	15-Apr-08	M3
EPA 6010B	Lead	mg/kg	111	19.0	100	92.4	75 - 125	W815106	14-Apr-08	
EPA 6010B	Lead	mg/kg	102	8.30	100	93.8	75 - 125	W815108	15-Apr-08	

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Copper	mg/kg	843	833	100	1.20	20	W815106	14-Apr-08	
EPA 6010B	Copper	mg/kg	132	136	100	3.08	20	W815108	15-Apr-08	
EPA 6010B	Iron	mg/kg	20900	21500	1000	2.80	20	W815106	14-Apr-08	
EPA 6010B	Iron	mg/kg	23800	24500	1000	3.19	20	W815108	15-Apr-08	
EPA 6010B	Lead	mg/kg	111	111	100	0.434	20	W815106	14-Apr-08	
EPA 6010B	Lead	mg/kg	101	102	100	1.50	20	W815108	15-Apr-08	

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Work Order: **W801532**
Reported: 16-Apr-08 10:40

Notes and Definitions

M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable

W801532

SVL ANALYTICAL

CHAIN OF CUSTODY RECORD

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Page 1 of 1

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt:

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: Chino Mines Co.
Contact: Pam Pinson
Address: PO Box 7
Hurley NM
Phone Number: (505) 537-4213
FAX Number: (505) 537-8012
E-mail: pamela_pinson@fmi.com

Invoice Sent To: Chino Mines Co.
Contact: Pam Pinson
Address: PO Box 7
Phone Number: Same
FAX Number: Same
PO#: ~~R0600063~~

Project Name: Groundhog Post-Removal
Sampler's Signature:

~~PO# R0600063~~ PO#G12526-003

Indicate State of sample origination: _____ **USACE?** ☐ Yes ☐ No

Please take care to distinguish between:
1 and I
2 and Z
5 and S
Ø and O
Thanks!

	Sample ID	Collection Date	Collection Time	Collected by: (Init.)	Misc. Matrix Type (From Table 1)	Misc. No. of Containers	Preservative(s) Unpreserved	HNO3 Filtered	HNO3 Unfiltered	HCl	H2SO4	NaOH	Other (Specify)	Analyses Required: paste pH*	Rush Instructions (Days)	Comments
1	GU-TGR-34	4.30.08	10:46	JD JP	3	1								X		Report results to Chino. Jen Pepe (Golder) is also contact person.
2	GU-TGR-35	4.30.08	11:00	JD JP	3	1								X		* Hold all samples after paste pH for further analysis
3	GU-TGR-36	4.30.08	11:30	JD JP	3	1								X		
4	GU-TGR-37	4.30.08	11:45	JD JP	3	1								X		
5	GL-TQM-13	4.30.08	12:45	JD JP	3	1								X		
6	GL-TGR-14	4.30.08	13:00	JD JP	3	1								X		
7	GL-TQM-12	4.30.08	12:40	JD JP	3	1								X		
8	Dup 1	4.30.08		JD JP	3	1								X		
9																
10																

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
G4-TS1-1	W804106-01	Solid	—	23-Jul-2008
G4-TGR-2	W804106-02	Solid	—	23-Jul-2008
G4-TGR-3	W804106-03	Solid	—	23-Jul-2008
G4-TQM-4	W804106-04	Solid	—	23-Jul-2008
GL-TGR	W804106-05	Solid	—	23-Jul-2008
GL-TQM	W804106-06	Solid	—	23-Jul-2008
GU-JV	W804106-07	Solid	—	23-Jul-2008
GU-TGR-G5	W804106-08	Solid	—	23-Jul-2008
GU-TGR	W804106-09	Solid	—	23-Jul-2008
GU-TGRP	W804106-10	Solid	—	23-Jul-2008
GU-TKN	W804106-11	Solid	—	23-Jul-2008
GU-TQM	W804106-12	Solid	—	23-Jul-2008

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested.
Sample preparation is defined by the client as per their Data Quality Objectives.
The complete report includes pages for each sample, a full QC report, and a notes section.

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **G4-TS1-1**
SVL Sample ID: **W804106-01 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	11800	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	1.92	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	13.3	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	138	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	11900	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	88.9	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	1060	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	426	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	ABA	< 0.3	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	AGP	< 0.3	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	Pyritic Sulfur	< 0.01	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.02	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.02	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.94	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	95.8	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	9.47	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	1.8	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	Cadmium	< 0.002	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	0.02	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	**Iron**	0.8	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	Lead	< 0.0075	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	0.03	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	0.04	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	61	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	9.45 @20.2°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.52	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	4.6	mg/L Extract	0.3	0.05		W832070	AJE	07-Aug-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

SVL holds the following certifications: **AZ**:0538, **CA**:2080, **CO**:ID00019, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **MT**:CERT0027, **NV**:ID000192007A, **WA**:1268, **WY**:ID00019

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **G4-TGR-2**
SVL Sample ID: **W804106-02 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	13900	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	0.53	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	8.22	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	94.8	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	18300	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	502	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	1070	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	263	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	12.8	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	AGP	< 0.3	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**ANP**	12.8	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	Pyritic Sulfur	< 0.01	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	Sulfate Sulfur	< 0.01	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	Total Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	7.77	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	95.7	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	9.35	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	0.7	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	Cadmium	< 0.002	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	Copper	< 0.01	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	**Iron**	0.3	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	Lead	< 0.0075	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	0.007	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	0.01	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	50	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	9.77 @20.2°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	1.96	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	5.3	mg/L Extract	0.3	0.05		W832070	AJE	07-Aug-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

SVL holds the following certifications: **AZ**:0538, **CA**:2080, **CO**:ID00019, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **MT**:CERT0027, **NV**:ID000192007A, **WA**:1268, **WY**:ID00019

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **G4-TGR-3**
SVL Sample ID: **W804106-03 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	6080	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	**Arsenic**	3.4	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	0.74	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	0.85	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	128	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	53300	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	282	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	305	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	272	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	2.4	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	< 0.3	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**ANP**	2.6	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	< 0.01	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.09	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.14	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	**Non-extractable Sulfur**	0.04	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	7.50	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	96.2	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	9.64	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	2.2	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	Cadmium	< 0.002	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	0.02	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	**Iron**	4.4	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	**Lead**	0.0559	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	0.008	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	0.04	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	76	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	9.69 @20.1°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.86	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	3.1	mg/L Extract	0.3	0.05		W832070	AJE	07-Aug-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

SVL holds the following certifications: **AZ**:0538, **CA**:2080, **CO**:ID00019, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **MT**:CERT0027, **NV**:ID000192007A, **WA**:1268, **WY**:ID00019

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **G4-TQM-4**
SVL Sample ID: **W804106-04 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	14500	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	0.79	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	11.9	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	45.3	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	21100	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	11.4	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	817	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	258	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	20.5	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	AGP	< 0.3	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**ANP**	20.5	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	Pyritic Sulfur	< 0.01	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	Sulfate Sulfur	< 0.01	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	Total Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	7.88	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	95.5	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	9.56	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	1.0	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	Cadmium	< 0.002	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	Copper	< 0.01	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	**Iron**	0.7	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	Lead	< 0.0075	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	0.02	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	0.01	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	58	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	8.93 @20.2°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	1.15	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	7.6	mg/L Extract	0.3	0.05		W832070	AJE	07-Aug-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GL-TGR**
SVL Sample ID: **W804106-05 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	11900	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	**Arsenic**	2.7	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	4.55	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	8.84	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	258	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	27900	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	821	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	4030	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	2170	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	19.3	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	1.3	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**ANP**	20.6	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.04	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.11	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.15	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	7.33	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	96.8	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	8.72	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	Aluminum	< 0.08	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	Cadmium	< 0.002	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	0.01	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	Iron	< 0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	Lead	< 0.0075	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	0.01	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Zinc	< 0.01	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	110	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	7.86 @20.4°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.69	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	64.6	mg/L Extract	0.6	0.09	2	W832070	AJE	07-Aug-08	D2

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GL-TQM**
SVL Sample ID: **W804106-06 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	7700	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	3.18	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	5.75	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	166	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	8590	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	300	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	723	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	1390	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	17.7	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	3.8	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**ANP**	21.5	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.12	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.06	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.18	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	6.45	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	95.2	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	7.43	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	Aluminum	< 0.08	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	**Cadmium**	0.011	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	Copper	< 0.01	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	Iron	< 0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	Lead	< 0.0075	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	1.38	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	0.29	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	190	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	9.12 @20.5°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.34	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	71.5	mg/L Extract	0.6	0.09	2	W832070	AJE	07-Aug-08	D2

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

SVL holds the following certifications: **AZ**:0538, **CA**:2080, **CO**:ID00019, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **MT**:CERT0027, **NV**:ID000192007A, **WA**:1268, **WY**:ID00019

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GU-JV**
SVL Sample ID: **W804106-07 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	4860	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	**Arsenic**	13.3	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	1.42	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	2.94	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	511	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	48000	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	2710	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	1920	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	595	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	-0.8	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	0.8	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.03	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.15	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.20	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	**Non-extractable Sulfur**	0.03	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.48	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	99.0	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	9.11	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	Aluminum	< 0.08	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	**Cadmium**	0.002	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	0.07	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	**Iron**	0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	Lead	< 0.0075	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	0.43	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	0.20	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	61	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	3.99 @21.3°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.20	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	19.0	mg/L Extract	0.3	0.05		W832070	AJE	07-Aug-08	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GU-TGR-G5**
SVL Sample ID: **W804106-08 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	8910	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	**Arsenic**	3.9	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	3.00	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	9.85	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	284	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	24700	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	305	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	1710	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	871	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	14.4	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	5.1	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**ANP**	19.5	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.16	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.07	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.23	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	7.28	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	97.8	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	9.02	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	Aluminum	< 0.08	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	Cadmium	< 0.002	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Cobalt	< 0.006	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	Copper	< 0.01	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	Iron	< 0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	Lead	< 0.0075	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	Manganese	< 0.004	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	Zinc	< 0.01	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	130	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	8.95 @20.7°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.24	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	47.7	mg/L Extract	1.5	0.2	5	W832070	DT	08-Aug-08	D2

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GU-TGR**
SVL Sample ID: **W804106-09 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	10600	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	**Arsenic**	5.8	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	3.51	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	7.48	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	515	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	31600	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	1050	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	2170	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	1530	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	-2.2	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	6.9	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**ANP**	4.7	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.22	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.29	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.51	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	5.45	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	98.1	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	6.22	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	0.1	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	**Cadmium**	0.033	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Cobalt**	0.02	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	0.83	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	Iron	< 0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	**Lead**	0.284	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	7.32	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	9.11	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	260	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	6.42 @20.6°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.30	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	162	mg/L Extract	1.5	0.2	5	W832070	AJE	07-Aug-08	D2

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GU-TGRP**
SVL Sample ID: **W804106-10 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	5230	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	**Arsenic**	7.5	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	2.07	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	2.03	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	859	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	38100	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	1850	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	644	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	971	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	-2.4	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	2.4	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.08	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.31	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.41	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	**Non-extractable Sulfur**	0.02	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	3.89	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	97.7	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	4.60	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	1.6	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	**Cadmium**	0.041	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Cobalt**	0.04	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	8.65	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	Iron	< 0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	**Lead**	2.20	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	6.25	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	13.4	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	300	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	4.49 @20.4°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	**Fluoride**	0.85	mg/L Extract	0.10	0.02		W832070	AJE	07-Aug-08	
EPA 300.0	**Sulfate as SO4**	193	mg/L Extract	1.5	0.2	5	W832070	AJE	07-Aug-08	D2

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GU-TKN**
SVL Sample ID: **W804106-11 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	7600	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	1.33	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	5.21	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	351	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	23100	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	1040	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	1660	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	767	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	-2.6	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	2.6	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.08	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.45	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.54	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	**Non-extractable Sulfur**	0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	3.94	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	97.2	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	4.05	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	3.3	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	**Cadmium**	0.027	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Cobalt**	0.03	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	3.17	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	Iron	< 0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	**Lead**	0.291	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	2.99	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	7.25	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	260	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	4.17 @20.7°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	Fluoride	< 0.50	mg/L Extract	0.50	0.12	5	W832070	AJE	08-Aug-08	D1
EPA 300.0	**Sulfate as SO4**	175	mg/L Extract	1.5	0.2	5	W832070	AJE	08-Aug-08	D2

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

SVL holds the following certifications: **AZ**:0538, **CA**:2080, **CO**:ID00019, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **MT**:CERT0027, **NV**:ID000192007A, **WA**:1268, **WY**:ID00019

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Client Sample ID: **GU-TQM**
SVL Sample ID: **W804106-12 (Solid)**

Sample Report Page 1 of 1

Sampled: —
Received: 23-Jul-08
Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Aluminum**	7070	mg/kg	8.0	1.0		W832103	AS	10-Aug-08	
EPA 6010B	**Arsenic**	2.8	mg/kg	2.5	0.7		W832103	AS	10-Aug-08	
EPA 6010B	**Cadmium**	1.98	mg/kg	0.20	0.05		W832103	AS	10-Aug-08	
EPA 6010B	**Cobalt**	5.91	mg/kg	0.60	0.07		W832103	AS	10-Aug-08	
EPA 6010B	**Copper**	435	mg/kg	1.00	0.29		W832103	AS	10-Aug-08	
EPA 6010B	**Iron**	24000	mg/kg	6.0	1.2		W832103	AS	10-Aug-08	
EPA 6010B	**Lead**	2520	mg/kg	0.75	0.25		W832103	AS	10-Aug-08	
EPA 6010B	**Manganese**	898	mg/kg	0.40	0.06		W832103	AS	10-Aug-08	
EPA 6010B	**Zinc**	805	mg/kg	1.00	0.20		W832103	AS	10-Aug-08	
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	-8.5	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	**AGP**	8.5	TCaCO3/kT	0.3			N/A	BJF	31-Jul-08	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3	0.01		W831092	BJF	31-Jul-08	
Modified Sobek	**Pyritic Sulfur**	0.27	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Sulfate Sulfur**	0.56	%	0.01			N/A	BJF	31-Jul-08	
Modified Sobek	**Total Sulfur**	0.84	%	0.01			W831092	BJF	31-Jul-08	
Modified Sobek	**Non-extractable Sulfur**	0.01	%	0.01			W831092	BJF	31-Jul-08	
Classical Chemistry Parameters										
ASA 9	**Paste pH**	4.54	pH Units				W831152	BJF	30-Jul-08	
Percent Solids										
Percent Solids	**% Solids**	96.7	%				W832107	HB	05-Aug-08	
SPLP Extraction Parameters										
ASTM E2242-02	**Sample Weight**	100	g				W830290	TW	31-Jul-08	
ASTM E2242-02	Extraction Type	Western					W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Fluid**	2000	mL				W830290	TW	31-Jul-08	
ASTM E2242-02	**Extraction Time**	18.0	Hrs				W830290	TW	31-Jul-08	
ASTM E2242-02	**Final Fluid pH**	5.15	pH Units				W830290	TW	31-Jul-08	
SPLP Leachates (Metals)										
EPA 6010B	**Aluminum**	2.9	mg/L Extract	0.08	0.03		W831233	DG	12-Aug-08	
EPA 6010B	Arsenic	< 0.02	mg/L Extract	0.02	0.006		W831233	DG	12-Aug-08	
EPA 6010B	**Cadmium**	0.025	mg/L Extract	0.002	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Cobalt**	0.03	mg/L Extract	0.006	0.0006		W831233	DG	12-Aug-08	
EPA 6010B	**Copper**	2.91	mg/L Extract	0.01	0.003		W831233	DG	12-Aug-08	
EPA 6010B	Iron	< 0.06	mg/L Extract	0.06	0.02		W831233	DG	12-Aug-08	
EPA 6010B	**Lead**	0.313	mg/L Extract	0.0075	0.0039		W831233	DG	12-Aug-08	
EPA 6010B	**Manganese**	2.78	mg/L Extract	0.004	0.001		W831233	DG	12-Aug-08	
EPA 6010B	**Zinc**	6.80	mg/L Extract	0.01	0.002		W831233	DG	12-Aug-08	
SPLP Leachates (Classical)										
SM 2540 C	**Total Diss. Solids**	200	mg/L Extract	10	4.3		W831265	JMS	01-Aug-08	H1
SM4500-H-B	**pH**	4.23 @20.6°C	pH Units				W831297	DKS	01-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	Fluoride	< 0.50	mg/L Extract	0.50	0.12	5	W832070	AJE	08-Aug-08	D1
EPA 300.0	**Sulfate as SO4**	161	mg/L Extract	1.5	0.2	5	W832070	AJE	08-Aug-08	D2

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

SVL holds the following certifications: **AZ**:0538, **CA**:2080, **CO**:ID00019, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **MT**:CERT0027, **NV**:ID000192007A, **WA**:1268, **WY**:ID00019

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Freeport McMoRan - Chino Mines
PO Box 7
Hurley, NM 88043

Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods								
EPA 6010B	Aluminum	mg/kg	<8.0	1.0	8.0	W832103	10-Aug-08	
EPA 6010B	Arsenic	mg/kg	<2.5	0.7	2.5	W832103	10-Aug-08	
EPA 6010B	Cadmium	mg/kg	<0.20	0.05	0.20	W832103	10-Aug-08	
EPA 6010B	Cobalt	mg/kg	<0.60	0.07	0.60	W832103	10-Aug-08	
EPA 6010B	Copper	mg/kg	<1.00	0.29	1.00	W832103	10-Aug-08	
EPA 6010B	Iron	mg/kg	<6.0	1.2	6.0	W832103	10-Aug-08	
EPA 6010B	Lead	mg/kg	<0.75	0.25	0.75	W832103	10-Aug-08	
EPA 6010B	Manganese	mg/kg	<0.40	0.06	0.40	W832103	10-Aug-08	
EPA 6010B	Zinc	mg/kg	<1.00	0.20	1.00	W832103	10-Aug-08	
Acid/Base Accounting & Sulfur Forms								
Modified Sobek	ANP	TCaCO3/kT	<0.3	0.01	0.3	W831092	31-Jul-08	
Modified Sobek	Total Sulfur	%	<0.01		0.01	W831092	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	%	<0.01		0.01	W831092	31-Jul-08	
SPLP Leachates (Metals)								
EPA 6010B	Aluminum	mg/L Extract	<0.08	0.03	0.08	W831233	12-Aug-08	
EPA 6010B	Aluminum	mg/L Extract	<0.08	0.03	0.08	W831233	12-Aug-08	
EPA 6010B	Arsenic	mg/L Extract	<0.02	0.006	0.02	W831233	12-Aug-08	
EPA 6010B	Arsenic	mg/L Extract	<0.02	0.006	0.02	W831233	12-Aug-08	
EPA 6010B	Cadmium	mg/L Extract	<0.002	0.001	0.002	W831233	12-Aug-08	
EPA 6010B	Cadmium	mg/L Extract	<0.002	0.001	0.002	W831233	12-Aug-08	
EPA 6010B	Cobalt	mg/L Extract	<0.006	0.0006	0.006	W831233	12-Aug-08	
EPA 6010B	Cobalt	mg/L Extract	<0.006	0.0006	0.006	W831233	12-Aug-08	
EPA 6010B	Copper	mg/L Extract	<0.01	0.003	0.01	W831233	12-Aug-08	
EPA 6010B	Copper	mg/L Extract	<0.01	0.003	0.01	W831233	12-Aug-08	
EPA 6010B	Iron	mg/L Extract	<0.06	0.02	0.06	W831233	12-Aug-08	
EPA 6010B	Iron	mg/L Extract	<0.06	0.02	0.06	W831233	12-Aug-08	
EPA 6010B	Lead	mg/L Extract	<0.0075	0.0039	0.0075	W831233	12-Aug-08	
EPA 6010B	Lead	mg/L Extract	<0.0075	0.0039	0.0075	W831233	12-Aug-08	
EPA 6010B	Manganese	mg/L Extract	<0.004	0.001	0.004	W831233	12-Aug-08	
EPA 6010B	Manganese	mg/L Extract	<0.004	0.001	0.004	W831233	12-Aug-08	
EPA 6010B	Zinc	mg/L Extract	<0.01	0.002	0.01	W831233	12-Aug-08	
EPA 6010B	Zinc	mg/L Extract	<0.01	0.002	0.01	W831233	12-Aug-08	
SPLP Leachates (Classical)								
SM 2540 C	Total Diss. Solids	mg/L Extract	<10	4.3	10	W831265	01-Aug-08	
SPLP Leachates (Anions)								
EPA 300.0	Fluoride	mg/L Extract	<0.10	0.02	0.10	W832070	07-Aug-08	
EPA 300.0	Fluoride	mg/L Extract	<0.10	0.02	0.10	W832070	08-Aug-08	
EPA 300.0	Sulfate as SO4	mg/L Extract	0.7	0.05	0.3	W832070	08-Aug-08	B7
EPA 300.0	Sulfate as SO4	mg/L Extract	<0.3	0.05	0.3	W832070	07-Aug-08	

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods									
EPA 6010B	Aluminum	mg/kg	98.3	100	98.3	80 - 120	W832103	10-Aug-08	
EPA 6010B	Arsenic	mg/kg	86.6	100	86.6	80 - 120	W832103	10-Aug-08	
EPA 6010B	Cadmium	mg/kg	94.0	100	94.0	80 - 120	W832103	10-Aug-08	
EPA 6010B	Cobalt	mg/kg	95.6	100	95.6	80 - 120	W832103	10-Aug-08	
EPA 6010B	Copper	mg/kg	95.0	100	95.0	80 - 120	W832103	10-Aug-08	
EPA 6010B	Iron	mg/kg	988	1000	98.8	80 - 120	W832103	10-Aug-08	
EPA 6010B	Lead	mg/kg	93.0	100	93.0	80 - 120	W832103	10-Aug-08	

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Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods (Continued)									
EPA 6010B	Manganese	mg/kg	95.3	100	95.3	80 - 120	W832103	10-Aug-08	
EPA 6010B	Zinc	mg/kg	97.1	100	97.1	80 - 120	W832103	10-Aug-08	
Acid/Base Accounting & Sulfur Forms									
Modified Sobek	ANP	TCaCO3/kT	86.8	89.8	96.7	85 - 116	W831092	31-Jul-08	
Modified Sobek	Total Sulfur	%	4.34	4.44	97.7	84 - 136	W831092	31-Jul-08	
Classical Chemistry Parameters									
ASA 9	Paste pH	pH Units	6.90	7.25	95.2	94.4 - 102	W831152	30-Jul-08	
SPLP Leachates (Metals)									
EPA 6010B	Aluminum	mg/L Extract	1.1	1.00	110	80 - 120	W831233	12-Aug-08	
EPA 6010B	Arsenic	mg/L Extract	1.1	1.00	105	80 - 120	W831233	12-Aug-08	
EPA 6010B	Cadmium	mg/L Extract	1.05	1.00	105	80 - 120	W831233	12-Aug-08	
EPA 6010B	Cobalt	mg/L Extract	1.07	1.00	107	80 - 120	W831233	12-Aug-08	
EPA 6010B	Copper	mg/L Extract	1.09	1.00	109	80 - 120	W831233	12-Aug-08	
EPA 6010B	Iron	mg/L Extract	10.4	10.0	104	80 - 120	W831233	12-Aug-08	
EPA 6010B	Lead	mg/L Extract	1.04	1.00	104	80 - 120	W831233	12-Aug-08	
EPA 6010B	Manganese	mg/L Extract	1.09	1.00	109	80 - 120	W831233	12-Aug-08	
EPA 6010B	Zinc	mg/L Extract	1.02	1.00	102	80 - 120	W831233	12-Aug-08	
SPLP Leachates (Classical)									
SM 2540 C	Total Diss. Solids	mg/L Extract	419	430	97.4	87 - 113	W831265	01-Aug-08	
SPLP Leachates (Anions)									
EPA 300.0	Fluoride	mg/L Extract	2.47	2.50	98.8	90 - 110	W832070	07-Aug-08	
EPA 300.0	Sulfate as SO4	mg/L Extract	9.9	10.0	98.7	90 - 110	W832070	07-Aug-08	

Quality Control - DUPLICATE Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms									
Modified Sobek	ANP	TCaCO3/kT	0.6	<0.3	UDL	20	W831092	31-Jul-08	R2
Modified Sobek	Total Sulfur	%	0.0276	0.0233	16.9	20	W831092	31-Jul-08	
Modified Sobek	Non-extractable Sulfur	%	<0.01	<0.01	<RL	20	W831092	31-Jul-08	R3
Classical Chemistry Parameters									
ASA 9	Paste pH	pH Units	3.85	3.94	2.3	20	W831152	30-Jul-08	
ASA 9	Paste pH	pH Units	4.92	4.94	0.4	20	W831152	30-Jul-08	
SPLP Leachates (Classical)									
SM 2540 C	Total Diss. Solids	mg/L Extract	115	112	2.6	20	W831265	01-Aug-08	
SM4500-H-B	pH	pH Units	4.49	4.49	0.0	20	W831297	01-Aug-08	
SM4500-H-B	pH	pH Units	9.56	9.45	1.2	20	W831297	01-Aug-08	
SPLP Leachates (Anions)									
EPA 300.0	Fluoride	mg/L Extract	0.52	0.52	0.2	13	W832070	07-Aug-08	
EPA 300.0	Sulfate as SO4	mg/L Extract	4.6	4.6	0.5	2.17	W832070	07-Aug-08	

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Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Aluminum	mg/kg	28200	11800	100	R > 4S	75 - 125	W832103	10-Aug-08	M3
EPA 6010B	Arsenic	mg/kg	88.8	<2.5	100	88.1	75 - 125	W832103	10-Aug-08	
EPA 6010B	Cadmium	mg/kg	97.4	1.92	100	95.5	75 - 125	W832103	10-Aug-08	
EPA 6010B	Cobalt	mg/kg	108	13.3	100	94.5	75 - 125	W832103	10-Aug-08	
EPA 6010B	Copper	mg/kg	277	138	100	139	75 - 125	W832103	10-Aug-08	M1
EPA 6010B	Iron	mg/kg	18400	11900	1000	R > 4S	75 - 125	W832103	10-Aug-08	M3
EPA 6010B	Lead	mg/kg	165	88.9	100	76.6	75 - 125	W832103	10-Aug-08	
EPA 6010B	Manganese	mg/kg	837	1060	100	R > 4S	75 - 125	W832103	10-Aug-08	M3
EPA 6010B	Zinc	mg/kg	580	426	100	R > 4S	75 - 125	W832103	10-Aug-08	M3
SPLP Leachates (Metals)										
EPA 6010B	Aluminum	mg/L Extract	1.8	0.7	1.00	111	75 - 125	W831233	12-Aug-08	
EPA 6010B	Arsenic	mg/L Extract	1.1	<0.0	1.00	108	75 - 125	W831233	12-Aug-08	
EPA 6010B	Cadmium	mg/L Extract	1.06	<0.002	1.00	106	75 - 125	W831233	12-Aug-08	
EPA 6010B	Cobalt	mg/L Extract	1.09	<0.01	1.00	109	75 - 125	W831233	12-Aug-08	
EPA 6010B	Copper	mg/L Extract	1.11	<0.01	1.00	110	75 - 125	W831233	12-Aug-08	
EPA 6010B	Iron	mg/L Extract	11.0	0.3	10.0	106	75 - 125	W831233	12-Aug-08	
EPA 6010B	Lead	mg/L Extract	1.05	<0.0075	1.00	105	75 - 125	W831233	12-Aug-08	
EPA 6010B	Manganese	mg/L Extract	1.12	0.007	1.00	111	75 - 125	W831233	12-Aug-08	
EPA 6010B	Zinc	mg/L Extract	1.04	0.01	1.00	103	75 - 125	W831233	12-Aug-08	
SPLP Leachates (Anions)										
EPA 300.0	Fluoride	mg/L Extract	2.59	0.52	2.00	104	90 - 110	W832070	07-Aug-08	
EPA 300.0	Fluoride	mg/L Extract	2.40	0.20	2.00	110	90 - 110	W832070	07-Aug-08	
EPA 300.0	Sulfate as SO4	mg/L Extract	14.5	4.6	10.0	99.2	90 - 110	W832070	07-Aug-08	
EPA 300.0	Sulfate as SO4	mg/L Extract	28.3	19.0	10.0	93.2	90 - 110	W832070	07-Aug-08	

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Aluminum	mg/kg	27200	28200	100	3.57	20	W832103	10-Aug-08	
EPA 6010B	Arsenic	mg/kg	87.8	88.8	100	1.17	20	W832103	10-Aug-08	
EPA 6010B	Cadmium	mg/kg	95.2	97.4	100	2.32	20	W832103	10-Aug-08	
EPA 6010B	Cobalt	mg/kg	105	108	100	2.62	20	W832103	10-Aug-08	
EPA 6010B	Copper	mg/kg	265	277	100	4.48	20	W832103	10-Aug-08	
EPA 6010B	Iron	mg/kg	17800	18400	1000	3.62	20	W832103	10-Aug-08	
EPA 6010B	Lead	mg/kg	162	165	100	1.85	20	W832103	10-Aug-08	
EPA 6010B	Manganese	mg/kg	768	837	100	8.59	20	W832103	10-Aug-08	
EPA 6010B	Zinc	mg/kg	557	580	100	4.01	20	W832103	10-Aug-08	
SPLP Leachates (Metals)										
EPA 6010B	Aluminum	mg/L Extract	1.7	1.8	1.00	2.14	20	W831233	12-Aug-08	
EPA 6010B	Arsenic	mg/L Extract	1.1	1.1	1.00	1.21	20	W831233	12-Aug-08	
EPA 6010B	Cadmium	mg/L Extract	1.07	1.06	1.00	0.928	20	W831233	12-Aug-08	
EPA 6010B	Cobalt	mg/L Extract	1.10	1.09	1.00	1.59	20	W831233	12-Aug-08	
EPA 6010B	Copper	mg/L Extract	1.12	1.11	1.00	1.13	20	W831233	12-Aug-08	
EPA 6010B	Iron	mg/L Extract	11.0	11.0	10.0	0.421	20	W831233	12-Aug-08	
EPA 6010B	Lead	mg/L Extract	1.06	1.05	1.00	1.21	20	W831233	12-Aug-08	
EPA 6010B	Manganese	mg/L Extract	1.12	1.12	1.00	0.553	20	W831233	12-Aug-08	
EPA 6010B	Zinc	mg/L Extract	1.06	1.04	1.00	1.66	20	W831233	12-Aug-08	

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Project Name: Groundhog soil
Work Order: **W804106**
Reported: 12-Aug-08 15:34

Quality Control - POST DIGESTION SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Copper	mg/kg	224	138	100	85.7	75 - 125	W832103	10-Aug-08	

Notes and Definitions

B7	Target analyte in method blank exceeded method QC limits, but concentrations in samples were at least 10x the blank concentration.
D1	Sample required dilution due to matrix.
D2	Sample required dilution due to high concentration of target analyte.
H1	Sample analysis performed past holding time.
M1	Matrix spike recovery was high, but the LCS recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
R2	RPD/RSD exceeded the laboratory acceptance limit.
R3	There is no control limit for the RPD if the concentration in the sample is less than five times the reporting limit
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable