REPORT

UPDATED CLOSURE/CLOSEOUT PLAN FOR THE LITTLE ROCK MINE

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Golder Associates

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List of Acronyms and Abbreviations

ABA	Acid-Base Accounting
ac-ft/yr	Acre-Feet per Year
APP	Abatement Plan Proposal
BLM	Bureau of Land Management
BMP	Best Management Practices
CCP	Closure/Closeout Plan
CDQAP	Construction Design Quality Assurance Plan
CFR	Code of Federal Regulations
CN	Curve Number
Copper Mine Rules	New rules for the copper mining industry adopted in late 2013 under 20.6.7 NMAC and 20.6.8 NMAC
Corps	U.S. Army Corps of Engineers
CQA	Construction Quality Assurance
CQAP	Construction Quality Assurance Plan
CQAR	Construction Quality Assurance Report
CQC	Construction Quality Control
DBS&A	Daniel B. Stephens and Associates, Inc.
DNA	Determination of NEPA Adequacy
DP	Discharge Permit
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EOY	End of Year
FONSI	Finding of No Significant Impact
ft	Feet
Golder	Golder Associates Inc.
gpm	Gallons Per Minute
Guidelines	Closeout Plan Guidelines
HDPE	High Density Polyethylene
kV	Kilovolt
LOM	Life of Mine
mg/L	Milligrams Per Liter
msl	Mean Sea Level
MMD	Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department
MPO	Mine Plan of Operations
MPO Amendment	Amendment to Mine Plan of Operations
MSGP	Multi-Sector General Permit
NEPA	National Environmental Policy Act
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department

NMMA	New Mexico Mining Act
NMOSE	New Mexico Office of the State Engineer
NMWQA	New Mexico Water Quality Act
NMWQCC	New Mexico Water Quality Control Commission
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	United States Department of Agriculture, Natural Resources Conservation Service
NSR	New Source Review
O&M	Operation and Maintenance
OSE	Office of the State Engineer
PDTI	Phelps Dodge Tyrone, Inc.
PMLU	Post-Mining Land Use
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
Rules	New Mexico Mining Rules
SCS	Soil Conservation Service
SPCC	Spill Prevention Control and Countermeasures
SX/EW	Solution Extraction-Electrowinning
SWPPP	Stormwater Pollution Prevention Plan
su	Standard Unit of Measure for pH
TDS	Total Dissolved Solids
Telesto	Telesto Solutions Incorporated
Tyrone	Freeport-McMoRan Tyrone, Inc.
USFS	United States Department of Agriculture, Forest Service
WQA	Water Quality Act
WQCC	Water Quality Control Commission

1.0 INTRODUCTION

The Little Rock Mine is approximately 11 miles south of Silver City, New Mexico and 1 mile west of the Tyrone Mine **(Figure 1-1)**. The site features at the Little Rock Mine are depicted on **Figure 1-2** and include an existing open pit copper mine, haul road, and associated facilities to support mining operations. The Little Rock Mine also includes lands that were disturbed by earlier operations (1970's) and have since been reclaimed.

The Little Rock Mine is currently permitted with the Mining and Minerals Division of the Energy, Minerals and Natural Resources Department of New Mexico (MMD) as an existing active mining operation (Rev. 10-1 to Permit No. GR007RE). The New Mexico Environment Department (NMED) Ground Water Quality Bureau issued Discharge Permit (DP) 1236 and both Departments approved the Closure/Closeout Plan (CCP) in 2010.

This CCP is an update of the 2009 and 2010 Little Rock Mine Closure/Closeout Plans (CCPs) and renewal application submitted to the NMED and the MMD, which was approved by the agencies in December 2010. This submittal includes an updated CCP and associated reclamation cost estimate for the Little Rock Mine based on 2013 mine expansion plans.

1.1 Purpose of Plan

The Little Rock Mine CCP has been updated as required by DP-1236, which was issued by the NMED on December 27, 2000 (NMED, 2000) and Permit Revision 10-1 to Permit GR007RE (MMD, Permit), which was issued by the Director of the MMD on December 30, 2010 (MMD, 2010). DP-1236 addressed a number of issues regarding site-specific closure requirements at Little Rock, post-closure ground water monitoring and reporting requirements, and general financial assurance requirements. The MMD Permit details general obligations and conditions for mine closure, reclamation, and associated financial assurance requirements.

In addition, this CCP is intended to conform to all applicable mine reclamation regulations set forth by the U.S. Bureau of Land Management (BLM) (43 CFR 3809). The land that is planned to be disturbed by future mining is either managed by the BLM or is owned by Freeport-McMoRan Tyrone, Inc. (Tyrone). No lands managed by the U.S. Forest Service (USFS) are expected to be disturbed by future mining.

1.2 Regulatory Authority

In 1993, the New Mexico legislature enacted the New Mexico Mining Act (NMMA) requiring that closure/closeout plans be put in place for applicable mines within the state. Rules to implement the requirements of the NMMA were promulgated in 1994. This plan was prepared to comply with applicable regulations and requirements stipulated in the NMMA (NMAC Title 19, Chapter 10, Part 5), New Mexico Water Quality Act (NMWQA), and the New Mexico Water Quality Control Commission (NMWQCC)

Regulations (NMAC Title 20, Chapter 6, Parts 2, 7, and 8). New rules for the copper mining industry were adopted in late 2013 under 20.6.7 NMAC and 20.6.8 NMAC. Applicable requirements of these new rules (Copper Mine Rules) have been incorporated into this updated CCP. Additional details of the NMMA and closure planning concepts associated with the Little Rock Mine are described in the following sections.

1.2.1 The New Mexico Mining Act and Administrative Rules

The NMMA established a goal of promoting responsible utilization and reclamation of lands impacted by mining while also recognizing that mining is vital to New Mexico. The program is administered by the MMD, and approved existing mine permits apply for the life of the operation. The Little Rock Mine is regulated as an 'existing mine" under the NMMA because it produced marketable minerals for a total of at least two years between January 1, 1970 and the effective date of the NMMA.

1.2.2 Closeout Planning

The MMD's New Mexico Mining Rules (Rules) and advisory Closeout Plan Guidelines (Guidelines) provide a foundation for the development of Closeout Plans. Subpart 506.A of the NMMA states that "… closeout plans shall be based on site-specific characteristics and the anticipated life of the mining operation. Site-specific characteristics include, but are not limited to, disturbances from previous mining operations, past and current mining methods utilized, geology, hydrology and climatology of the area." The Guidelines recognize that each site presents a unique set of circumstances and that many of the existing mines subject to closure requirements were largely developed prior to the NMMA without the requirement for reclamation.

The landowner proposes the post-mining land use, which must be approved by the Director of the MMD. Post-mining land uses include, but are not limited to, agricultural (e.g., cropland, grazing land, or forestry), commercial, industrial, or ecological uses that would comply with applicable laws and regulations. Determining future land-use is the first step in developing a closeout plan and establishing financial assurance for the site. The post-mining land use applicable to the Little Rock Mine is wildlife habitat.

1.2.3 Closure Planning

The primary reclamation objectives at the Little Rock Mine involve the control of surface water and ground water in the vicinity of the open pit, stabilization of the mined materials to prevent off-site dispersal, and establishment of a self-sustaining ecosystem. Tyrone intends to achieve the reclamation goals at the Little Rock Mine through a combined approach involving stabilization of disturbed areas, containment and isolation through covering and revegetation, and surface water and ground water controls.

The reclamation process is multi-faceted in practice and the development of the Little Rock Mine CCP required the coordinated efforts of a diverse group of scientists and engineers. The CCP presented herein relies on the application of standard reclamation principles to the unique set of conditions that

characterize the facilities at the Little Rock Mine. Consistent with industry practices at open pit copper mines with long operating histories, the Little Rock Mine CCP employs vegetated soil covers, ripped and revegetated surfaces, and water management systems to stabilize the facilities and to reduce and control impacted water. To aid Tyrone in selecting a plan for the Little Rock Mine, environmental scientists and reclamation design engineers performed site-specific investigations to develop a comprehensive understanding of the mined material and the surrounding environment. Over the past decade, a broad range of specialized studies (e.g., surface water, ground water, material characteristic, cover design, and revegetation) have been conducted to evaluate the environmental and economic implications of various closure alternatives.

Under the current Little Rock Mine plan, active mining will continue for approximately 7 years (2010 through 2017), with the potential to extend the mine life based on the demonstration of additional copper resources in the area. Tyrone recognizes and supports that the closure plan must be structured to accommodate advancements in science, engineering, and mining technology. Extensive reclamation has been performed to date at the Freeport-McMoRan mine sites in southwestern New Mexico. Tyrone has employed innovative reclamation techniques and products during construction and plans to continue this practice for future reclamation at both the Tyrone Mine and Little Rock Mine. Thus, Tyrone reserves the option to modify the Little Rock Mine closure plan by adopting new developments in reclamation science or based on an improved understanding of the site.

1.3 History of Closure/Closeout Plan Submittals

The original CCP for the Little Rock Mine was submitted to the MMD on August 29, 1997, and later revised in May 1998 at the request of MMD to reflect the approved Mine Plan of Operations (Phelps Dodge Tyrone, Inc, 1993). The original CCP was submitted to both agencies (NMED and MMD) on September 30, 1999 and approved by MMD on December 29, 2000 (MMD, 2000) and the NMED on December 27, 2000 (NMED, 2000). In September 2009, Tyrone submitted a reclamation cost estimate for the Copper Leach Stockpile, Precipitation Plant, and existing pit area (non-mining scenario) to the NMED and MMED, and the non-mining reclamation cost estimate was approved by both agencies in October 2009. In April, 2010 Tyrone requested that MMD revise the mine permit to return to an operating status. An updated CCP for the Little Rock Mine was submitted to the agencies on July 21, 2010 (Tyrone et. al., 2010) detailing the reclamation plan associated with updated mine development and operational plans. Revision 10-1 was approved on December 30, 2010 (MMD, 2010), approving the change from standby to operating status, incorporating the 2010 Updated CCP which detailed the CCP under a mining scenario for the Little Rock Mine, and replacing Revision 97-1 to Permit No. GR007RE.

1.4 Description of Updated Plan

The MMD, NMED, and NMWQCC require that existing mines prepare a CCP and the entity responsible for the mine must put in place financial assurance "sufficient to assure the completion of the performance requirements of the permit, including closure/closeout, and reclamation, if the work had to be performed by the director or a third party contractor." The CCP is revised on a 5-year basis throughout the mine's active life to reflect changes in mine operations, site conditions, and adjusted financial assurance estimates.

This 5-year update to the CCP revises the CCP Updates submitted in 2009 (Telesto, 2009) and 2010 (Tyrone et. al., 2010) with refined closure/closeout conceptual designs that account for changes in site-specific conditions, ongoing and completed reclamation projects, and updated mine plans. This updated CCP supports financial assurance cost estimates for closure/closeout based on the end of year (EOY) 2017 mine plan.

As such, the facility characteristics and reclamation designs presented in this CCP are referenced to conditions at the Little Rock Mine at the EOY 2017. Use of the EOY 2017 mine plan is consistent with the snapshot in time philosophy that was adopted by Tyrone and the Agencies early in the closure planning process. This process results in the development of an end-of-year reclamation plan with the highest reclamation cost by evaluating the mine plan with the greatest volume of regrading and cover placement between 2014 and 2018. If mining activities were to cease between the years 2014 and 2018, the highest financial assurance requirements would be associated with the EOY 2017 conditions. Details of facility changes that have occurred since the last CCP and those projected in the subsequent planning period are provided in this CCP. The proposed reclamation and post-closure monitoring plans for the principal mine facilities are described in Sections 5.0 and 6.0.

1.5 Proposed Modifications to Mine Permit Boundary and Open Pit Design Limit

As part of this updated CCP, Tyrone is proposing to modify both the existing Little Rock Mine Permit Boundary and the current open pit design limit to account for the current life of mine (LOM) plan. Tyrone is proposing to expand the existing Little Rock Mine Permit Boundary by approximately 68 acres to account for the projected expansion of the open pit and associated disturbance areas outside the current permit boundary limits (**Figure 1-3**). Approximately 40 acres of the proposed 68 acre mine permit boundary expansion lies within the existing Tyrone Mine Permit Boundary. The Tyrone Mine (MMD Permit GR010RE) is currently under a revision process to incorporate the 2013 Tyrone CCP Update (Golder, 2013). Tyrone anticipates that the GR010RE permit boundary will be updated as part of that ongoing permit revision to reflect the proposed permit boundary changes shown on **Figure 1-3**. Tyrone is making these proposals to comply with NMMA 19.10.5.502 and 19.10.5.505.B. (1) that pertain to permit

modifications and revisions. In some instances the updated Permit Boundary and Mining Area Design Limit will overlap.

Tyrone is also proposing to combine and expand the current approved Little Rock Mine open pit design limit boundary. The proposed combined design limit boundary is referred to herein as the “Mining Area Design Limit.” The proposed Mining Area Design Limit presented on **Figure 1-3** increases the current open pit design limit boundary from approximately 197 acres to approximately 470 acres (Section 2.0 describes the associated mine facilities within the proposed Mining Area Design Limit). The proposed Mining Area Design Limit presented here is consistent with the proposed limit of disturbance presented in the Amendment to Mine Plan of Operations NMNM091644 (MPO Amendment) for the Little Rock Mine (Tyrone, 2013a). Further details of the proposed mine permit boundary and design limit changes are presented in Section 7.0.

2.0 EXISTING FACILITIES AND CONDITIONS

The existing Little Rock Mine Permit Boundary occupies approximately 610 acres in parts of Sections 16, 17 and 20, Township 19 South, Range 15 West, New Mexico Principle Meridian and Baseline. The existing topography, site features, existing and proposed permit boundaries, and section lines are shown on (**Figure 1-2**), and the topography, site features, and permit boundaries that are planned to be in place by the EOY 2017 are shown on (**Figure 2-1**).

The following sections describe the Little Rock mining facilities and operations, ownership history, past and current land uses, environmental setting, and mine material characteristics. In addition, pertinent permits and the operational DP for the Little Rock Mine are summarized herein.

2.1 Description of Mining Facilities

The principal historical mining features at the site include the open pit, the North and West Canyon overburden stockpiles, historic Ohio Mine and dam, and the reclaimed Copper Leach Stockpile (a.k.a. reclaimed leach stockpile) and Precipitation Plant (P-Plant). The existing open pit and overburden stockpiles occupy approximately 205 acres, while approximately 32 acres are associated with the reclaimed P-Plant and Copper Leach Stockpile. The existing haul road that provides access between the Little Rock and Tyrone mines covers an area of approximately 60 acres. In addition to these primary features of the Little Rock Mine, the current permits allow for operational facilities including a 46-kilovolt (kV) power distribution system, a secondary dewatering pipeline (dewatering pipeline alignment #2), and temporary operations and maintenance facilities that are all projected to be in place by the EOY 2017. The total existing and approved disturbance at the Little Rock Mine associated with the primary and ancillary facilities is approximately 320 acres.

Figure 2-1 depicts the primary elements of the Little Rock Mine that will be present at the EOY 2017, including the projected EOY 2017 pit configuration and western haul road. In addition, **Figure 2-1** shows the existing dewatering pipeline alignment #1, planned dewatering pipeline alignment #2, and new power line that will be present by the EOY 2017. The reclaimed Copper Leach Stockpile and P-Plant, existing seepage collection pipelines, North Stockpile, West Canyon Stockpile, and in-pit stockpile are also depicted in **Figure 2-1**.

2.1.1 Open Pit

The open pit at the EOY 2017 is anticipated to encompass approximately 280 acres (represented as blue line on **Figure 2-1**), including approximately 159 acres of BLM managed lands and approximately 121 acres of private land. The open pit is currently being mined in 50-foot benches, creating a terraced/benched pit wall that will ultimately have one or more flat bottoms. The anticipated EOY 2017 pit configuration spans California Gulch and portions of Deadman Canyon. During operation, storm water and ground water will be effectively managed as it is today under the current permit. Storm water from

California Gulch will continue to be directed to the main sump at the bottom of the open pit, and storm water from Deadman Canyon will be conveyed through a constructed diversion channel located along the eastern margin of the open pit. During operation, storm water, along with ground water inflow, will be pumped to the existing lined 1X1 pond (lined with high density polyethylene [HDPE]) located near the No. 1X Tailing Impoundment at Tyrone via dewatering pipeline alignments #1 and #2. The existing seepage collection pipeline from the reclaimed Copper Leach Stockpile and P-Plant area also connects to dewatering pipeline alignment #1, with the option of connecting up to dewatering pipeline alignment #2 in the future if site conditions warrant it. From the lined 1X1 pond, the collected water is conveyed through a booster pump station to the SX/EW raffinate tanks and used in the Tyrone Mine process water management system.

2.1.2 Reclaimed Facilities

A substantial amount of reclamation work has been conducted at the Little Rock Mine since the issuance of DP-1236 and MMD Permit GR007RE. Facilities where reclamation is complete include: the abandoned P-Plant and the Copper Leach Stockpile left by former operators (**Figure 1-2**); historic Ohio Mine underground openings that were plugged in 2011; and exploration roads, and all exploration holes located outside of the open pit boundary that were found and accessible were plugged in the first quarter of 2010 (Tyrone, 2011a). Reclamation of the P-Plant and the Copper Leach Stockpile commenced in February 2010 and all work was completed in 2010.

2.1.3 Overburden Stockpiles

Two pre-existing overburden stockpiles (the North Stockpile and West Canyon Stockpile) are located around the perimeter of the open pit (**Figure 1-2**). The North Stockpile is located on the northwest side of the existing open pit. This stockpile is currently being colonized by native vegetation and no additional reclamation measures are proposed for the portion of this area that will remain at the EOY 2017 (**Figure 2-1**).

A small existing stockpile called the West Canyon Stockpile that is located approximately 200 feet southwest of the projected EOY 2017 open pit limit has also been colonized by native vegetation and no additional reclamation measures are proposed for this historic overburden pile. The West Canyon Stockpile is composed of overburden rock previously mined from the open pit. Although no additional reclamation measures are proposed for the North and West Canyon stockpiles, reclamation costs are included in this CCP until financial assurance is released. Reclamation costs presented in **Appendix B** include ripping the stockpile surfaces to a depth of 18 to 24 inches, and revegetation.

Additionally, a new overburden stockpile, as described in the approved 2010 Little Rock Mine CCP (Tyrone et. al., 2010), will be under development within the Little Rock Mine open pit by the EOY 2017. This facility, referred to herein as the “in-pit stockpile”, is projected to cover an area of approximately

49 acres above the pit lake surface within the western portion of the open pit at the EOY 2017 (**Figure 2-1**). The in-pit stockpile, which will consist primarily of leach cap, is not anticipated to require any additional cover because the materials are non-acid generating, and have few apparent limitations as a plant growth media when compared to the native soils.

Topsoil resources will be salvaged during mining operations, and the salvaged material will be temporarily stored within the Mining Area Design Limit or the 9A Stockpile for future use as cover material. One potential location for temporary storage of the topsoil material within the Mining Area Design Limit is the North Stockpile. If the remnant of the North Stockpile is used for temporary storage of salvaged topsoil during mining operations, then it will be revegetated following removal of the topsoil for cover material. At present it is anticipated that alternate areas can be found within the proposed Mining Area Design Limit for storage of salvaged topsoil.

2.1.4 Historic Ohio Mine and Reservoir

The Ohio Mine was an underground copper mine with workings dating back to the early 1900's. The Ohio Mine facility includes a small shaft, adits, thin-walled concrete dam across California Gulch, small impoundment behind the dam, and pipeline that conducts impounded surface water to the lined 1X1 pond. All of the Ohio Mine features will be encompassed by the north lobe of the open pit by the EOY 2017 (**Figure 2-1**). Surface water that collects behind the Ohio Mine dam is currently being conveyed by pipeline to the lined 1X1 pond. This water will continue to be conveyed by pipeline to the lined 1X1 pond until the Ohio Mine dam is removed as part of the expansion of the open pit to the north. Once the Ohio Mine dam is removed, any surface water that enters the open pit will be collected within the open pit sump and pumped to the lined 1X1 pond.

2.1.5 Haul Roads

As depicted in **Figure 1-2**, the existing haul road provides access between the Little Rock and Tyrone mines, crosses Deadman Canyon over an existing spanning arch culvert. By the EOY 2017, all but approximately 4 acres of the existing haul road that provides access to the Tyrone Mine will be enveloped by the open pit (including the existing spanning arch culvert over Deadman Canyon) and removed as a part of mine operations. The existing haul road will be reconfigured and a new spanning arch culvert will be constructed within the proposed Mining Area Design Limit by the EOY 2017 as shown on **Figure 2-1** to provide access for mining operations. Ore from the Little Rock Mine will continue to be hauled to the Tyrone 2A, 4A, 4B, 4C or 4D leach stockpiles.

The western haul road depicted on **Figure 2-1** will be constructed by the EOY 2017 to provide access to the west end of the open pit for the in-pit stockpile. The western haul road is anticipated to be approximately 2,200 feet in length and lies within the proposed Mining Area Design Limit. Additionally, as with the ongoing mining operations, haul roads internal to the open pit will be extended from their current

elevations and locations and will progress downward as pit excavation advances. The in-pit haul road that will be present at the EOY 2017 is shown in **Figure 2-1**.

2.1.6 Dewatering System and Conveyance Pipelines

The dewatering system will pump surface water and ground water that accumulates in a sump located at the bottom of the open pit during operations, which allows the mine to operate during normal activities within the open pit and during rain events. Water quality monitoring is addressed in Section 6.3 of this CCP.

Dewatering systems will continue to pump surface water and ground water that accumulates in a sump located at the bottom of the open pit during operations. A series of temporary dewatering sumps will be excavated as the pit is lowered, and water extracted from these sumps is pumped to a booster station consisting of two sumps arranged in series that also serve as settling basins for sediments. Both sumps will be removed by the EOY 2017 as mining progresses within the open pit.

The booster station also receives seepage from the CLDS and CLDS-1 collection trenches. Water from the booster station is then pumped via a diesel powered pump through a 12-inch HDPE pipeline that extends to an existing 10-inch HDPE pipeline (dewatering pipeline alignment #1) that runs to the existing lined 1X1 pond (**Figure 2-1**). It is anticipated that dewatering pipeline alignment #2, extending northward from the open pit, will also be in place by the EOY 2017 to convey surface water and ground water inflow within the eastern portion of the pit to the lined 1X1 pond. This pipeline will also provide the option for redundancy for dewatering pipeline alignment #1, if needed. Post-closure water quality monitoring is addressed in Section 6 of this CCP.

2.1.7 Other Ancillary Facilities and Structures

In addition to the major mine components identified above, there are a number of key ancillary facilities and structures dispersed across the mine that support the operations at Little Rock. The ancillary facilities at the Little Rock Mine include: electrical power transmission lines and substations; storm water structures for drainage, diversion, and sediment control; and fencing.

2.2 Past and Current Land Uses

Lands in the vicinity of the mine have historically been used for mining, livestock grazing, timber and fuel wood harvesting, recreation, and wildlife habitat. Ponderosa pine was logged in the Big Burro Mountains south of the Little Rock Mine, and fuel wood has been cut from woodlands in this area for at least a century. Recreation in the area includes camping, picnicking, hunting, off-road vehicle use, hiking, horseback riding, and bicycling.

Current surrounding land uses include grazing, mining, and recreation. Grazing is the predominant land use surrounding the mine. Mining in the area of Little Rock dates back to the mid to late 1800s. During this period, mining and prospecting ranged from small shallow surface excavations to large scale underground workings. In the 1960s and early 1970s, operations at the Little Rock Mine were expanded. Mining during this period was intermittent but included the development of an open pit, leach stockpiles, and precipitation plant used to recover copper. The nearby Tyrone Mine went into large scale open pit production in the late 1960s. In the early 1990s, Tyrone began the process of obtaining the regulatory permits and land leases required to mine at the site.

2.3 Environmental Setting

The following sections present various aspects of the mine site, including its topography, geology, climate, hydrology, soils and vegetation, wildlife, and material characteristics.

2.3.1 Topography

The Little Rock Mine area is just west of the Continental Divide between the Big Burro and Little Burro Mountains. The mine is located on the northeastern slopes of the Big Burro Mountains, a northwest-southeast trending range approximately 22 miles long and 4 to 12 miles wide. The Little Burro Mountains are situated northeast of the Big Burro Mountains and are separated from the Big Burro Mountains by the Tyrone mine and the Mangas Valley (**Figures 2-2 and 2-3**). The Mangas Valley and the Little Burro Mountains are located within a structurally controlled regional topographic feature that trends northwest to southeast.

The topography in the vicinity of the Little Rock Mine reflects the relatively gentle northeastern slopes of the Big Burro Mountains (**Figures 2-2 and 2-3**). Burro Peak, on the Continental Divide, rises to an elevation of 8,035 feet above mean sea level (msl). By contrast, the elevation of the Mangas Valley north of the mine is around 5,800 feet above msl. The Continental Divide traces immediately to the east of the Little Rock Mine; bisecting the Tyrone Mine. The Divide separates Mangas Wash, which drains westerly toward the Gila River, from the southeasterly-draining Brick Kiln Gulch and Oak Grove Wash. The Continental Divide crosses the Little Burro Mountains northwest of Tyrone Peak at a maximum elevation of 6,439 feet above msl.

2.3.2 Geology

The mineral deposits at the Little Rock Mine are hosted in granitic rocks that have been altered by hydrothermal and supergene processes. The ore deposit consists of a copper oxide enrichment zone surrounded by leached cap and underlain by a mineral zone that contains minor amounts of pyrite and lesser amounts of chalcopyrite and chalcocite. Copper oxide ore will be mined and then transported to Tyrone for processing by solvent extraction and electrowinning (SX/EW). Leach cap material, the same material present in the stockpiles that surround the existing Little Rock Mine open pit, will be the primary

source of overburden. The majority of overburden rock could be used as a reclamation cover material. Minor amounts of sulfide containing rocks produced during mining will be placed on the Tyrone waste or leach stockpiles.

The Big Burro Mountains are primarily composed of Precambrian Burro Mountain Granite. This granite is part of a batholith that was intruded by the Tyrone laccolith nearly 56 million years ago (Kolessar, 1982). Both Precambrian Burro Mountain granite and Tertiary intrusive rocks are exposed in the vicinity of the Little Rock Mine. The surface geology at the Little Rock Mine is predominately Precambrian Burro Mountain granite, while Tertiary intrusive rocks are present throughout much of the area immediately south of the site (Trauger, 1972). Younger geologic units, such as Quaternary-Tertiary Gila Conglomerate and Quaternary alluvium occupy the Mangas Valley north of the Little Rock Mine. Gila Conglomerate was deposited as bolson fill and fan deposits derived from Late Tertiary and older tectonic uplifts. More recent alluvium was deposited unconformably on Gila Conglomerate north of the Little Rock Mine and is also present as valley fill along many present-day drainages including California Gulch and Deadman Canyon.

Several faults have been mapped in the area of the Little Rock and Tyrone mines in association with early geologic mapping (Trauger, 1972; Hedlund, 1978) and through mining and mineral exploration activities. The predominant geologic structures in the region are sets of northeast- and northwest-trending faults. Some of these faults exhibit hundreds of feet of offset and juxtapose different geologic units. The Austin-Amazon fault is a major northeast-striking fault approximately 0.4 miles northwest of the existing Little Rock Mine open pit. Two east-west trending faults are also located near or within the permit boundary. These include the Southern Star fault located along the northern perimeter of the permit boundary and an unnamed fault that runs through the permit boundary and is located approximately 0.3 miles north of the existing open pit (**Figure 2-4**). A generalized geologic map showing the exposed geology associated with the projected EOY 2017 open pit configuration is presented on **Figure 2-5**, and associated geologic cross sections through the projected EOY 2017 open pit are presented on **Figure 2-6**.

2.3.3 Climate

The Little Rock Mine is located in a semi-arid region in southwestern New Mexico, with elevations ranging from about 5,800 to 6,300 feet above msl (**Figure 2-3**). The climate is warm and dry, with mean annual precipitation of approximately 16 inches and a mean annual temperature near 50°F. Precipitation falls mainly as rain, but snow may occur from November to March. Most of the precipitation in the area falls during July through October in the form of rain during short, intense, thunderstorms. Approximately 60 percent of the precipitation falls during the summer months. Precipitation is characterized mostly by small magnitude events ranging from less than 0.1 to 0.25 inches per event. Larger magnitude rainfall events (greater than 1 inch) also occur in the summer months, but at a much lower frequency. Monthly precipitation is generally less than an inch per month from November through June, peaks in July, August, and September with between 2 and 3 inches per month, and generally falls to approximately

1 inch in October. Evaporative demand in this region is high and annual evaporation far exceeds annual precipitation.

Eight weather stations are located in the vicinity of the Little Rock Mine each with varying periods of record. Of those stations, the Tyrone Mine General Office station has the longest period of record (i.e., 1954 to the present). The Little Rock Mine station has a relatively short period of record, with records starting in 2001. Longer term records (more than 40 years) are available from five weather stations located near the mine. The five stations with the longest periods of record are:

- The Tyrone Mine General Office station, located at the Tyrone Mine at an elevation of 5,960 feet above msl;
- The White Signal station, located approximately 7 miles south at an elevation of 6,066 feet above msl;
- The Hurley station, located approximately 15 miles east at an elevation of 5,700 feet above msl;
- The Santa Rita station, located approximately 20 miles east-northeast at an elevation of 6,312 feet above msl; and
- The Fort Bayard station, located approximately 20 miles northeast at an elevation of 6,149 feet above msl.

These stations are considered fairly representative of the range of climate conditions at Little Rock. Long-term climatic records (spanning more than 100 years) are available for Fort Bayard.

2.3.4 Hydrology

The Continental Divide is located approximately 3 miles south of the Little Rock Mine and runs along the peaks of the Big Burro Mountains. The Continental Divide separates surface water drainages that are tributary to the Gila River from drainages that are tributary to the Mimbres River. The New Mexico Office of the State Engineer declared two ground water basins are present in the region. These are the Mimbres and Gila-San Francisco underground basins. Ground water beneath the Little Rock Mine is in the Gila-San Francisco ground water basin. The following sections further describe surface water and ground water resources in the vicinity of the Little Rock Mine.

2.3.4.1 Surface water

Surface water features in the area of the Little Rock Mine consists of ephemeral washes in California Gulch and Deadman Canyon (**Figure 1-2**). These ephemeral washes flow only in direct response to precipitation events and have channels that are above the regional bedrock aquifer. The washes do not support self-sustaining populations of fish or other aquatic species.

Deadman Canyon and California Gulch flow from south to north and converge at the north end of the site before discharging to a constructed diversion channel, and ultimately to the Mangas Wash. Whitewater

Canyon also contributes flows to the constructed diversion channel. Mangas Wash is a tributary to the Gila River, and the drainage is ephemeral in the vicinity of the Little Rock Mine. Both California Gulch and Deadman Canyon cross through the Little Rock Mine Permit Area. Storm water in California Gulch, upgradient of the Little Rock Mine flows to the Little Rock open pit. In response to runoff events, surface water converges with ground water in the open pit bottom. As previously described, water from the open pit is currently pumped to the lined 1X1 pond via dewatering pipeline alignment #1, and by the EOY 2017 dewatering pipeline alignment #2 will also be in place to convey surface water and ground water inflow within the eastern portion of the pit to the lined 1X1 pond.

At the EOY 2017, the open pit is expected to intersect the ephemeral Deadman Canyon drainage, requiring the management of storm water flows. A diversion channel will be constructed by the EOY 2017 to convey surface water flows from Deadman Canyon along the eastern portion of the open pit. The Deadman diversion will be constructed on non-acid generating rocks, similar to the surrounding terrain.

Two ephemeral springs occur outside the Little Rock Mine Permit Area. Sugar Loaf Spring occurs west of the Little Rock permit area and McCain Spring is located to the east of the Little Rock Mine Permit Area (**Figure 2-7**). Flows at these springs are sporadic, and primarily occur in response to precipitation events. The ephemeral nature of these springs and their location compared to the topography suggest that they are fed by infiltration on the upgradient slopes immediately adjacent to the springs and are not discharge points for regional ground water that would be hydraulically connected to the aquifer beneath the Little Rock Mine.

Surface water flow and water quality monitoring data are collected at several locations and the results are reported in accordance with DP-1236 (**Figure 2-7**). These monitoring locations include: seepage collection points CLDS and CLDS-1; Ohio Mine dam; flow samplers in California Gulch (LRFS-1 through LRFS-3); the open pit sump; and nearby Sugar Loaf and McCain springs. The three flow samplers are located near mine facilities and collect samples of ephemeral surface water within California Gulch during storm events. At closure (EOY 2017), a pit lake is expected to begin to form within the Little Rock Mine open pit due to the cessation of dewatering activities. Details of the predicted pit lake stage and water quality following closure are provided in Section 4.2.1.

2.3.4.2 Ground Water

Regional ground water exists within intrusive igneous rocks at the Little Rock Mine. These rocks include Precambrian granite, Tertiary granodiorite, and Tertiary quartz-monzonite (**Figure 2-4**). Precambrian granite is the most abundant rock type and is intruded by the Tertiary granodiorite in the area of the southwest portion of the projected EOY 2017 open pit. Several large Tertiary quartz-monzonite dikes trend southwest to northeast along the entire south side of the open pit. Ground water occurrence and flow within the igneous rocks is governed by secondary permeability (i.e., joints, fractures, and faults); the

direction of ground water flow is predominantly toward the northeast and in the direction of the Main Pit at Tyrone (**Figure 2-8**).

During mining operations, ground water flow patterns will continue to change in the vicinity of the Little Rock Mine open pit due to dewatering activities, as the open pit is advanced below the regional water table. In July 2013, ground water began infiltrating into the open pit and dewatering efforts commenced. The extraction rate from the Little Rock Mine open pit (from ground water dewatering, Ohio Dam flows, and stockpile seepage collection system flows) was approximately 2.7 gallons per minute (gpm) in July of 2013, and increased to approximately 178 gpm in August 2103 due to increased surface water, ground water inflows, and the advancement of mining within the pit (Tyrone, 2013b). Regional water quality generally meets all Section 20.6.2.3103 NMAC standards, but occasionally the standards for fluoride or manganese are exceeded due to natural background conditions.

Several geologic structures also affect ground water flow in the area of the Little Rock Mine. These structures include the Austin-Amazon and Southern Star faults and Tertiary quartz-monzonite dikes. The two faults are regionally extensive faults and act as low-permeability barriers to ground water flow (DBS&A, 2014). The Austin-Amazon and Southern Star faults are located to the northwest and north of the Little Rock Mine, respectively.

The Tertiary quartz-monzonite dikes act as low-permeability features, limiting ground water flow from the south side of the dikes to the north. Mining at the Little Rock Mine will excavate portions of the dikes below the regional water table, allowing ground water from the south to flow more readily to the Little Rock Mine open pit. Due to the presence of these low-permeability features (faults and dikes), the majority of the ground water in the Little Rock Mine area flows toward the Tyrone Main Pit rather than northerly toward the Mangas Valley. At closure (EOY 2017), a pit lake is expected to begin to form within the Little Rock Mine open pit due to the cessation of dewatering activities. Details of the predicted pit lake stage and water quality following closure are provided in Section 4.2.1.

Perched ground water is present in shallow alluvium beneath the California Gulch and Deadman Canyon drainages near the site. These shallow ground water systems are restricted to the alluvial sediments that overlie bedrock in the drainage channels. Saturation within these systems is intermittent, existing primarily during spring and summer runoff.

2.3.5 Soils and Vegetation

Two soil-vegetation associations have been identified within the mine permit area**.** Vegetation at the Little Rock Mine is characterized by mixed evergreen woodland dominated by pinyon pine (*Pinus edulis*), One-seed juniper (*Juniperus monosperma*), Emory oak (*Quercus emoryi*), and shrubs and scattered warm season grasses. The soils in the mountain slope mixed evergreen woodland association are mostly

loamy-skeletal Haplustolls. These soils are shallow, noncalcareous, and medium- to coarse-textured with moderate to high amounts of coarse fragments. These soils formed in residuum and colluvium from competent igneous rocks composed of quartz monzonite and granite.

Minor areas of bedrock are exposed at the surface. This association occupies the very steep back slopes and ridges of the Big Burro Mountains. Vegetation within the mountain slope mixed evergreen woodland association represents the lower elevation ranges of this community regionally. Ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*) are locally important subordinates in this community that may dominate minor sheltered topographic positions. A riparian corridor is associated with portions of the upper reaches of Deadman and Whitewater canyons and California Gulch. Fremont cottonwood (*Populus fremontii*) may occur as an incidental species in the riparian areas.

2.3.6 Wildlife

Wildlife species in the vicinity of the Little Rock Mine are representative of those communities that are found in southwestern New Mexico pinyon-juniper woodlands. Surveys conducted in the area of the Tyrone Mine indicate that there is a healthy diversity and abundance of vertebrate species using the habitat around the mine. At least 18 mammals, 79 bird species, and 5 reptiles have been documented in the vicinity of the Tyrone Mine (DBS&A, 1997; Metric Corporation, 1993 and 1996; and Dames & Moore, 1994).

Surveys to identify Federal and State threatened, endangered, and special status wildlife species, were conducted by Metric Corporation (1993 and 1996) and Tierra Environmental Consultants (2010) in the Little Rock Mine project area. Additional evaluations of the potential for federal and state threatened, endangered, and special status species and their habitats to occur in the project area will be conducted as a part of the BLM's NEPA process.

Existing wildlife habitats associated with the Little Rock Mine are largely upland, terrestrial habitats. No fisheries exist within the immediate vicinity of the proposed mine. The drainages which traverse the site are ephemeral and flow only in response to storm events or spring snowmelt.

2.3.7 Material Characteristics

Tyrone has developed a classification of the mineralization types that occur in the rocks at the Little Rock Mine area. This classification system was developed to characterize the deposit from an ore processing perspective. Mineral type information is routinely used for detailed mine planning and for copper production forecasting. The basic theme of the mineral type designation is to identify the type of copper mineralization and acid neutralizing potential associated with the ore body. This ore body contains a high concentration for calcite veins, which reduce copper leach recovery. The mineral information is used to evaluate the application concentration of leach solution for economic copper recovery.

These sample results also have an environmental application. Acid-base accounting (ABA) and total metals analyses were conducted on an initial group of 90 samples in order to evaluate the metal mobility/reactivity of the rocks for each of the mineral types defined for the area. A supplemental group of 34 samples were submitted for ABA determinations in August 1998. The collective results of the 124 samples from the two sampling campaigns indicate that the mineral types at the Little Rock Mine have very little to no potential to generate acid. There are three primary mineral types found within the Little Rock Mine Permit area in addition to reclamation borrow material. These mineral types are described below.

Leach Cap

The distinguishing minerals in leach cap consist predominantly of goethite and hematite. No sulfide minerals are known to occur in the leach cap; the degree of oxidation is complete. Other accessory minerals identified within leach cap include calcite, montmorillonite, kaolinite, and specularite.

The leach cap is hosted entirely by Precambrian granite. The granite is composed primarily of the minerals quartz, orthoclase, plagioclase and biotite that occur as coarse-grained crystals. The degree of fracturing within leach cap is related to its proximity to oxide copper mineralization. The fractures are more abundant adjacent the oxide zone and diminish outward. Goethite and hematite are present as secondary minerals, which are weathering products of oxidation of the pre-existing pyrite and chalcopyrite grains. Other secondary minerals mentioned above occur in association with the rock forming minerals such as feldspars altered to clay, specularite in veinlets, and calcite that is associated with iron oxides, feldspars, and also as discrete crystals. The ABA data for leach cap strongly suggest that it will not generate acid and has a moderate potential to neutralize acid. The leach cap comprises the bulk of the overburden rock mined from the open pit.

Copper Oxide

The distinguishing mineral in copper oxide is chrysocolla, which is the major ore component at the Little Rock Mine. Like leach cap, no sulfide minerals are known to occur in the oxide copper zone and the degree of oxidation is complete. Other accessory minerals include goethite, hematite, calcite, montmorillonite, kaolinite, white mica (sericite), malachite, and azurite.

Masses that contain varying amounts of manganese, iron, and copper in an oxide form are also present in volumetrically minor amounts. The oxide copper mass is entirely hosted by Precambrian granite. The oxide copper zone is the most fractured of all the rock types at the Little Rock Mine. The ABA data strongly suggest that the oxide copper will not generate acid and has a moderate to strong potential to neutralize acid. The oxide copper rock is the ore being mined at the Little Rock Mine and hauled to Tyrone.

Chalcopyrite-Pyrite

Chalcopyrite and pyrite are the distinguishing minerals for this mineral type. Accessory minerals identified include chalcocite, covellite, montmorillonite, kaolinite, white mica (sericite), specularite, bornite, and calcite. The copper- and iron-bearing minerals are principally in a sulfide form (not including the rock-forming minerals). This sulfide zone does not contain any appreciable amounts of secondary oxide minerals suggesting limited oxidation within this zone.

Precambrian granite is the host rock to this mineral type. Fractures are present within this zone, but at a lower density than is observed in the oxide copper zone. The presence of veinlets containing chalcopyrite, pyrite, quartz, and calcite is a distinctive feature of this mineral type. The collective ABA data show that the sulfides have a very low potential to generate acid, with sufficient neutralizing capacity to neutralize all of the acid that may potentially be produced. The sulfide zone rocks therefore also can be classified as having a moderate to high potential to neutralize acid. This mineral type is generally considered to be non-ore rock and constitutes a very small amount of the material being mined.

2.3.8 Overburden Materials:

Traditional cover/topsoil resources are scarce in the vicinity of the Little Rock Mine. The native soils are thin and contain moderate volumes of rock fragments. In addition, the slopes are steep and limit the practicality of operating equipment for topsoil salvage. However, the leach cap overburden has few apparent limitations as a plant growth media when compared to the native soils. The determination of suitability of these materials is based on observations of the establishment of perennial native vegetation on the pit walls, on the North Stockpile and West Canyon Stockpile, and an evaluation of chemical and physical characteristics of the overburden rock and native soils.

A cover design report was prepared for the Little Rock Mine and was submitted to MMD and NMED in 2004 (Golder, 2004). This report contains cover material characterization information and unsaturated flow modeling results that are relevant to the expected performance of the cover and overburden to be used at the Little Rock Mine.

Overall, the leach cap materials are non-acid generating. Laboratory analyses indicate there are no apparent chemical limitations with respect to salinity in either the leach cap or the native soils and the pH and extractable nitrate concentrations occur at similar levels in both materials. The leach cap is moderately coarse textured and contains moderate volumes of rock fragments. The native soils exhibited similar characteristics and are moderately coarse textured with moderate amounts of rock fragments (PDTI, 2000 and 2005). Thus, the leach cap is considered to be a reasonable substitute for native soils.

Although the facilities to be closed at the Little Rock Mine are not anticipated to require additional covers (because they consist of non-acid generating material), there is adequate volumes of cover materials

identified at the Little Rock and Tyrone mines (Golder, 2005 and 2006) that could be used as suitable cover material if the need arises.

The Little Rock Mine topsoil salvaging plan also calls for the salvaging of identified topsoil resources of greater than 300 cubic yards in volume with a minimum thickness of two feet. These areas will be identified during the clearing and grubbing of undisturbed areas in preparation for mining.

2.4 Permits and Discharge Plans

Tyrone holds the state and federal permits and authorizations necessary to produce copper from the existing facilities at the Little Rock Mine. Current permits include a New Mexico Mining Act (NMMA) permit from the MMD as an existing mining operation (Mining Act Permit No. GR007RE). The Little Rock Mine is also subject to Discharge Permit 1236 (DP-1236), issued by the New Mexico Environment Department (NMED). Because a portion of the lands at the Little Rock Mine are managed by the BLM, the mine also maintains a Mine Plan of Operations in conformance with the BLM Surface Management Regulations (43 CFR 3809). **Table 1-1** lists the permits under which the Little Rock Mine currently operates; these permits are further discussed in the following sections.

2.4.1 Mining Act Permit, GR007RE

The Little Rock Mine was permitted with MMD as an existing mining operation in 1998 (Permit No. GR007RE). A CCP was originally submitted to MMD in 1997 as Revision 97-1 to the Mining Act Permit; the revision approving the CCP was granted on December 29, 2000. Revision 02-2 to the permit was granted on November 22, 2004, which approved placing the Little Rock Mine on standby status through November 5, 2007. Revision 10-1 was granted on December 30, 2010, approving the change from standby to operating status, incorporating an updated CCP (Tyrone et al, 2010) for the Little Rock Mine, and replacing Revision 97-1 to Permit No. GR007RE.

Permit Modification 13-2 to Permit No. GR007RE authorized changes to the open pit design limit in four (4) locations, increasing the open pit design limit by approximately eight acres. Additional modifications to the Mining Act Permit have been approved or are pending approval by MMD, as listed in **Table 1-1**.

2.4.2 NMED Discharge Permit, DP-1236

In parallel to the Mining Act Permit and CCP process, a discharge permit was developed in coordination with NMED to address operational and post-closure water quality. DP-1236 was issued by NMED on December 27, 2000, and several conditions address closure requirements and incorporate the CCP submitted by Tyrone. Ongoing mining operations conducted in conformance with the terms of the existing permit are authorized during the discharge permit renewal process.

Pursuant to the Water Quality Control Commission (WQCC) rules, the discharge permit addresses the discharges from the earlier (now reclaimed) Copper Leach Stockpile and other mine water management requirements. In approving the DP-1236, NMED determined that the requirements of Title 20 of the New Mexico Administrative Code (NMAC), Part 6.2.3109.C were met.

The conditions of the DP-1236 provide for monitoring and reporting, an operational plan, a corrective action plan, a contingency plan, and a closure plan, including requirements such as quarterly reporting, notice of operational changes and pit configuration, geochemical and hydrologic modeling, waste rock management, and characterization of the exposed rock. Financial assurance for closure and post-closure activities is also included in DP-1236. In May 2013, NMED approved a revised DP-1236 amendment for the construction and operation of dewatering facilities to remove ground water and storm water from the open pit during mining (NMED, 2013).

2.4.3 National Pollutant Discharge Elimination System (NPDES) Permit

In accordance with the requirements of the U.S. Environmental Protection Agency's (EPA's) National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit (MSGP), Tyrone maintains a Storm Water Pollution Prevention Plan (SWPPP) that is inclusive of the Little Rock Mine.

The EPA issued the current MSGP on September 29, 2008; Tyrone operates under permit authorization number NMR05GB76, confirmed by the most recent NOI acknowledgement issued by the EPA on September 28, 2011. The SWPPP identifies pollution prevention procedures for areas of the site that could potentially discharge storm water associated with mining activities and implements best management practices (BMPs) for the management and control of storm water (Tyrone, 2012). The SWPPP will be updated to reflect the planned expansion of the Little Rock Mine.

2.4.4 Water Rights

Tyrone has a temporary permit from NMOSE License No. 02260 License to divert and consume up to 1,100 acre-feet per year at the Little Rock Mine. This permit allows Tyrone to dewater and use pit water for beneficial uses that would include SX-EW and leaching. Additionally the permit could be modified to allow for reclamation and any other approved beneficial use recognized by NMOSE. Tyrone has additional rights that could be utilized for the Little Rock Mine if there is a need; however, current mine plans and hydrology studies indicate that the current permit will suffice any anticipated need.

2.4.5 Air Quality

The Tyrone facility, inclusive of the Little Rock Mine, has two active air quality permits: a New Source Review (NSR) construction permit and a comprehensive air quality operating permit under Title V of the Clean Air Act. The NSR Permit (NSR 2448) has no expiration date. The Tyrone Title V permit P147

covers air emissions from Tyrone facilities, including the Little Rock Mine, and associated infrastructure (NMED, 2010). This permit is currently valid through October 24, 2015.

2.4.6 Hazardous Waste

The Tyrone facility, inclusive of the Little Rock Mine, is currently classified as a small-quantity hazardous waste generator under the Resource Conservation and Recovery Act (RCRA). Tyrone generates hazardous waste under EPA identification number NMD035806405 in compliance with the requirements for hazardous waste generators set forth in 40 CFR 262 and the applicable portions of 40 CFR 265.

2.4.7 Clean Water Action Section 404 Permit

The U.S. Army Corps of Engineers (Corps) issued an individual permit under Section 404 of the Clean Water Act on December 8, 2010 for the Little Rock Mine (Corps Action No. SPA 2009-00628-ELP). The permit allowed impacts to California Gulch for the open pit and the haul road crossing over Deadman Canyon and is valid for a ten-year period. The Corps also issued a nationwide permit in 2009 for impacts to California Gulch related to the reclamation of the Copper Leach Stockpile and P-Plant. In parallel to the 404 permits issued by the Corps, the NMED provided water quality certifications pursuant to Section 401 of the Clean Water Act.

2.4.8 BLM Permitting

Tyrone began the process of obtaining the regulatory permits required for operation of the mine in the early 1990s. The *Copper Leach Claim Group Plan of Operations* was submitted to the BLM in October 1993, and a Mining Operations Site Assessment was initiated in 1994 as part of the mine permitting process under the NMMA. To comply with the National Environmental Policy Act (NEPA), the BLM oversaw the preparation of an EIS. The Final EIS was completed in September 1997 (BLM, 1997a), and a Record of Decision (ROD) and MPO approval were completed in December 1997 (BLM, 1997b). Commencement of mining was delayed due to other required state permitting processes and the fluctuation of the copper market.

In 2009, the BLM approved a modification to the MPO (also referred to as the "Stockpile MPO Amendment") to allow in-place reclamation of the existing Copper Leach Stockpile and P-Plant (Tyrone, 2009). The BLM reviewed the *Little Rock Mine Stockpile Reclamation Final Environmental Assessment* (EA) and issued a Finding of No Significant Impact (FONSI) in 2009 to approve the Stockpile MPO Amendment (BLM, 2009a,b). Reclamation activities included excavating impacted soil and reshaping, covering, and revegetating reclaimed areas to restore the disturbed landscape and reduce infiltration and potential impacts to local surface water and ground water quality to meet the requirements of the MMD and NMED. Improvements to an access road across land managed by the USFS were also approved. The 2009 Stockpile MPO Amendment addressed specific reclamation changes and did not change operating activities at the Little Rock Mine.

In October 2010, the BLM issued a Determination of NEPA Adequacy (DNA). Approval of the DNA by the BLM authorized Tyrone to reestablish operations at the Little Rock Mine. Construction and development of the mine began in 2011. In 2013, BLM accepted minor modifications to the Little Rock MPO that authorized an adjustment to the pit configuration (BLM, 2013a), the installation of the replacement monitoring well 1236-2012-01 (BLM, 2013b) and related access, and dewatering pipeline alignment #1 (BLM, 2013c). Tyrone also recently submitted an amendment to the MPO to support the planned expansion of mining at Little Rock described within this CCP and related operations on lands managed by the BLM (Tyrone, 2013a).

3.0 DESCRIPTION OF COMPLETED RECLAMATION PROJECTS

As previously noted, a substantial amount of reclamation work has been conducted at the Little Rock Mine since the issuance of DP-1236 and MMD Permit GR007RE. Facilities where reclamation is complete include the abandoned P-Plant and the Copper Leach Stockpile both left by former operators (**Figure 1-2**), mine openings at the Ohio Mine area, and exploration drill holes and roads located outside of the pit boundary. Details of the reclamation conducted at each of these facilities are provided below.

3.1 P-Plant Reclamation

In May 2009, MMD and NMED approved the *Little Rock Mine Leach Pad and Precipitation Plant Reclamation Construction Design Quality Assurance Plan* (CDQAP) for the Copper Leach Stockpile and P-Plant (Telesto, 2009). In December 2009, the BLM approved a modification of the Mine Plan of Operations for in-place reclamation of the Copper Leach Stockpile and P-Plant and accepted the CDQAP as the design for this work. This allowed Tyrone to proceed with the reclamation plan for the Copper Leach Stockpile and P-Plant areas in order to stabilize leached ore, impacted soils and concrete, and to reduce seepage to ground water in the vicinity of the Copper Leach Stockpile. Details of the reclamation of the P-Plant were provided in the Construction Quality Assurance Report (CQAR) submitted to the MMD and NMED in September 2011 (Telesto, 2011).

Reclamation of the abandoned P-Plant facility commenced in February 2010 and the work was completed in 2010. By the EOY 2017, erosion monitoring will have been conducted for 7 years, and will continue for an additional 5 years (2018 through 2022) in accordance with Permit Revision 10-1 to Permit GR007RE.

3.2 Copper Leach Stockpile Reclamation

Reclamation of the Copper Leach Stockpile commenced in February 2010 and the work was completed in 2010. The reclaimed Copper Leach Stockpile is composed of copper oxide ore that was leached with sulfuric acid during the early 1970s. Copper Leach Stockpile reclamation included grading to a stable configuration, covering with three or more feet of approved cover material, construction of storm water controls, and seeding. Post-reclamation seepage is now collected in two subsurface collection trenches located beneath the lower part of the reclaimed east outslopes (CLDS and CLDS-1). Seepage is routed through the existing pipeline to the lined 1X1 pond and then conveyed through a booster pump station to the SX/EW raffinate tanks and used in the Tyrone Mine process water management system. By the EOY 2017, erosion monitoring will have been conducted for 7 years, and will continue for an additional 5 years (2018 through 2022) in accordance with Permit Revision 10-1 to Permit GR007RE.

3.3 Reclamation of Exploration Holes and Mine Openings

Old mine openings at the Ohio Mine area were closed in 2011 in accordance with Permit Revision 10-1 to Permit GR007RE. Additionally, expansion of the Little Rock Mine open pit will encompass the Ohio Mine

area, expected in 2016, and the old exploration drill holes within the pit limits will be mined-out. Twenty-two old exploration drill holes located within the mine permit boundary, but outside of the pit limits, were plugged in 2011 in accordance with approved procedures presented in the Little Rock Mine Drillhole Plugging Report (Tyrone, 2011a). An additional six drill holes were plugged by Tyrone that were not listed in the 2011 report. Also, 25 boreholes that were likely part of an effort to identify the depth to water (without installation of a well) were plugged in 2008, 2011 and 2012. A total of 50 plugging records (dated from 2008 to 2012) are located under OSE file numbers GSF-4548POD1 through POD50 associated with the plugging of these exploration drill holes.

4.0 FACILITY CHARACTERISTICS AND RECLAMATION PERFORMANCE STANDARDS

To standardize the development of the financial assurance cost estimate associated with this CCP, facilities with common characteristics and mine function have been grouped together in this section. Thus, the stockpiles, open pit, haul roads, conveyance pipelines, and ancillary facilities and structures are identified as the primary reclamation facility groups. Sections 4.1 through 4.5 provide general descriptions, estimated areas of disturbance, and reclamation performance standards associated with each of these facility groups.

The reclamation practices proposed within this CCP are intended to limit future environmental impacts and, to the extent practicable, provide protection of air and water resources consistent with state and federal laws. The conceptual reclamation design approach for closure/closeout has been prepared to consider current disturbance and completed and ongoing reclamation for the next five years. This 5-year update to the CCP revises the approved Updated CCP for the Little Rock Mine (Tyrone et al, 2010). This Updated CCP and financial assurance represents a “snapshot in time” that reflects the closure scenario with the highest reclamation cost based on the Little Rock Mine plans and site conditions.

Tyrone analyzed the 5-year mine plan to identify the highest liability year based on the volume of earthwork associated with mine reclamation. The MMD and NMED reviewed the analysis with Tyrone, in 2013, and approved using the 2017 mine plan. Final designs, technical specifications, and construction quality assurance plans for each facility will be prepared when mining ceases or as part of accelerated reclamation activities.

The performance objectives presented herein for closure/closeout of the facilities were developed with the intent of meeting rules and requirements associated with the WQA, WQCC Regulations, Copper Rules, NMMA, and applicable elements of 40 CFR 3809. The performance objectives for closure/closeout of the stockpile areas, haul roads, conveyance pipelines, and ancillary facilities and structures at the Little Rock Mine include: re-establishment of a self-sustaining ecosystem; stabilize the reclaimed areas to minimize future impacts to the environment and to protect air and water resources; limit ponding on the final cover and/or regraded surfaces; reduction of infiltration; containment of seeps and sediment transport; and control of releases to perched and regional ground water. The existing and planned closure/closeout activities, key design criteria, and reclamation plans for each of the facility groups to be closed are presented in Section 5.0.

4.1 Stockpiles

Two stockpiles currently exist within the proposed Mining Area Design Limit, including the reclaimed Copper Leach Stockpile, and the North overburden stockpile. The West Canyon Stockpile, consisting of overburden rock, is located immediately west of the reclaimed Copper Leach Stockpile. Additionally, two

in-pit operational stockpiles will ultimately be developed within the Little Rock Mine open pit, one of which will be under development by the EOY 2017. At this time, this facility is projected to cover an area of approximately 49 acres and is located to the west of the open pit sump (**Figure 2-1**). The second in-pit stockpile will be located within the northern portion of the open pit and is projected to begin to be developed in 2018. Both in-pit stockpiles shown on **Figures 1-3** will consist primarily of leach cap, and are not anticipated to require additional cover at closure because the materials are non-acid generating, and the leach cap material has few apparent limitations as a plant growth media when compared to the native soils.

As previously described in Section 3.0, the former Copper Leach Stockpile was reclaimed in 2010. The stockpile was covered with three or more feet of leach cap overburden material and is performing well based on the 2013 Vegetation Assessment (Golder, 2014). The 32-acres of reclaimed Copper Leach Stockpile consisted of: approximately 10 acres of top surface, 9 acres of outslopes, 12-acres of perimeter area and 1 acre of reclaimed P-Plant. Since 2010, approximately 2 acres of perimeter area that was seeded as part of the reclamation was removed due to the expansion of the Little Rock Mine open pit. The two overburden stockpiles (the North Stockpile and West Canyon Stockpile) are currently being colonized by native vegetation, are erosionally stable, and no additional reclamation measures are proposed for these two facilities, pending vegetation studies. The North Stockpile covers an area of approximately 4 acres, and the West Canyon Stockpile covers approximately 1.5 acres.

4.2 Open Pit

Open pit mining is projected to continue at the Little Rock Mine for an additional seven years, through 2020. The conceptual end of mine life pit configuration, presented in **Figure 1-3**, will enable mining of approximately 135 million tons of leachable ore, which will be transferred to the adjacent Tyrone facility for copper extraction. Additionally, an estimated 140 million tons of waste rock will be mined to access the leachable ores. The pit configuration at the EOY 2017 will encompass approximately 280 acres within the proposed Mining Area Design Limit, with a total of approximately 104 acres of accessible flat areas targeted for reclamation (**Figure 2-1**).

Predictive ground water flow and geochemical modeling was recently completed by Daniel B. Stephens & Associates (DBS&A) for the Little Rock Mine area to evaluate the rate of rise of the pit lake following cessation of dewatering and the associated estimated water quality of the pit lake water following closure. The predictive modeling results are described in detail in the Groundwater Flow and Geochemical Modeling Report for the Little Rock Mine (DBS&A, 2014), and are summarized below. The reclamation plan for the Little Rock Mine open pit is described in Section 5.2.

4.2.1 Updated Ground Water Flow and Geochemical Modeling

Predictive ground water flow and geochemical modeling was conducted to evaluate ground water and pit lake conditions at closure and to satisfy requirements of DP-1236 (DBS&A, 2014). Sources of water inflow to the open pit considered in the modeling included the following:

- Ground water inflow;
- Direct precipitation on to the lake surface;
- Runoff within the perimeter of the pit; and
- California Gulch storm water.

Water outflow from the pit lake included evaporation from the lake surface and flow from the pit lake to adjacent ground water in some areas.

4.2.1.1 Ground Water Flow Modeling Results

The ground water flow model was developed by DBS&A by extending the existing model used for the Tyrone Mine Stage II Abatement Plan Proposal (Stage II APP, [DBS&A, 2012]), which is a three dimensional MODFLOW (Harbaugh et. al, 2000) model. Modifications to the model presented in the Stage II APP include: (1) expansion of the model domain to the west and southwest; (2) addition of 5 model layers to better represent ground water conditions in the vicinity of the Little Rock Mine open pit; (3) extension of the Southern Star Fault (a low-permeability feature) to the west; (4) addition of the Austin-Amazon and Tertiary quartz-monzonite dikes as horizontal flow barriers; and (5) detailed simulation of transient, site-specific recharge for the Little Rock Mine area and upgradient watersheds (i.e. Deadman Canyon and California Gulch) using local climate and soils data. Once these changes were made, the model calibration was updated with an emphasis placed on the Little Rock Mine area.

The expanded ground water flow model was then used to predict the following:

- Drawdown at the end of mining caused by pit dewatering;
- Pit lake area and ground water elevation at closure;
- Ground water levels and ground water flow directions at closure; and
- A water budget for the pit lake, including ground water inflow and outflow rates and losses due to evaporation.

Based on the predictive simulations, drawdown at the open pit at the end of mining is estimated to be approximately 340 feet. Once mining is complete and dewatering is stopped, the pit will begin to fill with water, due primarily to ground water inflow. The ground water inflow rate is estimated at approximately 170 gpm at the end of mining and decreases as the lake level rises. The ground water inflow rate is predicted to be approximately 100 gpm once the pit lake water level begins to stabilize at an elevation of 5,700 feet msl. The pit lake is predicted to rise to an elevation of approximately 5,665 feet msl at 30 years

following closure, and then generally stabilizes at an elevation of approximately 5,700 feet msl at approximately 80 years after closure. At an elevation of 5,665 feet msl, the pit lake will cover approximately 38 acres and will hold an estimated 3,940 acre-feet of water. At the 5,700-foot level, the lake will cover approximately 42 acres and hold an estimated 5,290 acre-feet of water.

The final simulated pit lake level is 65 feet below the lowest point along the crest of the Little Rock Mine open pit (5,765 ft. msl). As the lake surface area increases, evaporation is expected to account for a greater proportion of the outflow than ground water outflow. Water is predicted to flow through the lake and into ground water along the northeast portion of the open pit. Ground water derived from the pit lake is expected to flow toward the Tyrone Main Pit, which unlike the Little Rock Mine open pit, will continue to be dewatered during the post-closure period. Further details of the predictive ground water flow and geochemical modeling project completed by DBS&A are presented in the Groundwater Flow and Geochemical Modeling Report for the Little Rock Mine (DBS&A, 2014).

4.2.1.2 Geochemical Modeling Results

The geochemical modeling platform PHREEQC Interactive (version 3.0) (Parkhurst and Appelo, 1999) was used by DBS&A to perform mixing and equilibrium calculations to estimate post-closure Little Rock Mine pit lake water quality (DBS&A, 2014).

The mixing and equilibrium calculations were performed using relative quantities of water with differing water quality for the individual sources to the Little Rock Mine pit lake. The individual water flow and chemistry inputs in the model included the following:

- Ground water inflow was represented by simulated inflow rates at 30 years and 100 years after closure calculated by the ground water flow model, while ground water quality was characterized by recent sampling at upgradient monitor wells LRW-4 and LRW-5. The water quality of LRW-5 was represented by averaging the chemistries of samples collected from 2006 to present. The quality of the water represented by well LRW-4 sampling results was determined by averaging the data over the period 2006 through 2010. Based on results of the ground water flow model, 98 percent of the water quality input was assigned the water quality consistent with LRW-5, and the remainder was assigned water quality consistent with LRW-4.
- Direct precipitation on to the lake surface was calculated using the simulated pit lake areas at 30 years and 100 years following closure and a mean annual precipitation of 16 inches based on the observed climate history at National Climatic Data Center (NCDC) Fort Bayard weather station (NCDC Coop 293265). The chemistry of this precipitation was represented by an average of monthly data collected at the Gila Cliff Dwellings National Monument meteorological station between 1985 and 2012.
- Pit wall runoff was estimated by applying the Soil Conservation Service (SCS) curve number (CN) method (NRCS, 2004) and using daily precipitation values based on the observed climate history at Fort Bayard. CNs of 80 and 90 were used for the in-pit overburden stockpile areas and exposed pit wall surfaces, respectively. The areas and relative proportions of the exposed materials were determined from the post-mining mineralization map presented in the Amendment to Mine Plan of Operations (Tyrone,

2013). Water quality of the pit wall runoff for these geologic materials was determined from the data presented in URS (2009).

- California Gulch storm water, upgradient of the open pit, will continue to be diverted to the Little Rock Mine pit lake. Average annual runoff from this watershed was estimated using HEC-HMS modeling performed by Telesto (2014). Surface water quality in California Gulch upgradient of the Little Rock Mine is monitored at location LRFS-1. Average water quality at this monitor location for the 5-year period between August 2008 and July 2013 was used to represent the chemistry of California Gulch storm water.
- Evaporation is an important contributor to the water balance of the pit lake, and the geochemical modeling includes the effects of evapo-concentration on pit lake water chemistry.

Results of the geochemical modeling are reported in **Table 4-1** for 30 years and 100 years following closure and indicate that applicable surface water and ground water standards are expected to be met with the exception of fluoride. Fluoride and manganese concentrations are naturally elevated in some ground water in the Little Rock and Tyrone areas (DBS&A, 2012), and the fluoride concentration is predicted to be above the Section 3103 standard of 1.6 milligrams per liter (mg/L). Predicted fluoride concentrations at 30 and 100 years after closure are 2.23 and 3.01 mg/L, respectively.

The predicted manganese concentration at both 30 and 100 years after closure is 0.11 mg/L; the Section 3103 standard for manganese is 0.2 mg/L. Predicted sulfate and total dissolved solids (TDS) concentrations are relatively low (**Table 4-1**), and the expected pH is slightly alkaline at approximately 7.9 standard units (su). These results are consistent with the geology of the Little Rock Mine deposit and general lack of sulfide bearing rocks expected to be exposed at the end of mining.

4.3 Haul Roads

A new haul road, designated as the western haul road, will be constructed by the EOY 2017 along the northwestern edge of the conceptual pit configuration to provide access to the west end of the pit for future stockpile construction (**Figure 2-1**). The western haul road will be constructed within the proposed Mine Area Design Limit, and is anticipated to be approximately 2,200 feet in length and will cover approximately 15 acres. The western haul road surface will be approximately 95 feet wide.

Depending on the location of the haul road with respect to the wall of the open pit, the road surface will be flanked by single or dual berms. Each berm will measure approximately 24-feet wide and 6-feet tall to accommodate the largest haul trucks that will be using the road.

By the EOY 2017, all but approximately 4 acres of the existing haul road, including the existing spanning arch culvert over Deadman Canyon which will be removed as a part of mine operations (**Figure 2-1**). A new spanning arch culvert will be constructed in the vicinity of the Deadman Canyon diversion by the EOY 2017.

4.4 Conveyance Pipelines

Water extracted from the open pit is currently being conveyed to the lined 1X1 pond via dewatering pipeline alignment #1, which extends northward from the current pit configuration to the lined 1X1 pond (**Figure 2-1**). It is anticipated that dewatering pipeline alignment #2, extending northward from the open pit, will also be in place by the EOY 2017 to convey surface water and ground water inflow within the eastern portion of the pit to the lined 1X1 pond. This pipeline will also provide the option for redundancy for dewatering pipeline alignment #1, if needed. Dewatering pipeline alignment #1 is approximately 6,000 feet long, with approximately 2,400 feet located within the Little Rock Mine Permit area. Dewatering pipeline alignment #2 will be approximately 2,570 feet long, with approximately 1,900 feet located within the Little Rock Mine Permit area.

Impacted waters (generally flowing between 0 and 5 gpm) from the reclaimed Copper Leach Stockpile are intercepted in the CLDS and CLDS-1 seepage collection systems and will continue to be routed through the existing seepage collection pipeline to dewatering pipeline alignment #1 or #2 throughout the post-closure period.

4.5 Other Ancillary Facilities and Structures

A miscellaneous group of ancillary facilities and structures are present at the Little Rock Mine including: operational and exploration roads; dewatering systems (including booster pump stations, pit dewatering sumps, decant ponds, HDPE pipelines, and power supply); electrical power distribution system and components; storm water structures for drainage, diversion, and sediment control; equipment storage areas; and fencing. The total estimated disturbance area associated with the ancillary facilities and structures is approximately 5.5 acres. Also, an additional 10 acres of area has been included in the reclamation cost estimate for allowance for additional disturbed areas within the Mine Permit area. The additional disturbed areas may include small staging areas, utility corridors, haul roads, pull-offs, stockpile expansions, or other miscellaneous unforeseen changes for operations.

5.0 RECLAMATION PLAN AND DESIGN CRITERIA

The CCP that is proposed for the Little Rock Mine is intended to reclaim existing and the newly disturbed areas and achieve compliance with state and federal regulations on mine reclamation and water quality protection. The reclamation plan and associated design criteria conform to the closure requirements described in DP-1236 and the Copper Mine Rules, closeout requirements described in MMD Permit GR007RE (MMD, 2000; 2010), and applicable mine reclamation regulations set forth by the BLM (3809.401(b)(3) and 3809.420(b)(3)). The reclamation will provide for the establishment of a self-sustaining ecosystem consistent with the designated post-mining land uses and life zone of the surrounding area, which for the Little Rock Mine, is wildlife habitat.

The reclamation plan was developed with consideration of the site-specific conditions that will exist at the Little Rock Mine at the EOY 2017. The general setting of the Little Rock Mine area is shown on **Figures 1-2** (existing features) and **2-1** (EOY 2017 features), and the closure or reclamation designs are depicted in the drawing set provided in **Appendix A**. The designs were developed to provide enough information to calculate the financial assurance cost estimate.

The reclamation proposed for each of the major facilities is discussed in Sections 5.1 through 5.5. The plans and methods developed herein represent relatively detailed conceptual designs for reclamation of the facilities. More specific plans will be developed prior to mine closure. A final design (CDQAP) for reclamation and closure will be prepared by Tyrone for submittal to and approval by the State of New Mexico with joint review by the BLM at least 180 days prior to commencement of reclamation. The CDQAP will be a detailed description of the work proposed to be performed to close the site. Monitoring and maintenance activities will follow primary reclamation and will continue for approximately thirty years as described in Section 6.0.

As previously described in Section 3.0, several facilities have been reclaimed and additional facilities are projected to be reclaimed by the EOY 2017. Erosion and vegetation establishment monitoring will continue at these facilities in accordance with the MMD Permit. Additionally, the Ohio Dam and associated facilities within the Ohio Mine area are currently scheduled to be completely mined out in 2016, and all but approximately 4 acres of the existing haul road between the Little Rock and Tyrone mines will be mined out by the EOY 2017. The following sections describe the specific facilities that will still have components to be closed at the EOY 2017 and the components that will be retained for further use during the closure/post-closure period. A summary of the key design criteria for the facilities to be closed is presented in **Table 5-1**.

5.1 Stockpiles

Conceptual designs and associated earthwork cost estimates for the in-pit stockpile are based on an inter-bench slope of 3H:1V, 32-foot wide terrace benches, and 200-foot inter-bench slope lengths to allow

for flexibility in the final design of the terrace benches. With these designs, the overall outslope gradient from the crest to toe is generally 3.5H:1V. Precise designs for the in-pit stockpile will be prepared and submitted to the agencies at final design and may alter the 3.5H:1V overall slope in this conceptual design.

The in-pit stockpile that will be present at the EOY 2017 at the Little Rock Mine will be composed of blasted overburden rock (leach cap) placed on the western end of the open pit through end-dumping at angle of repose. The process will result in overall slopes that are flatter than angle of repose thus, the factor of safety for the stockpile will be substantially greater than 1.0. Placement of this material into the west side of the pit prior to the cessation of mining will also allow time for consolidation before the surface of the stockpile receives final grading. Storm water from the in-pit stockpile area will be routed along the inside of the benches to the stockpile and pit wall contact (consisting of bedrock and non-ore mined rock material) and down to the pit sump.

The North, West Canyon, and reclaimed Copper Leach stockpiles are constructed above the surrounding terrain therefore run-on controls are not required for these facilities. The need for run-on protection for the in-pit stockpile will be fully evaluated in the final design process. Temporary erosion control measures may be provided during the construction and early vegetation establishment periods for the in-pit stockpile. These measures may include, but are not limited to, berms, mulch, straw bales, silt fences, and minor corrective regrading. The in-pit stockpile will consist of leach cap overburden and is not anticipated to require additional cover. Following grading, the top surface and outslope of the in-pit stockpile will be revegetated by seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with MMD Permit GR007RE.

The following sections describe the specific stockpile facilities that will still have components to be closed at the EOY 2017, and the components that will be retained for further use during the closure/post-closure period.

5.1.1 Existing Components That Will Be Used for Post-Closure Purposes

The existing closure components and related engineering controls associated with the Little Rock Mine stockpiles and stockpile areas that will be used for post-closure purposes include:

- Existing reclaimed surfaces and vegetation at the Copper Leach Stockpile and P-Plant reclamation areas;
- Volunteer native vegetation growing on the existing overburden stockpiles (North Stockpile and West Canyon Stockpile);
- Operation and maintenance of existing seepage collection systems CLDS and CLDS-1 at the reclaimed Copper Leach Stockpile and associated pumps, tanks, and HDPE pipeline extending to the lined 1X1 pond;

- Operation and maintenance of one existing surface water collection point in California Gulch (LRFS-1) and a new point located downgradient of projected LOM pit rim;
- Operation and maintenance of three existing ground water monitoring wells (LRW-4, LRW-5, and 1236-2012-01), and four ground water monitoring wells that will be installed by the EOY 2017 at locations jointly selected by Tyrone and NMED;
- Operation and maintenance of surface water diversion structures constructed to route upland flows around the Copper Leach Stockpile and P-Plant reclaimed areas and surrounding impacted areas; and
- Operation and maintenance of Deadman Canyon surface water diversion structure constructed to route upland flows around the Little Rock Mine open pit (note Deadman Canyon surface water diversion structure will be constructed and operational by the EOY 2017).

5.1.2 Planned Closure/Closeout Activities

The construction design criteria for the stockpiles and monitoring wells are summarized in **Table 5-1** and the planned approaches for closure of these facilities are described below. Reclamation design drawings for the facilities are presented in **Appendix A**. The planned approaches for closure of the stockpiles include:

- Grading of the in-pit stockpile surfaces in a manner that orients surface water drainage toward the pit bottom and routes storm water along the inside of the benches to the bedrock/rocky material at the stockpile and pit wall contact;
- Grading of the in-pit stockpile top surface to a final grade of between 1 and 5% to direct storm water to slope drainage channels;
- Grading of the in-pit stockpile outslope down to interbench slopes of 3.0H:1V;
- Construction of 32 foot wide terrace benches on the outslope of the in-pit stockpile at maximum slope lengths of 200 feet;
- Ripping of in-pit stockpile top surface and outslope to a depth of 18 to 24 inches;
- Seeding of ripped surfaces of in-pit stockpile to reestablish vegetation in accordance with MMD Permit GR007RE and associated Permit revisions; and
- Plugging and abandonment of any unneeded ground water monitor wells.

5.2 Open Pit

The pit configuration at the EOY 2017 will encompass approximately 280 acres. Accessible pit flat areas and benches not covered by the ultimate pit lake that will form after dewatering is stopped, will be ripped to a depth of 18 to 24 inches and vegetated by seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with MMD Permit GR007RE and associated Permit revisions.

Temporary erosion control measures will be provided during the construction and early vegetation establishment periods. These measures include, but are not limited to, berms, mulch, straw bales, silt fences, and minor corrective regrading. All construction will be in compliance with state regulations for temporary storm water control.

The EOY 2017 open pit configuration is projected to span California Gulch and portions of Deadman Canyon. Storm water from California Gulch will continue to flow to the open pit. Storm water from Deadman Canyon will be conveyed through the Deadman Canyon diversion structure and new spanning arch culvert to be constructed and operational by the EOY 2017.

The recently completed Little Rock Mine pit lake model (DBS&A, 2014) shows a relatively small pit lake forming near the current open pit sump (without active dewatering) by the EOY 2017. The pit lake is predicted to rise to an elevation of approximately 5,665 feet msl at 30 years following closure, and then generally stabilizes at an elevation of approximately 5,700 feet msl at about 80 years after closure. These model simulations assume an average annual surface water input of approximately 5 gpm from California Gulch.

The pit lake water quality is predicted to meet applicable surface water and ground water quality standards, or natural background concentrations in the case of Fluoride. As such, this CCP includes the cessation of pit dewatering activities upon closure. The existing pumps, pipelines, aboveground electrical systems and infrastructure will be removed from the pit upon closure.

Site access to the open pit will be controlled by a combination of new 6-foot high chain link fences and earthen berms installed around the perimeter of the pit. Signs will be posted on the fencing at 500 foot intervals and at all access points, and warnings of potential hazards present. Pit walls are sufficiently stable that a specific conceptual design is not needed. Any materials eroded from these slopes will be contained within the pit.

The Little Rock Mine open pit configuration at the EOY 2017 is shown on **Figure 2-1** and reclamation designs are depicted in the drawing set provided in **Appendix A**. The existing closure components and the planned closure activities for the Little Rock Mine open pit are described below.

5.2.1 Components to be used for Post-Closure Purposes

The closure components and related engineering controls associated with the Little Rock Mine open pit that will be used for post-closure purposes include:

- Pit perimeter fencing and berms;
- Maintenance, sampling and reporting of monitoring wells;
- Monitoring of the open pit lake water quality; and
- Construction and maintenance of haul road within open pit for post-closure reclamation monitoring.

5.2.2 Planned Closure/Closeout Activities

The design criteria for the Little Rock Mine open pit are summarized in **Table 5-1** and the planned approaches for closure are described below. Reclamation design drawings for the Little Rock Mine open pit are presented in **Appendix A**. The planned approaches for closure of the Little Rock Mine open pit include:

- Grading of accessible open pit flat areas, not covered by the ultimate pit lake that will form after dewatering stops, to direct storm water toward the pit lake. For the purposes of this CCP, accessible pit flat areas are defined as pit haul road driving surfaces and flat areas 50-feet or greater from a highwall;
- Ripping of accessible open pit flat areas, not covered by the ultimate pit lake that will form after dewatering stops, and accessible benches in the open pit to a depth of 18 to 24 inches;
- Seeding of ripped surfaces to reestablish vegetation in accordance with MMD Permit GR007RE and associated Permit revisions;
- Construction and maintenance of 6-foot chain link fencing and earthen berms approximately 40 feet from the open pit highwalls to limit public access;
- Installation and maintenance of signs on fencing at 500-ft intervals and at access points, warning of potential hazards present;
- Seeding of approximate 25-foot-wide disturbance area used to construct the chain link fencing, and approximate 100-foot-wide disturbance area used to construct the berm to reestablish vegetation in accordance with MMD Permit GR007RE and associated Permit revisions; and
- Removal of aboveground electrical systems and infrastructure, including pumps, lighting and transmission lines not necessary for post-closure site operations and maintenance.

5.3 Haul Roads and Access Roads

By the EOY 2017, all but approximately 4 acres of the existing haul road that provides access to the Tyrone Mine will be removed as a part of mine operations, including the existing spanning arch culvert over Deadman Canyon. Additionally, by the EOY 2017, the western haul road will be constructed along the northwestern edge of the conceptual pit configuration to provide access to the west end of the open pit for the in-pit stockpile. Additional roads are present within the mine permit area that provide access to various monitoring stations and mine features.

Haul roads and access roads not needed for closure and post-closure access will be reclaimed. The compacted road material will be loosened by ripping to a depth of between 18 and 24 inches and revegetated by seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with MMD Permit GR007RE and associated Permit revisions. If acid-generating material is encountered, the roads will be ripped, covered with 36 inches of the suitable cover material and revegetated in accordance with MMD Permit GR007RE.

Temporary erosion control measures will be provided during the construction and early vegetation establishment periods. These measures include, but are not limited to, berms, mulch, straw bales, silt fences, and minor corrective regrading. All culverts will be removed unless they serve a post-closure purpose. The existing closure components and the planned closure activities for the haul roads and access roads are described below.

5.3.1 Existing Components to be used for Post-Closure Purposes

The existing closure components and related engineering controls associated with the haul roads and access roads that will be used for post-closure purposes include:

- Operation and maintenance of haul road within the pit for post closure access to pit bottom for pit lake and reclamation monitoring;
- Operation and maintenance of access roads to reclaimed facilities and post-closure monitoring stations (wells, samplers, meteorological station, outfalls, etc.); and
- Operation and maintenance of storm water control structures located along post-closure haul roads and access roads.

5.3.2 Planned Closure/Closeout Activities

The design criteria for the haul roads and access roads to be closed are summarized in **Table 5-1** and the planned approaches for closure include:

- Ripping of roads to a depth of 18 to 24 inches;
- Covering impacted areas with 36 inches of suitable cover material;
- Seeding of ripped and covered areas to reestablish vegetation in accordance with MMD Permit GR007RE; and
- Removal of culverts not needed for post-closure storm water management and disposal of them in an approved manner.

5.4 Pipelines

The existing dewatering pipeline alignment #1 and dewatering pipeline alignment #2 (to be constructed before the EOY 2017) are designed to convey surface water and ground water inflow in the open pit to the lined 1X1 pond during mine operations. Impacted waters from the CLDS and CLDS-1 seepage collection systems will continue to be routed through the existing seepage collection pipeline on the south side of the open pit to the booster station. Water from the booster station will continue to be pumped via a diesel powered pump through a 12-inch HDPE pipeline that extends to the existing dewatering pipeline alignment #1 and/or dewatering pipeline alignment #2 (to be constructed before the EOY 2017) and then to the existing lined 1X1 pond.

As previously noted, open pit dewatering will be discontinued following cessation of open pit mining at the Little Rock Mine. As such, the sections of dewatering pipeline alignment #1 and dewatering pipeline

alignment #2 located within the open pit will not be required for post-closure conveyance of water from the open pit. These sections of pipeline will be buried or removed and disposed of in an approved manner.

The pipeline corridors will be inspected and characterized for evidence of past spills that could potentially cause exceedances of water quality standards of Section 20.6.1 NMAC and Section 20.6.2.3103 NMAC. If they are shown to constitute a source of contamination (defined as exceedances of standards), the impacted material will be covered with 36-inches of suitable cover material. Disturbed areas along the pipeline corridors will be revegetated by seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with MMD Permit GR007RE. The existing closure components and the planned closure activities for the pipelines are described below.

5.4.1 Existing Components to be used for Post-Closure Purposes

The existing closure components and related engineering controls associated with the pipelines that will be used for post-closure purposes include:

- Operation and maintenance of pipeline alignment #1 to convey seepage water to the lined 1X1 pond;
- Operation and maintenance of pipeline alignment #2 as a backup pipeline for conveyance of seepage water to the lined 1X1 pond; and
- Operation and maintenance of seepage collection pipeline located south of the open pit and extending to pipeline alignments #1 and #2.

5.4.2 Planned Closure/Closeout Activities

The design criteria for the pipelines are summarized in **Table 5-1** and the planned approaches for closure include:

- Covering impacted areas with 36 inches of suitable cover material;
- Removal of residual sediments and fluids from pipelines within the open pit and disposal of materials at an approved location on-site;
- Removal of sections of pipeline within the open pit and disposed of pipe in an approved manner; and
- Seeding of disturbed and covered areas to reestablish vegetation in accordance with MMD Permit GR007RE.

5.5 Other Ancillary Facilities and Structures

Reclamation of the disturbed areas associated with the ancillary facilities and structures will be accomplished by removing or burying utility and structure foundations, pipelines, power lines, and temporary buildings and providing erosion and drainage control and revegetation. Relocation of a portion of the power supply line to the Little Rock Mine will include an approximately 50-foot wide corridor

supporting an access road, utility poles, and the power line. Utility poles associated with the power line will be left in place as bird perches to support the designated Post Mining Land Use (PMLU). The power line and access road will be reclaimed by ripping and/or covering the disturbed areas and seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with MMD Permit GR007RE. The existing closure components and the planned closure activities for the ancillary facilities and structures are described below.

5.5.1 Existing Components to be used for Post-Closure Purposes

The existing closure components and related engineering controls associated with the ancillary facilities and structures that will be used for post-closure purposes include:

- Maintenance of existing power poles that will be left in place as bird perching sites; and
- Operation and maintenance of existing booster station until seepage from the CLDS and CLDS-1 collections has been eliminated, or seepage water meets applicable ground water standards.

5.5.2 Planned Closure/Closeout Activities

The design criteria for the ancillary facilities and structures are summarized in **Table 5-1** and the planned approaches for closure include:

- Covering impacted areas with 36 inches of suitable cover material;
- Ripping of non-impacted disturbed areas to a depth of 18 to 24 inches;
- Seeding of ripped and covered areas to reestablish vegetation in accordance with MMD Permit GR007RE and associated Permit revisions;
- Removal of electrical distribution system, including the substation and transmission lines; and
- Removal of any temporary, portable operations and maintenance facilities used to support mining and not needed for post-closure purposes.

6.0 CLOSURE & POST-CLOSURE MONITORING, REPORTING AND CONTINGENCY PLANS

It is assumed that all closure and post-closure monitoring, reporting, and contingency plans required under DP-1236 and MMD Permit GR007RE will continue to take place post-closure. The costs associated with these conditions were included in the CCP cost estimate using an assumed third party to complete.

All the closure and post-closure ground water, surface water, seep, spring, and piezometer monitoring data will be reported under DP-1236. The MMD guidelines require monitoring of revegetation during the bonding period to evaluate revegetation success, and NMWQCC Regulation 3107.A.11 requires the development of post-closure monitoring and contingency plans that are consistent with the terms and conditions of the applicable DP. Additional monitoring and reporting requirements associated with public health and safety, wildlife, meteorology, erosion, and construction quality assurance (CQA)/construction quality control (CQC) plans are specified in MMD Permit GR007RE. Closure and post-closure monitoring and reporting requirements specified in the Copper Rules include: CQA/CQC plans; seepage interceptor system inspections and reporting; water quality monitoring and reporting; and reclamation monitoring and reporting. The following sections summarize the general approach that will used to meet all of these requirements.

6.1 Erosion and Drainage Control Structures

Tyrone will perform both scheduled and storm event-based inspections for potential erosion damage of the reclaimed features. Scheduled inspections are anticipated monthly for the first year following completion of final reclamation and quarterly thereafter. Storm event inspections will be conducted when one or more inches of rain is received in a 24-hour period as recorded at the Little Rock Mine weather station.

Tyrone will provide the MMD and NMED Surface Water Quality Bureau a report that describes the nature and extent of any significant erosion features identified. A corrective action plan will be developed within 30 days of identification of the problem, and the plan will be implemented as soon as practicable following regulatory approval. Tyrone will accomplish the inspections in accordance with professionally recognized standards such as Natural Resources Conservation Service.

6.2 Ground Water and Surface Water Control Facilities

Tyrone maintains several state and federal permits to protect surface water and ground water and to ensure adherence to water quality standards as mandated by the New Mexico Water Quality Act and the WQCC regulations (NMAC 20.6), Sections 401 and 404 of the Clean Water Act, and the EPA's NPDES MSGP. DP-1236 has been issued by NMED to address operational and post-closure water quality issues at the Little Rock Mine. In addition to surface water monitoring and analyses required in

DP-1236, the SWPPP and SPCC Plan, inclusive of the Little Rock Mine, serve to protect water quality.

DP-1236 includes an operational plan, corrective action plan, contingency plan, and closure plan. Collectively, these plans provide the mechanisms for the regulatory agencies to collect ongoing and real-time data related to mine operations; continuously monitor, model, and project potential impacts to the environment; document compliance; and mitigate these potential impacts where conditions warrant.

Contingency Plans and Emergency Response Plans have been prepared that present details for addressing potential failures of individual components of the Little Rock Mine closure plan, including an increase in the extent or magnitude of ground water and/or surface water contamination, potential failures associated with interceptor systems and impoundments, and potential failures of various components of closed lands.

The emergency response plan outlines operational parameters and contingencies to address operation failures at the Little Rock Mine associated with pumping water from the open pit, sumps, and other impoundments that may contain affected water. Accordingly, Tyrone will verify any potential discharges not approved in DP-1236. If an unapproved discharge is identified, Tyrone will perform appropriate corrective actions to contain and remove or mitigate the condition, provide verbal notification to the NMED within 24 hours after discovery of the condition, provide written notification to the NMED within one week after discovery of the condition, prepare a corrective action report within 15 days after discovery of the condition, and submit an abatement plan in accordance with Section 20.6.2.1203.A.9 NMAC or, if required by NMED, in accordance with DP-1236.

6.3 Post-Closure Monitoring of Seepage, Ground Water, and Surface Water

In accordance with Condition 41 of DP-1236, post-closure monitoring of seepage, ground water, and surface water will continue for a minimum of 30 years after completion of final closure construction activities. The monitoring will be conducted in accordance with monitoring and reporting requirements specified in Conditions 1 through 10 of DP-1236.

In addition to surface water monitoring and analyses required in DP-1236, the SWPPP and SPCC Plan serves to protect water quality. Monitoring will be conducted in accordance with 20.6.2.3107 NMAC. Tyrone may request a reduction in monitoring frequency, change in location, and change in analytical parameters for NMED approval after two years of quarterly monitoring.

The proposed post-closure monitoring and reporting schedule for the Little Rock Mine includes quarterly monitoring and reporting for the first 2 years after reclamation, semi-annual for the next 8

years, and yearly for the remaining 20 years. Each monitoring report will contain monitoring well laboratory analyses, surface water analyses, water level data, potentiometric surface maps, seepage water analyses, spring and seep discharge rates, and summaries of daily weather data. The monitoring reports will be submitted to NMED in accordance with the approved discharge permit.

6.3.1 Ground Water Monitoring Network:

Seven monitoring wells were constructed in 1995, with four wells within the current pit configuration (**Figure 2-8**). Two of the wells, LRW-3 and LRW-7, have already been abandoned while LRW-1 and LRW-2 will be abandoned at a later date. Well LRW-6 has been dry for several years and will also be abandoned by the EOY 2017.

Existing wells located outside of the conceptual EOY 2017 pit configuration that are expected to remain in place and continue to be sampled through post closure, include LRW-4 near the reclaimed P-Plant; LRW-5 located upgradient of the open pit in California Gulch; and 1236-2012-01 (replacement of well LRW-6) located north and downgradient of the open pit (**Figure 2-8**). Considering the anticipated drawdown of ground water during active mining in the immediate vicinity of the open pit, Tyrone and NMED have jointly agreed to select locations for additional replacement monitoring wells later in the mining sequence of the Little Rock Mine. These wells will be installed by the EOY 2017 and will be incorporated into the post-closure monitoring network.

Monitoring will be conducted in all monitoring wells required to be monitored in DP-1236, and in all new monitoring wells installed after closure for compliance monitoring purposes. Sample collection will be done in-house or under contract by an environmental contractor. Samples will be shipped to an analytical laboratory for analysis. A report will be prepared to document the sampling and analysis for review by regulatory authorities.

6.3.2 Surface Water and Seep Monitoring Network:

Post-closure surface water monitoring locations within and around the Little Rock Mine include the following points:

- Depth and water quality of the open pit lake;
- Water quality at two surface water collection points in California Gulch (existing LRFS-1 and new point located downgradient of projected LOM pit rim)
- Estimated volume of storm water from California Gulch that reports to the open pit;
- Water quality at the booster station;
- Flows and water quality from seepage collection systems CLDS and CLDS-1 at the reclaimed Copper Leach Stockpile; and
- Flows at McCain Spring and Sugarloaf Spring.

The Ohio Mine dam will be removed by the EOY 2017 as part of the open pit expansion and will not be part of the post-closure surface water monitoring network.

Surface water monitoring and sampling activities will be performed quarterly at each spring, surface water collection point, and discrete pit lake. The surface water collection ports in California Gulch will be checked after each precipitation event of 1.0 inch or greater at the Little Rock Mine site; if a sample is present it will be collected and analyzed. No more than one surface water sample per port will be collected in a 24-hour period, and no more than six surface water samples per port will be collected per quarter. Sample collection will be done in-house or by an environmental contractor. Samples will be shipped to an analytical laboratory for analysis. A report will be prepared to document the sampling and analysis in accordance with DP-1236 for review by regulatory authorities.

6.4 Revegetation Success Monitoring

Vegetation establishment monitoring of reseeded areas will be conducted in accordance with Appendix A of Revision 10-1 of the MMD Permit (MMD, 2010). Vegetation establishment monitoring will be conducted during the third year after seeding, with the objective of determining the adequacy of reseeding efforts. The vegetation establishment monitoring (Year 3) will be semi-quantitative and the results will be provided to MMD. Revegetation monitoring will be performed at the 6th year after planting, and for at least 2 years of the last 4 years, starting after the 8th year of the 12-year monitoring period.

Revegetation monitoring will include, at a minimum, canopy cover, plant diversity, and woody stem density. The revegetation monitoring will be conducted to meet statistical adequacy for the monitoring conducted during two of the last four years prior to financial assurance release. The canopy cover survey and woody stem density survey will be conducted using survey techniques approved by MMD. Tyrone will submit a vegetation monitoring plan, for MMD approval, at least 90 days before vegetation monitoring is conducted. Areas where vegetation has not been successfully established will be reseeded or inter-seeded.

6.5 Wildlife Monitoring

Tyrone will document wildlife use of reclaimed areas beginning three years after reseeding is completed in accordance with Sections 8.Q.2 of Revision 10-1 of the MMD Permit (MMD, 2010). The wildlife monitoring program will include annual deer pellet group counts and bi-annual bird diversity surveys, consistent with the monitoring program currently being implemented at the Tyrone Mine. Results of the surveys will be evaluated to determine wildlife-use trends during reestablishment of a self-sustaining ecosystem. Tyrone will review the 2001 Little Rock Mine wildlife monitoring plan (Tetra Tech EMI, 2001), conditionally approved by MMD on September 27, 2001, and submit to MMD for approval, an updated wildlife monitoring plan at least 180 days prior to implementation of the wildlife monitoring surveys. Due to use of the area by wildlife species, particularly birds, the pit lake could be attractive to migratory

waterfowl. The pit lake water quality is predicted to meet applicable surface water and ground water quality standards, or natural background concentrations in the case of Fluoride.

6.6 Public Health and Safety

Pursuant to Sections 8.E.2 of Revision 10-1 of the MMD Permit (MMD, 2010), Tyrone will submit written details and maps showing the locations of berms and fences that will be placed around the pits to restrict access by unauthorized personnel and provide for public safety within 180 days of cessation of operations.

Annual visual inspections will be conducted to monitor the stability of the pit walls and to identify potential failure areas. If potential failure areas are identified through monitoring, which may adversely impact the environment and public health or safety, Tyrone will propose measures to mitigate the hazard caused by the potential failure areas within 30 days of identification for MMD approval. Any evidence of stockpile instability that could potentially result in a slope failure or an unauthorized discharge will be reported to the NMED as soon as possible, but not later than 24 hours after discovery and corrected pursuant to Subsection H of Section 20.6.7.30 NMAC.

6.7 Construction Quality Assurance Plan

Pursuant to Section 8.D of Revision 10-1 of the MMD Permit, Tyrone will submit a Construction Quality Assurance Plan (CQAP) to MMD for approval no less than 180 days prior to regrading of a facility and placement of any cover material for final closure. The CQAP will be supplemented with a Final Design (formerly known as a Construction Quality Assurance Report) to be submitted to the MMD within 180 days after completion of construction.

7.0 POST-MINING LAND USE DESIGNATION AND SITE-SPECIFIC REVEGETATION SUCCESS GUIDELINES

This section provides a description of the PMLU for the permit area and the associated site-specific revegetation guidelines based upon the requirements of the MMD Permit, NMMA Section 69-36-11.6, and Subparts 507.A, 507.B, and 508 of the NMMA Rules (MMD, 1996). The proposed wildlife habitat PMLU area is shown on **Figure 7-1**.

7.1 Post-Mining Land Use Designation

The wildlife habitat PMLU is specified in Section 3.G. of the MMD Permit. The selection of the wildlife habitat PMLU for purposes of the NMMA does not preclude multiple beneficial uses (e.g., grazing, recreation, and watershed) in the post-closure period by the surface landowners (e.g., BLM and USFS). Reclamation of the Little Rock Mine will improve the character of the mined area to achieve the wildlife habitat post-mining land use.

Successful implementation of the proposed reclamation plan will result in the development of an early-stage grass/shrub community within a larger plant community that is dominated by a mixed-evergreen woodland community. The areas of cliffs and talus associated with the pit walls will provide features that are consistent with the local topography in the canyons. The reclaimed area will provide a locally important increase in community level diversity that will benefit the broad range of wildlife adapted to the area. The pit's topographic relief is expected to present desirable nesting and perching sites for birds. Power poles will also remain in place to provide perching spots.

Native vegetation will be established on the reclaimed areas at the Little Rock Mine resulting in increased erosion protection and direct habitat improvement, and reduced percolation of water into the underlying materials relative to current conditions. Proposed reclamation seed mixes and seeding rates for the Little Rock Mine are presented in **Table 7-1**. These species have broad ecological amplitudes and provide structural diversity. **Table 7-2** lists some of the major functional attributes of the primary vegetation selected for use at the Little Rock Mine.

The seed mix was selected to provide early establishment of ground cover, erosion control, and diversity in growth forms. The species selected for the Little Rock Mine have been successfully used in mine reclamation and range improvement projects in many parts of New Mexico, including both the Little Rock and Tyrone mines. The vegetation will provide forage, seeds, and cover for reptiles, small mammals, and birds. The reptiles, small mammals, and birds common to the mine area will benefit from the increased insect populations that are likely to accompany revegetation of the site. The shrubs, grasses, and forbs selected for use at the Little Rock Mine will provide nutritious forage and browse for large mammals (e.g., deer). In addition, the seed mix includes a number of valuable forage grasses that are absent or occur at a low frequency outside the permit area, thus, improving the range condition locally.

The pit lake that is anticipated to form after reclamation is expected to benefit the local wildlife. Access to the pit lake by wildlife will be promoted by low slope gradients in the shoreline area (adjacent to the toe of the in-pit stockpile), and the development of brush and/or rock piles to provide hiding cover. Shoreline vegetation may ultimately develop once the pit lake levels stabilize. Specific details of the wildlife features will be presented in the Construction Quality Assurance/Construction Quality Control Plan for this facility.

7.2 Site Specific Revegetation Success Guidelines

As previously noted, Tyrone is proposing to modify both the existing Little Rock Mine Permit Boundary and the current open pit design limit to account for the change in the mine plan (Section 1.5). The proposed Mining Area Design Limit combines the estimated extent of disturbed areas and the projected LOM open pit configuration as shown on **Figure 2-1**.

New disturbances located outside the current open pit design limit, and new disturbances identified in Permit Revision 13-2 to MMD Permit GR007RE that are to be backfilled, covered with topdressing, and revegetated will meet the reclamation standards set forth in 19.10.5.507 NMAC and will also comply with the new unit standards set forth in 19.10.5.508.E NMAC. Disturbances located within the current open pit design limit (excluding new disturbances identified in Permit Revision 13-2 to MMD Permit GR007RE) and disturbances within the approximate 40 acre proposed mine permit boundary expansion within the existing Tyrone Mine Permit Boundary are considered existing mine units and will meet the reclamation standards set forth in 19.10.5.507 NMAC. The proposed Mining Area Design Limit, proposed changes to the Little Rock mine permit boundary, projected LOM open pit configuration, and associated new unit and existing unit disturbance areas are presented in **Figure 7-2.** Site-specific revegetation success guidelines for each of these areas are described below.

The MMD recognizes that replication of the pre-mining plant communities after mining is not practical (MMD, 1996). The intent of the reference area characterization is to provide a site-specific, quantitative basis for determining revegetation success. More importantly, the reference area provides an “ecological barometer” that integrates normal climatic variations to aid in the evaluation of temporal changes or trends in the reclaimed ecosystem. Thus, the reference areas do not represent model plant communities that will be replicated in detail, but rather local indications of the ecological potential of the reclaimed plant communities.

The reclamation success guidelines required by the MMD vary depending on the PMLU and whether the area to be reclaimed is an existing disturbance or an existing mine new unit disturbance. Canopy cover, shrub density, and vegetation diversity are the revegetation success guidelines that are typically used to judge revegetation success on lands designated as wildlife habitat. The vegetation success guidelines include numerical standards to address the canopy cover and shrub density requirements of the NMMA.

The plant diversity guidelines are addressed through a technical standard and are complemented by a qualitative assessment of plant colonization and regeneration to corroborate the establishment of a self-sustaining ecosystem. A detailed description of the vegetation success guidelines for reclaimed existing disturbance areas is included in DBS&A (1999). The guidelines for revegetation success that apply to the Little Rock Mine are discussed in Sections 7.2.1 through 7.2.3.

7.2.1 Canopy Cover

Because of its broad implications for erosion control and ecologically based PMLUs, canopy cover is one of the primary criteria for determining reclamation success. The Little Rock Mine has a proportional success guideline for total canopy cover equal to 70 percent of the measured reference area value for existing unit disturbance areas (**Figure 7-2**). The proportional standard was determined based on the interpretation of the community structure and ecological conditions in the reference area. The proportional standard reflects the view that the typical 12-year bond release period does not allow enough time for full maturation of the reclaimed plant community relative to the native sites. The numerical standard derived from the proportional standard will vary over time to account for temporal differences in canopy cover associated with climatic variations. Thus, the numerical standard may increase or decrease based on reference area measurements, but the proportional standard will remain fixed.

For the new unit disturbance areas (**Figure 7-2**), the proportional success guideline for total canopy cover will be equal to 90 percent of the measured reference area value in accordance with 19.10.5.508E NMAC. The ground cover of living perennial plants shall be adequate in both the existing and new unit disturbance areas to control erosion.

7.2.2 Shrub Density

Shrubs are important components of many reclaimed landscapes. A proportional success guideline of 60 percent (of the reference area) has been accepted by the MMD for shrub density in the reclaimed areas associated with the existing disturbance areas. For the new unit disturbance areas, the proportional success guideline for shrub density will be equal to 90 percent of the measured reference area value in accordance with 19.10.5.508E NMAC. As with canopy cover, the shrub density standards are determined based on the interpretation of the ecological conditions of the reference areas.

Plant Diversity

Species diversity is commonly thought to increase the stability of plant communities. The perceived enhancement of ecological stability is related to the buffering effect that species with different ecological amplitudes provide in response to environmental stresses. A technical, rather than proportional, standard is proposed for plant diversity.

The plant diversity guidelines for the Little Rock Mine are based on the assumption that site stability is improved by establishing plants with different ecological amplitudes to buffer seasonal and annual fluctuations in climate. Tyrone understands that creating a monoculture on the reclaimed lands is not desirable, while at the same time, recognizing that the benefits of increased diversity diminish beyond subjective threshold levels that are defined by the reclamation objectives. Thus, the diversity guideline for the Little Rock Mine was developed from a functional perspective, whereby site stability and erosion control are primary performance objectives. In addition, these guidelines were developed in recognition of the limitations associated with the sampling and statistical evaluation of plant communities whereby minor components are often not represented in the monitoring data.

The numerical diversity guidelines for the Little Rock Mine are listed in **Table 7-3**. To summarize, the diversity guideline would be met if the reclaimed area contains at least three warm season grasses and two shrubs, with individual cover levels of at least 1 percent, and two perennial cool season grasses with a minimum cover level of 0.5 percent. For the purposes of this guideline, intermediate-season grasses such as sand dropseed are considered the functional equivalent of the more traditionally defined cool season grasses. In addition, one non-weedy forb species should occur at a minimum cover level of at least 0.1 percent to meet the proposed diversity guideline. The forb guideline is unqualified with respect to seasonality and could include a perennial, biannual, or annual species.

Species diversity on the reclaimed areas is expected to increase with time; however, this process is likely to be slow. Successful colonization depends on the convergence of a seed source and the proper weather conditions; however, even with such an ideal convergence, inter-specific competition, predation, and dispersion mechanisms may limit the establishment of new plants on the reclaimed area. Because of the strong climatic influence on seed production and plant establishment, the rate of colonization is expected to be erratic and potentially slow for many species, with the highest rates of colonization expected to be concentrated in the reclaimed/undisturbed ecotone.

Evidence of colonization will complement the numerical diversity guidelines listed in **Table 7-3**. No numerical guideline is proposed for colonization, which would be demonstrated by increases in the number of species recognized in the reclaimed area. Information on colonization will be collected and reported to provide evidence of the ability of the reclaimed landscape to support native plants from the surrounding communities. Secondarily, observations of colonization provide evidence of regeneration and thus help demonstrate the establishment of a self-sustaining ecosystem required in the NMMA.

The intent of the colonization standard is to provide evidence of the ability of the reclaimed landscape to support plants from the surrounding communities. In addition, observations of colonization provide evidence of regeneration and thus support the demonstration of the establishment of a self-sustaining ecosystem. Colonization will be demonstrated by increases in the number of species recognized in the

reclaimed area. This information will be obtained from the relative cover data or documented observations along the margins of the reclaimed areas.

8.0 CAPITAL AND OPERATION AND MAINTENANCE COST ESTIMATES

This section provides a brief description of the capital and operation and maintenance cost estimate portions of the financial assurance. Cost estimates are budgetary and for the purpose of determining the value of the financial assurance performance bond.

8.1 Capital Cost Estimates

The capital cost estimate has been prepared in accordance with standard engineering practice and is supported with data from various references and is fully documented in **Appendix B**. The capital costs for closure are presented in detail in **Appendix B** and are summarized as follows:

Capital Cost Summary			
Item	**Subtotal Direct Costs**	**Subtotal Indirect Costs[1]**	**Total (Current Cost)**
Primary Haul Road	$39,900	$16,900	$56,800
Western Haul Road	$29,000	$12,300	$41,300
North Stockpile[2]	$5,700	$2,400	$8,100
West Canyon Stockpile[2]	$6,000	$2,600	$8,600
Reclaimed Copper Leach Stockpile and P Plant[2]	$39,700	$16,900	$56,600
In-pit Stockpile	$438,000	$186,100	$624,100
Open Pit Flat Areas	$137,300	$58,300	$195,600
Safety Berms and Fencing Around Perimeter of Open Pit	$175,400	$74,500	$249,900
Other Ancillary Facilities and Structures[3]	$122,300	$52,000	$174,300
Allowance for Other Disturbed Areas	$13,200	$5,600	$18,800
TOTAL CAPITAL COST	**$1,006,400**	**$427,700**	**$1,434,100**

Note:

[1] – Total indirect costs of 42.5% were applied to the capital direct costs. This includes: 5% for mobilization and demobilization; 7% for contingencies; 6% for engineering redesign fee; 20% for contractor profit and overhead; and 4.5% for project management fee and State procurement costs.

[2] - Area is vegetated, remains in estimate pending vegetation surveys and/or financial assurance release.

[3] – Includes: demolition of power lines, substation, dewatering pipeline; well abandonment; and reclamation of small ancillary facility areas.

8.2 Operation and Maintenance Cost Estimates

The operations and maintenance (O&M) cost estimate details and supporting documentation are provided in **Appendix B**. A summary of these details are provided below. O&M estimated costs related to periodic erosion control, road maintenance, vegetation maintenance, and wildlife monitoring have been included in a standalone calculation sheet in **Appendix B**. O&M costs are assumed to diminish with time and are allocated as follows:

Erosion Control and Monitoring:

Annual cost estimates after closure are based on an erosion control crew engaged for 12 days per year for the first year and then 4 days per year for 11 additional years. The reclaimed Copper Leach Stockpile and P-Plant were revegetated in August 2010, leaving 5 years of erosion control and monitoring remaining before revegetation is established. Costs associated with this area include an erosion control crew engaged for 1 day per year from 2018 to 2022. The remaining two stockpiles within the proposed Mining Area Design Limit (the North Stockpile and West Canyon Stockpile) are currently being colonized by native vegetation, are erosionally stable, and no additional reclamation measures are proposed for these two facilities.

Road Maintenance:

Access road maintenance for post-reclamation years 13 through 30 is included in the erosion control and monitoring costs. The road maintenance cost for post-reclamation years 13 through 30 is included for access to all post-closure monitoring points and the power line access road. These consist of access roads for erosion monitoring and open pit slope stability monitoring, and access to all water quality and flow monitoring points (California Gulch flow samplers, seepage collections CLDS and CLDS-1, McCain Spring, Sugarloaf Spring, open pit lake, and the seven compliance monitoring wells). Road maintenance consists of a motor grader engaged for 12 hours prior to each sampling event annually.

Water Quality Monitoring and Reporting:

In accordance with Condition 41 of DP-1236, post-closure monitoring of seepage, ground water, and surface water will continue for a minimum of 30 years after completion of final closure construction activities. The monitoring will be conducted in accordance with monitoring and reporting requirements specified in DP-1236. The water quality monitoring and sampling program will include: water quality and water levels at seven ground water monitoring wells; open pit water quality and elevation; CLDS and CLDS-1 seep collection water quality and flow rates; California Gulch surface water quality and flow rates; flows at McCain Spring and Sugarloaf Spring; and meteorological monitoring from the Little Rock Mine weather station.

For cost estimating purposes, it is assumed that post-closure monitoring and sampling will be conducted quarterly for the first 2 years after reclamation, semi-annually for the next 8 years, and yearly for the remaining 20 years.

Estimated sampling frequencies for California Gulch surface water and seepage collection water is based on sampling conducted in 2008. The seep collections are assumed to be dry two quarters a year and sampled the other two quarters. The surface water collection ports in California Gulch will be checked after each precipitation event of 1.0 inch or greater at the Little Rock Mine site, and it is assumed that water will be present once a year.

Appendix B provides the supporting documentation for the O&M cost estimate. O&M costs for closure are summarized as follows:

O&M Cost Summary			
Item	**Subtotal Direct Costs**	**Subtotal Indirect Costs[1]**	**Total (Current Cost)**
Erosion Control and Monitoring (Newly Reclaimed Facilities)	$184,500	$59,900	$244,400
Erosion Control and Monitoring Reclaimed Copper Leach Stockpile and P-Plant [2]	$16,500	$5,400	$21,800
Road Maintenance	$44,500	$14,500	$59,000
Water Quality Monitoring and Reporting[3]	$162,600	$0	$162,600
O&M Subtotal	$408,100	$79,800	$487,900

Note:

[1] – Total indirect costs of 32.5% were applied to the capital direct costs for erosion control and monitoring and road maintenance. This includes: 5% for mobilization and demobilization; 7% for contingencies; 6% for engineering redesign fee; 10% for contractor profit and overhead; and 4.5% for project management fee and State procurement costs.

[2] –Areas are vegetated, remains in estimate until financial assurance release.

[3] –Indirect costs apply only to reclamation related activities. Therefore, indirect costs are not applied to post-closure water quality monitoring and reporting.

9.0 RECLAMATION SCHEDULE

An update to the reclamation schedule is required pursuant to the MMD Permit and 19.1 0.5.506.B.1 NMAC. **Table 9-1** presents the anticipated schedule for implementation of closure activities based on best available information and mine planning forecasts. The proposed schedule summarizes Tyrone's understanding of the existing near-term mine operation and longer-term mine plan projections. More specifically, the schedule is based on the following considerations:

- Practical phasing of the reclamation projects to account for the anticipated labor, equipment and other resources that would be necessary to complete these projects based on current conditions;
- Sequential closure of facilities in a phased cost efficient manner; and
- Total annual acreages that would be reclaimed over this period.

The anticipated durations for reclamation presented in **Table 9-1** include earthwork and reseeding, but do not include vegetation success/O&M/monitoring that will be conducted throughout the 30-year post-closure monitoring period as described in Section 6. Reclamation of the in-pit stockpile, accessible flat areas within the open pit, haul roads and access roads, pipelines, and ancillary facilities and structures would begin per the approved CCP schedule. All primary reclamation activities as described herein should be essentially completed within approximately two years, not including the required post-reclamation monitoring.

For clarity, the financial assurance cost estimate and the proposed reclamation schedule are explicitly linked. Tyrone expects that the planned closure of the facilities represented by the proposed schedule will be conducted in a more cost efficient manner than that reflected in the financial assurance cost estimate, which is predicated on the unlikely condition of forfeiture.

10.0 USE OF THIS REPORT

Golder has compiled this CCP Update to present Little Rock Mine's 5-year update of the CCP to the NMED and the MMD of the New Mexico Energy, Minerals and Natural Resources Department. In the compilation of this plan, Golder collaborated with Telesto Solutions, Inc., who designed the closure/closeout configuration of the mine facilities and prepared the cost estimate. The Little Rock Mine CCP has been updated to fulfill the requirements of the following:

- **Discharge Plan DP-1236, Little Rock Mine,** (DP-1236), issued by the NMED on December 27, 2000 (NMED, 2000) and associated amendments;
- **Permit GR007RE, Little Rock Mine Existing Mining Operation** (MMD Permit), issued by the MMD of the New Mexico Energy, Minerals and Natural Resources Department on December 21, 1998 (MMD, 1998) and associated Permit Revisions;
- **Copper Mine Rules, 20.6.7 NMAC and 20.6.8 NMAC** adopted by the New Mexico Water Quality Control Commission on December 1, 2013 (NMWQCC, 2013); and
- **43 CFR Subpart 3809**, applicable mine reclamation regulations set forth by the U.S. BLM.

Tyrone has completed numerous other studies required by DP-1236 and Mining Act Permit GR007RE. Information from these various studies has also been considered in preparing this CCP Update.

Please contact the undersigned with any questions or comments on the information contained in this report.

Respectfully submitted,

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TABLES

Table 1-1: Summary of Applicable Permits and Regulatory Framework for the Little Rock Mine

Environmental Media/ Regulatory Framework	Permit Number	Description	Issuing Agency	Status
Operations on land managed by BLM (43 CFR 3809)	NMNM091644	1993 MPO – approved in 1997 with related EIS/ROD and reevaluated in 2010 DNA 2009 MPO Amendment for Stockpile Reclamation and related EA/FONSI 2013 minor modifications	BLM	Current
New Mexico Mining Act	GR007RE	Original permit, effective 12/21/1998	MMD	Current
	Rev 97-1	CCP and financial assurance	MMD	Approved 12/29/00
	Rev 02-2	Approval of standby status	MMD	Approved 11/22/04
	Mod 04-1	Reclamation of Copper Leach Stockpile	MMD	Approved 06/01/04
	Mod 06-1	Replace surety bond with letter of credit	MMD	Approved 01/23/09
	Mod 08-1	Permittee name change	MMD	Approved 12/08/09
	Mod 09-3	Replace letter of credit with surety bond	MMD	Approved 12/08/09
	Mod 10-1	Partial release of financial assurance for stockpile reclamation	MMD	Approved 06/16/11
	Rev 10-1	Change status to active and revise CCP	MMD	Approved 12/30/10
	Mod 13-1	Financial assurance partial release	MMD	Pending
	Mod 13-2	Change in pit configuration	MMD	Approved 9/26/13
Groundwater New Mexico Administrative Code 20 Chapter 6, Water Quality	DP-1236	Groundwater Discharge Permit	NMED	Renewal pending
	Revised Discharge Permit Amendment	Construction and Operation of Dewatering Facilities	NMED	Approved 05/08/13
Surface Water Quality/ Federal Clean Water Act	NMR05GB76	NPDES MSGP –Sector G – Metal Mining (Ore Mining and Dressing) and Sector J – Mineral Mining and Dressing Authorization	EPA	NOI acknowledgement issued by the EPA on 9/28/11
	Oil Pollution Prevention	Spill Prevention Control and Countermeasures Plan	EPA	Current; maintained on-site
	SPA-2009-00628-ELP	Individual section 404 permit	Corps	Current; expires 12/31/20

Table 1-1: Summary of Applicable Permits and Regulatory Framework for the Little Rock Mine (continued)

Environmental Media/ Regulatory Framework	Permit Number	Description	Issuing Agency	Status
Hazardous Waste Management	HW EPA ID NMD035806405	Notification of status as generator of hazardous waste	EPA/NMED	Acknowledgment of notification from EPA, dated 01/21/91; no expiration date
Air Quality	NSR2448 M1	Air Quality Construction Permit – Tyrone Mine	NMED	Current; no expiration date
	P147 – R1M3	Air Quality Operating Permit – Tyrone Mine	NMED	Current; expires 10/24/15

Table 4-1: Geochemical Modeling Results for Little Rock Pit Lake

Water Quality Parameter	30 Years Following Closure	100 Years Following Closure
pH (su)	7.87	7.90
Aluminum	0.707	0.953
Arsenic	0.030	0.040
Boron	0.039	0.053
Bicarbonate	282	297
Cadmium	0.0035	0.0048
Calcium	69.3	65.8
Carbonate	1.02	1.15
Chloride	28.5	38.3
Chromium	0.0061	0.0082
Cobalt	0.0013	0.0013
Copper	0.12	0.12
Fluoride	**2.23**	**3.01**
Iron	0.00030	0.00030
Lead	0.0038	0.0055
Magnesium	24.5	32.9
Manganese	0.11	0.11
Nickel	0.021	0.028
Potassium	7.01	9.60
Sodium	47.4	63.6
Sulfate	95	128
Total Dissolved Solids	558	641
Zinc	0.22	0.30

Notes:
Geochemical model results provided by Daniel B. Stephens & Associates on June 6, 2014 and will be included in the Little Rock Groundwater Flow and Geochemical Modeling Report (DBS&A, 2014).
Predicted pit lake water quality results are for 30 and 100 years following closure.
Units mg/L unless otherwise noted.
Bold values indicate concentrations above associated 20.6.2 NMAC Section 3103 standards.

Table 5-1: Summary of Key Design Criteria for Facilities to be Closed

Stockpiles - (Applicable to the In-Pit Overburden Stockpile)

- Outslopes to be graded to a maximum inter-bench slope of 3H:1V.
- Maximum uninterrupted slope length of 200 feet for outslopes.
- Terrace benches will have maximum bench width of 32 feet.
- Bench longitudinal slopes at between 1 and 5 percent.
- Bench cross slopes and channels at a maximum of 5 percent.
- Top surfaces graded at 1 to 5 percent.
- Regrading to be done in such a manner that orients surface water drainage toward the pit bottom.
- Storm water will be routed along the inside of the benches to the bedrock/rocky material at the stockpile and pit wall contact.
- Top surfaces and outslopes to be ripped to a depth of 18 to 24 inches and vegetated in accordance with MMD Permit GR007RE and associated Permit revisions.

Open Pit – (Little Rock Open Pit)

- Accessible open pit flat areas, not covered by the ultimate pit lake, will be graded to direct stormwater toward the pit bottom (if required), ripped to a depth of 18 to 24 inches and vegetated in accordance with MMD Permit GR007RE and associated Permit revisions. For the purposes of this CCP, accessible pit flat areas are defined as pit haul road driving surfaces and flat areas 50-feet or greater from a highwall.
- Ripping of accessible open pit flat areas, not covered by the ultimate pit lake that will form after dewatering stops, and accessible benches in the open pit to a depth of 18 to 24 inches and vegetated in accordance with MMD Permit GR007RE and associated Permit revisions.
- A combination of 6-foot chain link fencing and earthen berms will be constructed approximately 40 feet from the open pit highwalls to limit public access.
- Signs will be posted on fencing at 500-ft intervals and at all access points, warning of potential hazards present.
- An approximate 25-foot-wide disturbance area used to construct the chain link fencing, and approximate 100-foot-wide disturbance area used to construct the berm will be vegetated in accordance with MMD Permit GR007RE and associated Permit revisions.
- Removal of aboveground electrical systems and infrastructure, including pumps, lighting and transmission lines not necessary for post-closure site operations and maintenance.

Pipelines (applies to pit dewatering and seepage collection pipelines that will not be used in closure/post closure water management, pipelines located outside the OPSDA, and pipelines located outside the regrade footprint of stockpiles)

- Removal of residual sediments and fluids from pipelines within the open pit and disposal of materials at an approved location.
- Removal of sections of pipeline within the open pit and dispose of pipe in an approved manner.
- Covering impacted areas with 36 inches of suitable cover material.
- Seeding of disturbed and covered areas to reestablish vegetation in accordance with MMD Permit GR007RE.

Haul Roads (applies to portions of existing haul road not mined out by the expanded pit, western haul road, and accessible haul roads within the open pit not needed for post closure access)

- Haul roads will be ripped to a depth of 18 to 24 inches and vegetated in accordance with MMD Permit GR007RE and associated Permit revisions. It is not anticipated that any haul roads will be located on acid-generating material, and all fill used for haul road construction will be non-acid generating.
- Removal of culverts not needed for post-closure storm water management and disposal of them in an approved manner.
- Acid-generating material will be graded to direct stormwater off road, covered with 36 inches of suitable cover material, and revegetated in accordance with MMD Permit GR007RE and associated Permit revisions.

Table 5-1: Summary of Key Design Criteria for Facilities to be Closed

Other Ancillary Facilities and Structures (surface impoundments including booster pump stations, decant ponds; electrical power transmission lines and a substation; operational and exploration roads; freshwater supply system; storm water structures for drainage, diversion, and sediment control; equipment storage areas; and fencing and security systems).

- Power transmission lines, booster pump stations, and substation will be removed once they are not needed for post-closure purposes. Power poles will be left in place to serve as raptor perches after reclamation.
- Removal of any temporary, portable operations and maintenance facilities used to support mining and not needed for post-closure purposes.
- Disturbed areas associated with the construction of the open pit security fencing and earthen berm will be ripped to a depth of 18 to 24 inches and vegetated in accordance with MMD Permit GR007RE and associated Permit revisions.
- Covering impacted areas with 36 inches of suitable cover material.
- Ripping of non-impacted disturbed areas to a depth of 18 to 24 inches.
- Seeding of ripped and covered areas to reestablish vegetation in accordance with MMD Permit GR007RE and associated Permit revisions.

Notes:
MMD = Mining and Minerals Department

Table 7-1: Proposed Interim Seed Mix and Rates for the Little Rock Mine Reclamation Sites

Species[a]	Life-Form	Duration[b]	Seasonality	Rate[a,c]
Primary Seed List				
Blue grama (*Bouteloua gracilis*)	Grass	Per	Warm	0.25
Side-oats grama (*Bouteloua curtipendula*)	Grass	Per	Warm	1.25
Green sprangletop (*Leptochloa dubia*)	Grass	Per	Warm	0.15
Galleta grass (*Plueraphis jamesii*)	Grass	Per	Warm	0.40
Sand dropseed (*Sporobolus cryptandrus*)	Grass	Per	Intermediate	0.05
Bottlebrush squirreltail (*Sitanion hystrix*)	Grass	Per	Cool	1.25
Indian Ricegrass (*Oryzopsis hymenoides*)	Grass	Per	Cool	1.75
Streambank wheatgrass (*Agropyron dastachyum v. riparium*)	Grass	Per	Cool	1.50
Apache plume (*Fallugia paradoxa*)	Shrub	Per	NA	0.10
Mountain mahogany *(Cercocarpus montanus)*	Shrub	Per	NA	0.10
Winterfat (*Eurotia lanata*)	Shrub	Per	NA	1.50
Fourwing saltbush (*Atriplex canescens*)	Shrub	Per	NA	0.25
White prairie clover (*Dalea candida*)	Shrub	Per	NA	0.20
Prairie coneflower (*Ratibida columnaris*)	Forb	Per	NA	0.20
Blue flax (*Linum lewisii*)	Forb	Per	NA	0.15
Total PLS (lb/ac)				**9.10**
Alternate Species Seed List				
Indian ricegrass (*Achnatherum hymenoides)*	Grass	Perennial	Cool	ND
Desert needlegrass (*Achnatherum speciosum)*	Grass	Perennial	Cool	ND
Big bluestem (*Andropogon gerardii)*	Grass	Perennial	Warm	ND
Sand bluestem (*Andropogon hallii)*	Grass	Perennial	Warm	ND
Silver bluestem (*Andropogon saccharoides)*	Grass	Perennial	Warm	ND
Purple three-awn (*Aristida purpurea)*	Grass	Perennial	Warm	ND
Cane beardgrass (*Bothriochloa barbinodis)*	Grass	Perennial	Warm	ND
Yellow bluestem (*Bothriochloa ischaemum)*	Grass	Perennial	Warm	ND
Fringed Brome (*Bromus ciliatus)*	Grass	Perennial	Cool	ND
Buffalograss (*Buchloe dactyloides)*	Grass	Perennial	Warm	ND
Arizona cottontop (*Digitaria californica)*	Grass	Perennial	Warm	ND
Canada wildrye (*Elymus canadensis)*	Grass	Perennial	Cool	ND
Blue wildrye (*Elymus glaucus)*	Grass	Perennial	Cool	ND
Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus)*	Grass	Perennial	Cool	ND
Streambank wheatgrass (*Elymus lanceolatus ssp.psammophilus)*	Grass	Perennial	Cool	ND
Slender wheatgrass (*Elymus trachycaulus)*	Grass	Perennial	Cool	ND
Tanglehead (*Heterotheca contortus)*	Grass	Perennial	Warm	ND
Curly mesquite (*Hilaria belangeri)*	Grass	Perennial	Warm	ND

Table 7-1: Proposed Interim Seed Mix and Rates for the Little Rock Mine Reclamation Sites

Species[a]	Life-Form	Duration[b]	Seasonality	Rate[a,c]
Tobosa *(Pleuraphis mutica)*	Grass	Perennial	Warm	ND
Alternate Species Seed List (cont.)				
Junegrass (*Koeleria macrantha)*	Grass	Perennial	Cool	ND
Mountain muhly (*Muhlenbergia montana)*	Grass	Perennial	Warm	ND
Bush muhly (*Muhlenbergia porteri)*	Grass	Perennial	Warm	ND
Deergrass (*Muhlenbergia rigens)*	Grass	Perennial	Warm	ND
Ring muhly (*Muhlenbergia torreyi)*	Grass	Perennial	Warm	ND
Spike muhly (*Muhlenbergia wrightii)*	Grass	Perennial	Warm	ND
Vine mesquite (*Panicum obtusum)*	Grass	Perennial	Warm	ND
Switchgrass (*Panicum virgatum)*	Grass	Perennial	Warm	ND
Western wheatgrass (*Pascopyrum smithii)*	Grass	Perennial	Cool	ND
Galleta grass (*Pleuraphis jamesii)*	Grass	Perennial	Warm	ND
Muttongrass (*Poa fendleriana)*	Grass	Perennial	Cool	ND
Sandberg's Bluegrass (*Poa secunda)*	Grass	Perennial	Cool	ND
Bluebunch wheatgrass (*Pseudoroegneria spicata)*	Grass	Perennial	Cool	ND
Little bluestem (*Schizachyrium scoparium)*	Grass	Perennial	Warm	ND
Plains bristlegrass (*Setaria vulpiseta)*	Grass	Perennial	Warm	ND
Indiangrass (*Sorgastrum nutans)*	Grass	Perennial	Warm	ND
Alkali sacaton (*Sporobolus airoides)*	Grass	Perennial	Warm	ND
Sand dropseed (*Sporobolus cryptandrus)*	Grass	Perennial	Intermediate	ND
Giant dropseed (*Sporobolus giganteus)*	Grass	Perennial	Warm	ND
Sacaton *(Sporobolus wrightii)*	Grass	Perennial	Warm	ND
Needle and thread *(Hesperostipa comata)*	Grass	Perennial	Cool	ND
New Mexico needlegrass (*Hesperostipa neomexicana)*	Grass	Perennial	Cool	ND
Sleepygrass (*Stipa robusta)*	Grass	Perennial	Cool	ND
Western yarrow (*Achillea millefolium)*	Forb	Perennial	NA	ND
Desert marigold (*Baileya multiradiata)*	Forb	Perennial	NA	ND
Chocolate flower (*Berlandiera lyrata)*	Forb	Perennial	NA	ND
Desert mariposa lily (*Calochortus 20mbiguous)*	Forb	Perennial	NA	ND
Lavenderleaf primrose (*Calylophus hartwegii)*	Forb	Perennial	NA	ND
Indian paintbrush (*Castilleja integra)*	Forb	Perennial	NA	ND
Downy paintbrush (*Castilleja sessiliflora)*	Forb	Perennial	NA	ND
Lanceleaf tickseed (*Coreopsis lanceolata)*	Forb	Perennial	NA	ND
Plains tickseed (*Coreopsis tinctoria)*	Forb	Perennial	NA	ND
White prairie clover (*Dalea candida)*	Forb	Perennial	NA	ND
James' dalea (*Dalea jamesii)*	Forb	Perennial	NA	ND
Blanket flower (*Gaillardia aristata)*	Forb	Perennial	NA	ND

Table 7-1: Proposed Interim Seed Mix and Rates for the Little Rock Mine Reclamation Sites

Species[a]	Life-Form	Duration[b]	Seasonality	Rate[a,c]
Firewheel (*Gaillardia pulchella)*	Forb	Perennial	NA	ND
Alternate Species Seed List (cont.)				
Bird's eyes (*Gilia tricolor)*	Forb	Perennial	NA	ND
Desert verbena (*Glandularia gooddingii)*	Forb	Perennial	NA	ND
Showy goldeneye (*Heliomeris multiflora)*	Forb	Perennial	NA	ND
Scarlet gilia (*Ipomopsis ambiguous)*	Forb	Perennial	NA	ND
Gordon bladderpod (*Lesquerella gordonii)*	Forb	Perennial	NA	ND
Arizona lupine (*Lupinus arizonicus)*	Forb	Perennial	NA	ND
Perennial lupine (*Lupinus perennis)*	Forb	Perennial	NA	ND
Bigelow's tansyaster (*Machaeranthera bigelovii var.bigelovii)*	Forb	Perennial	NA	ND
Tanseyleaf tansyaster (*Machaeranthera tanacetifolia)*	Forb	Perennial	NA	ND
Wild Four 'O Clock (*Mirabilis multiflora)*	Forb	Perennial	NA	ND
Lemon beebalm (*Monarda citriodora)*	Forb	Perennial	NA	ND
Wild bergamot (*Monarda fistulosa)*	Forb	Perennial	NA	ND
Hooker evening primrose (*Oenothera elata)*	Forb	Perennial	NA	ND
Missouri evening primrose (*Oenothera macrocarpa)*	Forb	Perennial	NA	ND
Sand penstemon (*Penstemon ambiguous)*	Forb	Perennial	NA	ND
Scarlet bulger (*Penstemon barbatus)*	Forb	Perennial	NA	ND
Firecracker penstemon (*Penstemon eatonii)*	Forb	Perennial	NA	ND
Fendler's penstemon (*Penstemon fendleri)*	Forb	Perennial	NA	ND
Palmer penstemon (*Penstemon palmeri)*	Forb	Perennial	NA	ND
Desert penstemon (*Penstemon pseudospectabilis)*	Forb	Perennial	NA	ND
Superb penstemon (*Penstemon superbus)*	Forb	Perennial	NA	ND
Wandbloom penstemon (*Penstemon virgatus)*	Forb	Perennial	NA	ND
Bluebells (*Phacelia campanularia)*	Forb	Perennial	NA	ND
Desert bluebells (*Phacelia crenulata)*	Forb	Perennial	NA	ND
Mexican hat (*Ratibida columnifera)*	Forb	Perennial	NA	ND
Blackeyed Susan (*Rudbeckia hirta)*	Forb	Perennial	NA	ND
Silver groundsel *(Senecio longilobus)*	Forb	Perennial	NA	ND
Desert senna (*Senna covesii)*	Forb	Perennial	NA	ND
Canada goldenrod (*Solidago canadensis)*	Forb	Perennial	NA	ND
Desert globemallow (*Sphaeralcea ambigua)*	Forb	Perennial	NA	ND
Scarlet globemallow (*Sphaeralcea coccinea)*	Forb	Perennial	NA	ND
Gooseberry globemallow (*Sphaeralcea grossulariifolia)*	Forb	Perennial	NA	ND
Greenthread (*Thelesperma filifolium)*	Forb	Perennial	NA	ND

Table 7-1: Proposed Interim Seed Mix and Rates for the Little Rock Mine Reclamation Sites

Parry's agave (*Agave parryi)*	Shrub	Perennial	NA	ND
Species[a]	**Life-Form**	**Duration[b]**	**Seasonality**	**Rate[a,c]**
Alternate Species Seed List (cont.)				
False indigo-bush (*Amorpha fruticosa)*	Shrub	Perennial	NA	ND
White sagebrush (*Artemisia ludoviciana)*	Shrub	Perennial	NA	ND
Fourwing saltbush (*Atriplex canescens)*	Shrub	Perennial	NA	ND
Canyon bricklebush (*Brickellia californica)*	Shrub	Perennial	NA	ND
Fairy duster (*Calliandra eriphylla)*	Shrub	Perennial	NA	ND
Desert willow (*Chilopsis linearis)*	Shrub	Perennial	NA	ND
Feather dalea (*Dalea formosa)*	Shrub	Perennial	NA	ND
Sotol (*Dasylirion wheeleri)*	Shrub	Perennial	NA	ND
Rubber rabbitbrush (Erimaceria *nauseosa)*	Shrub	Perennial	NA	ND
Wolfberry (*Lycium pallidum)*	Shrub	Perennial	NA	ND
Creeping Oregon grape (*Mahonia repens)*	Shrub	Perennial	NA	ND
Beargrass (*Nolina microcarpa)*	Shrub	Perennial	NA	ND
Skunkbush sumac (*Rhus trilobata)*	Shrub	Perennial	NA	ND
Canyon gooseberry (*Ribes leptanthum)*	Shrub	Perennial	NA	ND
NM locust (*Robinia neomexicana)*	Shrub	Perennial	NA	ND
Broadleaf yucca (*Yucca baccata)*	Shrub	Perennial	NA	ND
Soap tree yucca (*Yucca elata)*	Shrub	Perennial	NA	ND
Spanish bayonet (*Yucca glauca)*	Shrub	Perennial	NA	ND

Notes:
[a] Seed mix and rates are subject to change based on future investigations
[b] Per – Perennial; Ann = Annual
[c] Rate is in pounds of pure live seed per acre; substitutions may change seeding rates
lb/ac = pounds per acre
NA = Not applicable
ND = Not determined
PLS = Pure live seed

Table 7-2: Functions and Attributes of the Primary Plant Species Proposed for the Little Rock 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
Green sprangletop (Leptochloa dubia)	N,P,W,G	Erect bunch grass; aggressive short-lived nurse plant with forage value
Galleta (*Plueraphis jamesii*)	N,P,W,G	Sod and bunchgrass producing bunches of erect stems providing ground cover and forage
Sand dropseed (*Sporobolus cryptandrus*)	N,P,G	Erect bunchgrass forming a tuft of stems growing up to a meter long providing ground cover and forage
Bottlebrush squiretail (Sitanion hystrix)	N,P,C,G	Persistent (moderately palatable) bunch grass providing ground cover
Indian Ricegrass (*Oryzopsis hymenoides*)	N,P,C,G	Perennial cool-season bunchgrass providing ground cover and forage
Streambank wheatgrass (Agropyron dastachyum v. riparium)	N,P,C,G	Sod-forming grass providing ground cover and forage
Apache plume (Fallugia paradoxa)	N,P,S	Mid-height shrub providing browse, cover, and erosion control
Mountain mahogany *(Cercocarpus montanus)*	N,P,S	Mid-height to tall shrub providing browse and cover
Winterfat (Eurotia lanata)	N,P,HS	Low shrub providing winter browse
Fourwing saltbush (*Atriplex canescens*)	N,P,S	Evergreen shrub commonly 2 to 4 feet high that is salt, cold, and drought resistant providing ground cover and forage
White prairie clover (*Dalea candida*)	N,P,S	Early season legume providing ground cover and forage
Prairie coneflower (*Ratibida columnaris*)	N,P,F	Late-season, 12 to 24 inches in height providing ground cover and forage
Blue flax (Linum lewisii)	N,P,F	Persistent forb with a pretty blue flower

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

Table 7-3: Proposed Plant Diversity Guidelines for the Little Rock Mine

Class	Seasonality	Number	Minimum Occurrence (% cover)
Perennial grass	Warm	3	1
Perennial grass	Cool	2	0.5
Perennial shrub	NA	2	1
Forbs	NA	2	0.1

Notes:
NA = Not applicable

Table 9-1: Reclamation Schedule for the Little Rock Mine

Unit	Anticipated or Actual Start Date for Reclamation to Begin[a]	Anticipated Duration (Years)[b] or Completion Date
Inpit Stockpile	180 days following Cessation of Operation	2
Open Pit[c]	180 days following Cessation of Operation	2
Haul Roads and Access Roads[d]	180 days following Cessation of Operation	2
Pipelines[e]	180 days following Cessation of Operation	1
Ancillary Facilities and Structures	180 days following Cessation of Operation	1

Notes:

[a] Anticipated start dates are subject to modification.

[b] Estimated duration for facility reclamation does not include regulatory design review and approval processes.

[c] Only accessible flat areas within the open pit that are located above the pit lake surface will be reclaimed. For the purposes of this CCP, accessible pit flat areas are defined as pit haul road driving surfaces and flat areas 50-feet or greater from a highwall.

[d] Only haul roads and access roads not required for post-closure monitoring access will be reclaimed..

[e] Applies to portions of pipeline alignment #1 and #2 that extend from the open pit sump to the crest of the pit. The remaining portions of pipeline located outside the perimeter of the open pit will remain during the post-closure period.

FIGURES

Catron County
Sierra County
Grant County
Gila National Forest
180
Gila River
Gila National Forest
Silver City
Bayard
Santa Clara
Hurley
Tyrone
Tyrone Mine
Little Rock Mine
Grant County
Hidalgo County
90
Grant County
Luna County
180
10
Lordsburg
10
Deming
New Mexico
NOT TO SCALE
United States
Mexico

Legend

- Existing Little Rock MMD Permit Boundary
- Existing Tyrone MMD Permit Boundary
- Gila National Forest
- Continental Divide

Note:
Figure originally developed by Telesto Solutions, Inc.

N

80,000 40,000 0 Feet

FREEPORT-MCMORAN COPPER & GOLD

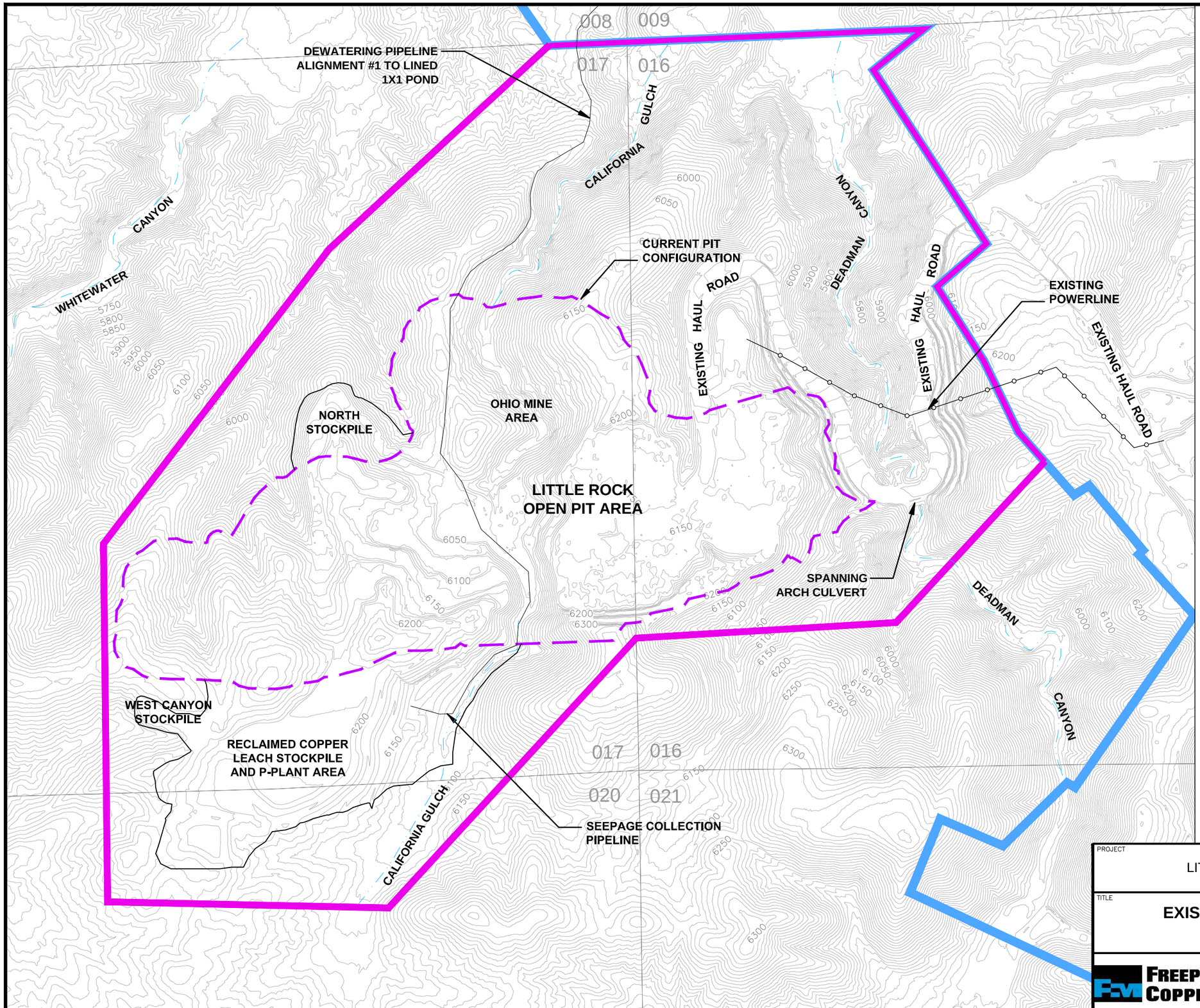
PROJECT No. 113-01155

PROJECT/REPORT
FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

FIGURE 1-1

TITLE
MINE LOCATION MAP

Path: W:\Eddy\MXDs\GOLDER_20130903_figure_1_DO.mxd



LEGEND

- EXISTING LITTLE ROCK MINE PERMIT BOUNDARY
- EXISTING TYRONE MINE PERMIT BOUNDARY
- APPROVED OPEN PIT DESIGN LIMIT (PERMIT MODIFICATION 13-2 TO MMD PERMIT GR007RE)

NOTES:

1. SOURCE: TOPOGRAPHIC SURFACE FROM JANUARY 2012 FLY-OVER SURVEY PROVIDED BY FREEPORT MCMORAN TYRONE, INC.
2. SOURCE: FIGURE ORIGINALLY CREATED BY TELESTO SOLUTIONS INCORPORATED.
3. CONTOUR INTERVAL AT 10 FEET.
4. COORDINATE SYSTEM IN TYRONE LOCAL MINE.
5. SECTION LINES FROM LITTLE ROCK AREA IN WIND MOUNTAIN, NM QUAD MAP (T19S R16W SECTIONS 8,9,16,17,20 AND 21).

PROJECT

FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

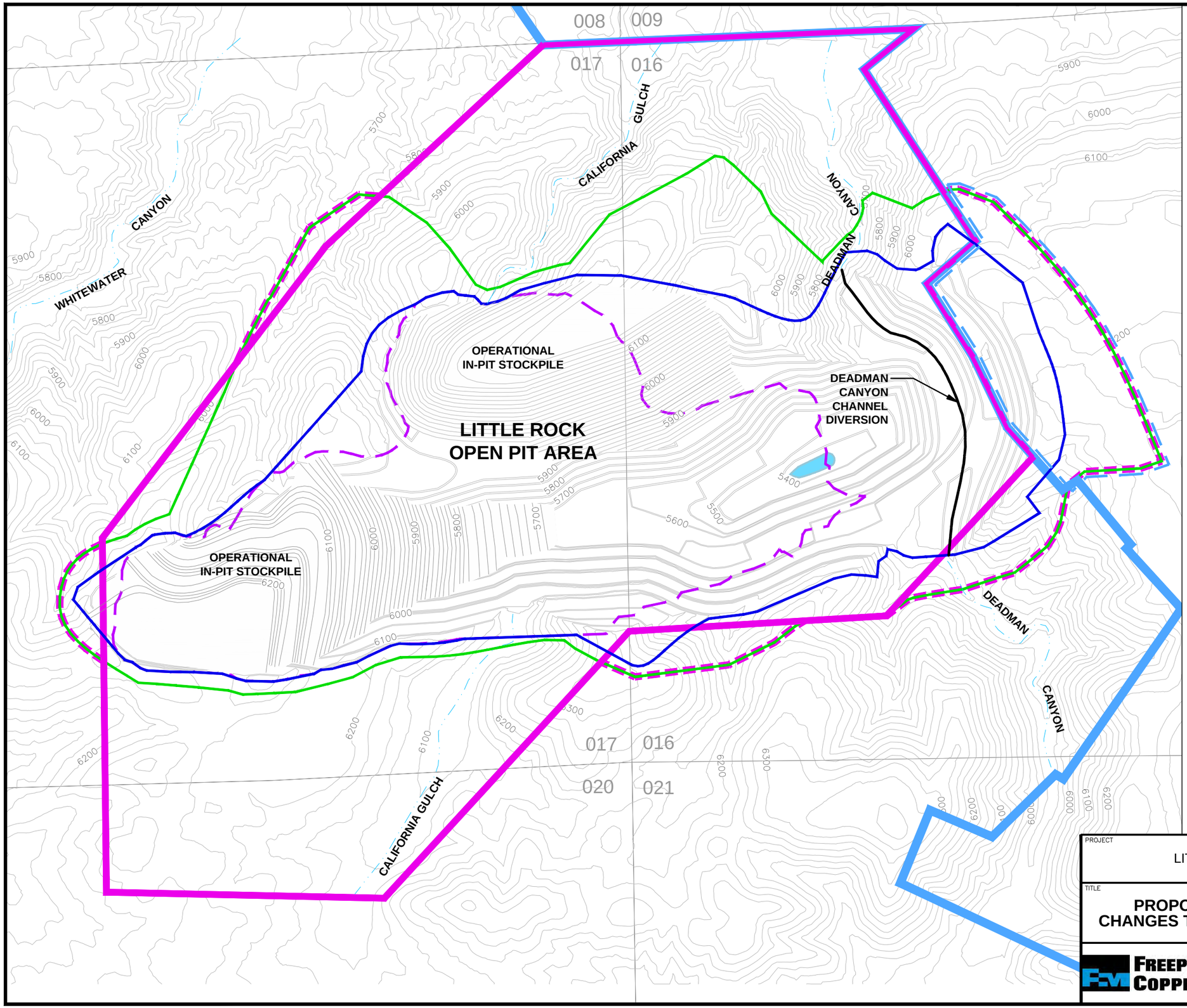
TITLE

EXISTING LITTLE ROCK MINE FACILITIES AND PERMIT BOUNDARIES

FREEPORT-McMoRAN COPPER & GOLD

PROJECT No.		11301155	FILE No.	11301155B001-2
DESIGN	TS	01/30/14	SCALE AS SHOWN	REV. 0
CADD	CM	05/07/14		
CHECK	TS	05/07/14		
REVIEW	TS	05/07/14		

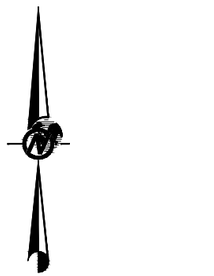
FIGURE 1-2



LEGEND

- PROPOSED MINING AREA DESIGN LIMIT
- PROJECTED EXTENT OF OPEN PIT AT END OF MINE LIFE
- EXISTING LITTLE ROCK MINE PERMIT BOUNDARY
- EXISTING TYRONE MINE PERMIT BOUNDARY
- PROPOSED CHANGE TO LITTLE ROCK MINE PERMIT BOUNDARY
- AREA WITHIN APPROVED TYRONE MINE DESIGN LIMIT (PERMIT MODIFICATION 06-1 TO PERMIT GR010RE)
- APPROVED OPEN PIT DESIGN LIMIT (PERMIT MODIFICATION 13-2 TO MMD PERMIT GR007RE)
- OPERATIONAL OPEN PIT SUMP

NOTES:
1. SOURCE: TOPOGRAPHIC SURFACE IS END OF MINE LIFE PROVIDED BY FREEPORT MCMORAN TYRONE INC.; PROJECTED OPERATIONAL IN-PIT STOCKPILE TOPOGRAPHIC CONTOURS PROVIDED BY FREEPORT MCMORAN TYRONE INC.
2. CONTOUR INTERVAL AT 25 FEET OUTSIDE OPEN PIT. RECLAIMED CONTOUR INTERVALS AT 10 FEET.
3. COORDINATE SYSTEM IN TYRONE LOCAL MINE.
4. SECTION LINES FROM LITTLE ROCK AREA IN WIND MOUNTAIN, NM QUAD MAP (T19S R15W SECTIONS 8,9,16,17,20 AND 21)



700 0 700
SCALE FEET

PROJECT
FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

TITLE
PROPOSED MINING AREA DESIGN LIMIT AND CHANGES TO LITTLE ROCK MINE PERMIT BOUNDARY

FREEPORT-McMoRan COPPER & GOLD

PROJECT No.		11301155	FILE No.		11301155B001-3
DESIGN	TS	01/07/14	SCALE	AS SHOWN	REV. 0
CADD	CM	04/23/14	FIGURE 1-3		
CHECK	TS	04/23/14			
REVIEW	TS	04/23/14			

DEWATERING PIPELINE ALIGNMENT #1 TO LINED 1X1 POND

DEWATERING PIPELINE ALIGNMENT #2 TO LINED 1X1 POND

NEW POWERLINE

CALIFORNIA GULCH

CANYON

WHITEWATER CANYON

DEADMAN CANYON

WESTERN HAUL ROAD

NORTH STOCKPILE

6150

DEADMAN CANYON CHANNEL DIVERSION

LITTLE ROCK OPEN PIT AREA

OPERATIONAL IN-PIT STOCKPILE

WEST CANYON STOCKPILE

RECLAIMED COPPER LEACH STOCKPILE AND P-PLANT AREA

SEEPAGE COLLECTION PIPELINE

CALIFORNIA GULCH

DEADMAN CANYON

008 009 017 016 020 021

LEGEND

- PROPOSED MINING AREA DESIGN LIMIT
- PROJECTED EXTENT OF OPEN PIT EOY 2017
- EXISTING LITTLE ROCK MINE PERMIT BOUNDARY
- EXISTING TYRONE MINE PERMIT BOUNDARY
- PROPOSED CHANGE TO LITTLE ROCK MINE PERMIT BOUNDARY
- AREA WITHIN APPROVED TYRONE MINE DESIGN LIMIT (PERMIT MODIFICATION 06-1 TO PERMIT GR010RE)
- APPROVED OPEN PIT DESIGN LIMIT (PERMIT MODIFICATION 13-2 TO MMD PERMIT GR007RE)

NOTES:
1. SOURCE: TOPOGRAPHY FROM FREEPORT MCMORAN TYRONE, INC. EOY 2017 MINE PLAN.
2. CONTOUR INTERVAL AT 10 FEET.
3. COORDINATE SYSTEM IN TYRONE LOCAL MINE.
4. SECTION LINES FROM LITTLE ROCK AREA IN WIND MOUNTAIN, NM QUAD MAP (T19S R15W SECTIONS 8,9,16,17 20 AND 21).

N

700 0 700

SCALE FEET

PROJECT

FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

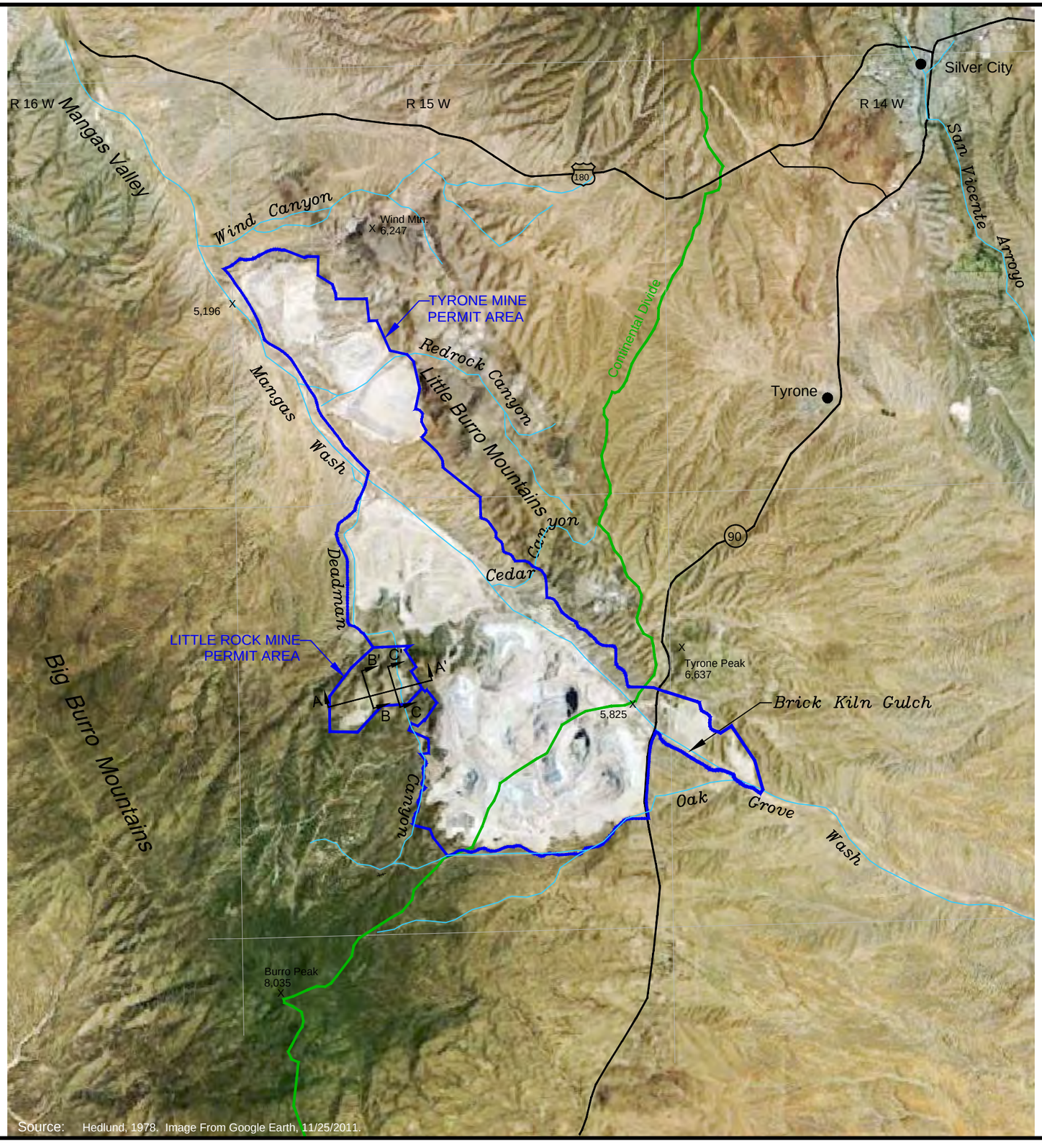
TITLE

EOY 2017 LITTLE ROCK MINE FACILITIES AND MINE PERMIT BOUNDARIES

FREEPORT-McMoRan COPPER & GOLD

PROJECT No.		11301155	FILE No.		11301155B002–1
DESIGN	TS	01/07/14	SCALE	AS SHOWN	REV. 0
CADD	CM	05/07/14			
CHECK	TS	05/07/14			
REVIEW	TS	05/07/14			

FIGURE 2-1



Source: Hedlund, 1978. Image From Google Earth, 11/25/2011.

LEGEND

- A—A' CROSS SECTION LOCATIONS
- MINE PERMIT AREA
- NATURAL DRAINAGE
- CONTINENTAL DIVIDE
- X 5,825 ELEVATION (FEET ABOVE MEAN SEA LEVEL)

NOTES:
1. CROSS SECTION DETAILS SHOWN ON FIGURES 2-5 AND 2-6.
2. SOURCE: FIGURE CREATED BY GOLDER ASSOCIATES

N

8000 0 8000
SCALE FEET

PROJECT
FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

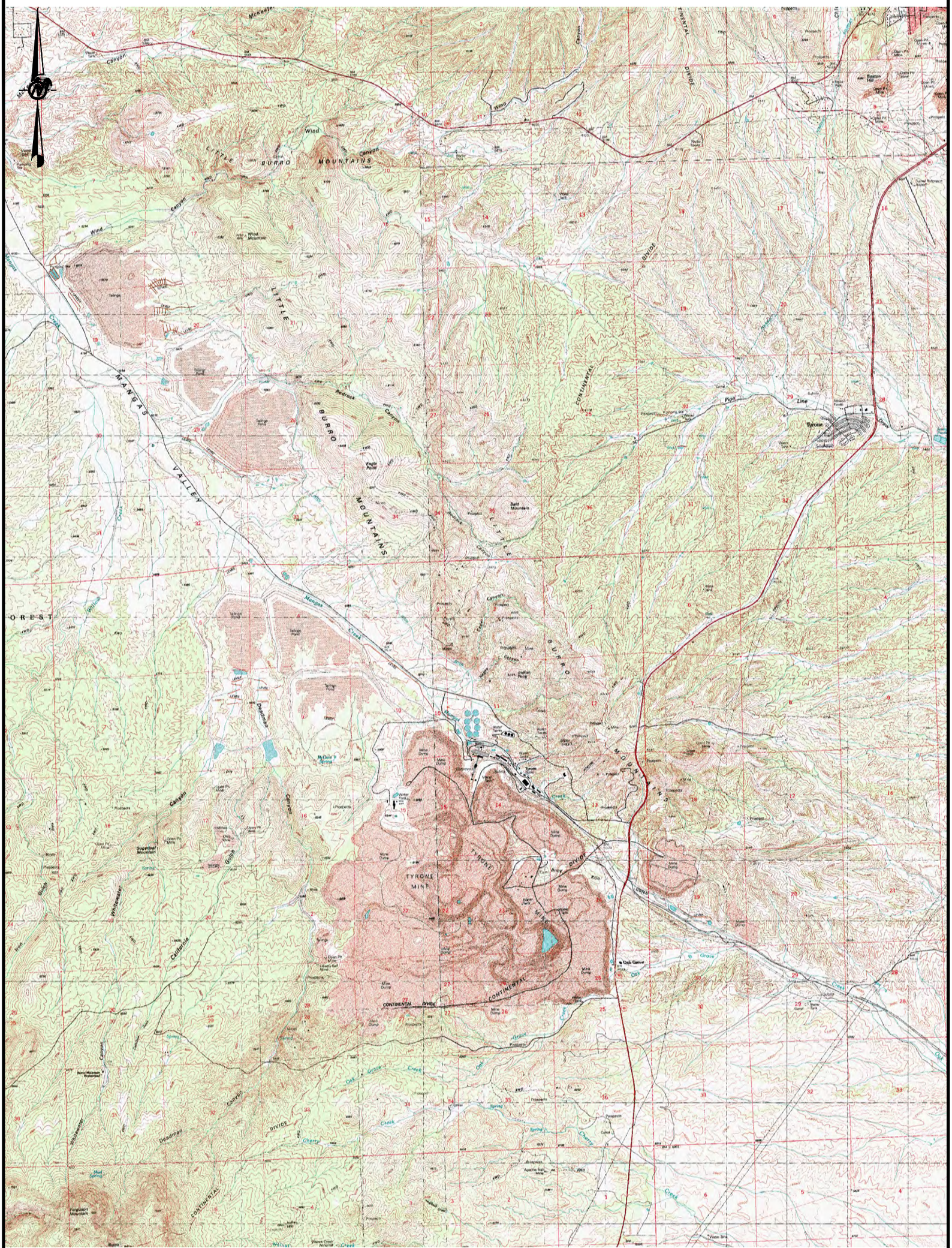
TITLE
REGIONAL PHYSIOGRAPHIC FEATURES AND CROSS SECTION LOCATIONS

FREEPORT-MCMORAN COPPER & GOLD

PROJECT No.		11301155	FILE No.		11301155B002-2
DESIGN	TS	12/16/13	SCALE	AS SHOWN	REV. 0
CADD	CM	05/07/14			
CHECK	TS	05/07/14			
REVIEW	TS	05/07/14			

FIGURE 2-2

Drawing file: 11301155B002-2.dwg May 08, 2014 - 12:31pm



1500 0 1500
SCALE METERS

NOTES:

1. TOPOGRAPHIC MAP DETAILS WERE DEVELOPED BETWEEN 1992 AND 1999. SPECIFIC MINE FEATURES MAY VARY FROM THOSE SHOWN ON THIS MAP. FOR SPECIFIC MINE TOPOGRAPHY AND PHYSICAL FEATURES, REFER TO FIGURES 1-2 AND 2-1 OF THIS CCP.
2. SOURCE: ALL TOPO MAPS V7 PROFESSIONAL MAP REFERENCE SET, NEW MEXICO RELEASE 3. INCLUDES QUADS: CIRCLE MESA, SILVER CITY, TYRONE, WIND MOUNTAIN, WHITE SIGNAL AND BURRO PEAK.
3. SOURCE: FIGURE CREATED BY GOLDER ASSOCIATES.

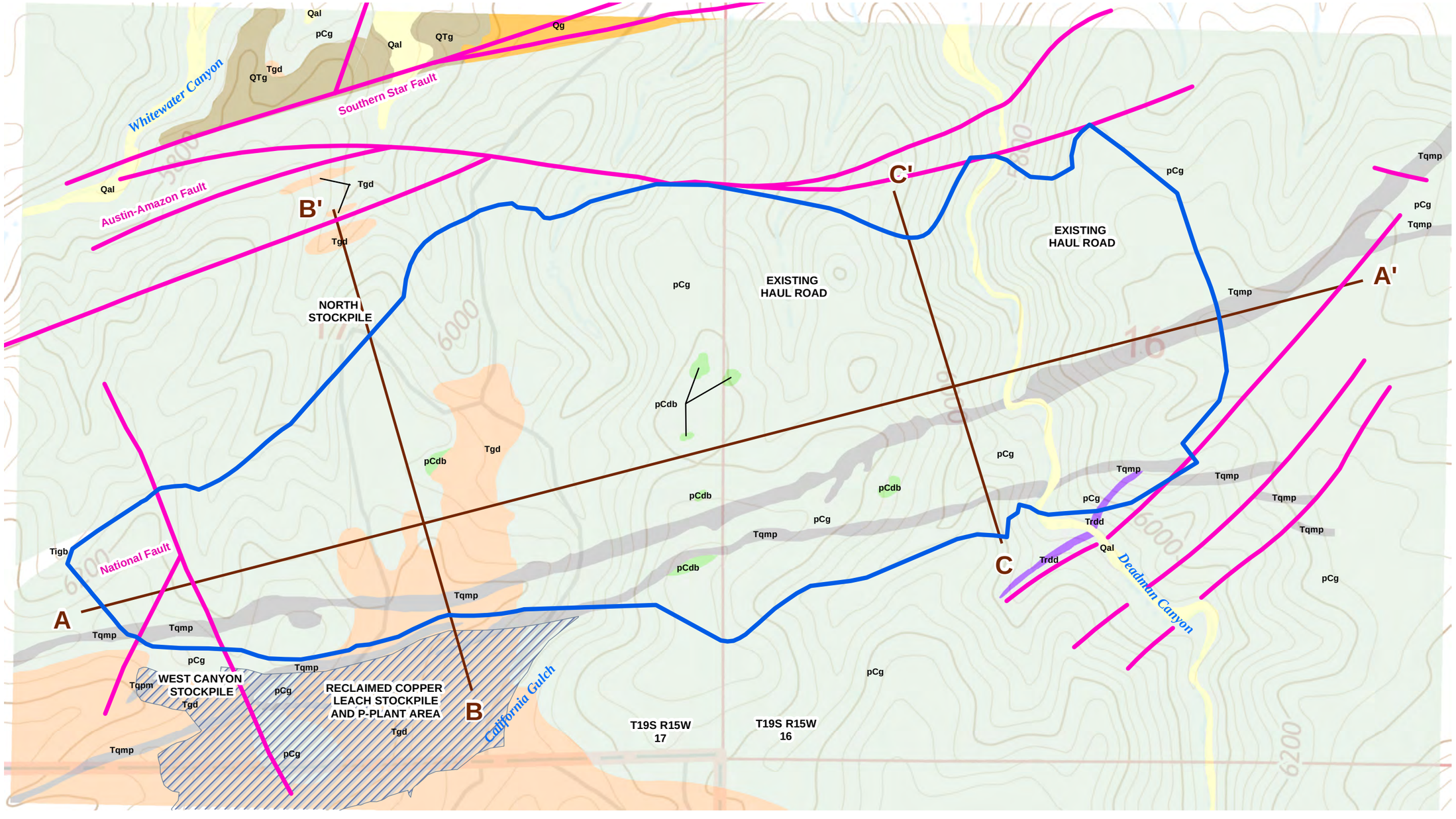
PROJECT
FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

TITLE
GENERALIZED REGIONAL TOPOGRAPHIC MAP

FREEPORT-MCMORAN COPPER & GOLD

PROJECT No.		11301155	FILE No.	11301155B002-3	
DESIGN	TS	12/16/13	SCALE	AS SHOWN	REV. 0
CADD	CM	05/07/14			
CHECK	TS	05/07/14			
REVIEW	TS	05/07/14			

FIGURE 2-3



Topography

10 ft contour interval, ft msl

6000 50 ft contour interval, ft msl

Figure modified from Figure 8
Surface Geology Little Rock Mine
(Daniel B Stephens & Associates, Inc., 06/12/2014)

Note:
1. Pre-mining land surface provided by Tyrone (dated 11/9/2007).
2. Surface geology based on Tyrone block model (received 12/16/2013), Tyrone (2003), and Hedlund (1978).
3. Faults within Little Rock conceptual open pit extent provided by Tyrone (received 06/11/2014).

Legend

- Conceptual Open Pit Configuration at End of Mine Life
- Faults (Minor faults not shown)
- Cross Section Line

Lithology

- Qal Quaternary Alluvial Deposits
- Qg Mangas Conglomerate
- Qtg Gila Conglomerate
- Tgd Tertiary Granodiorite
- Tqmp Tertiary Quartz Monzonite Porphyry Dike
- Trdd Tertiary Rhyodacite Dike
- pCg Pre-Cambrian Granite
- pCbd Pre-Cambrian Diabase

N

0 1,000
SCALE IN FEET

PREPARED FOR: FREEPORT-MCMORAN COPPER & GOLD

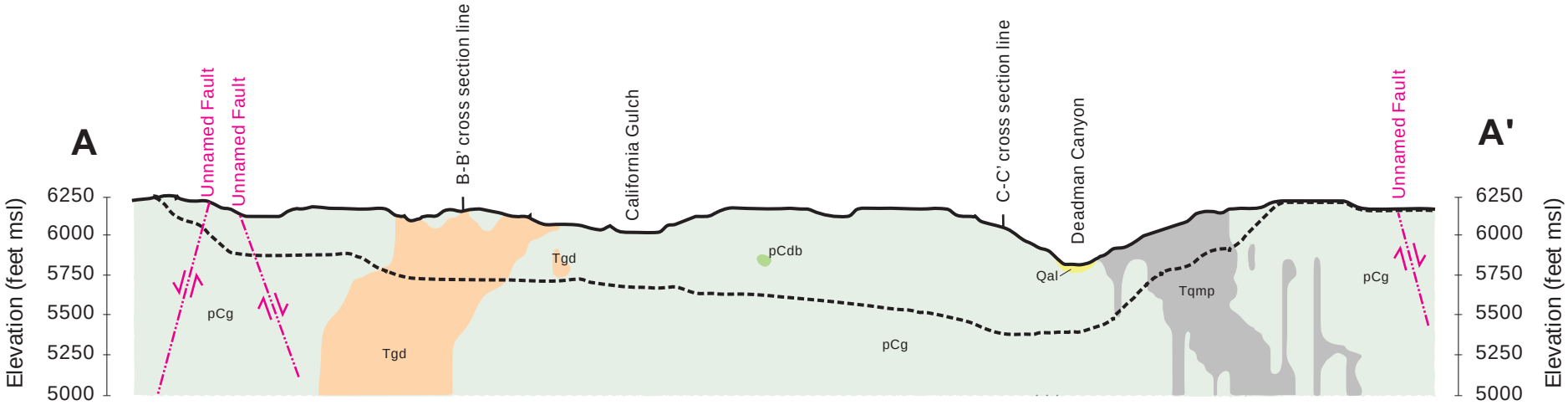
PROJECT No. 113-01155

PROJECT/REPORT FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

TITLE **FIGURE 2-4** GENERALIZED GEOLOGIC MAP OF LITTLE ROCK MINE AREA

Path: R:\Tyrone\Copper Mountain Reclamation Area\Products\Reports\Hydrology Hydraulics\Figures Coordinate System: NM83-WF

S:\Projects\Mine_Tyrone\Projects\ES12.0184_Little_Rock_Modeling\VR_Drawings\ES12_0184_05CS_cross_section_2.cdr



Legend

Notes:

1. Conceptual open pit at End of Mine Life configuration provided by Tyrone (received 5/8/2013).
2. Surface geology based on Tyrone block model (received 12/16/2013), Tyrone (2003), and Hedlund (1978)
3. Pre-mining land surface provided by Tyrone (dated 11/9/2007).
4. Faults within Little Rock conceptual open pit extent provided by Tyrone (received 6/11/2014).
5. Faults oriented sub-parallel to the cross section line are not shown.
6. Figure modified from Figure 9 West to East Geologic Cross Section A-A'Little Rock Mine (Daniel B Stephens & Associates, Inc. 6/3/2014).

Explanation

- Pre-mining land surface topography
- Conceptual open pit extent at End of Mine Life
- Fault (minor faults not shown)

Lithology

- Qal Quaternary Alluvial Deposits
- Tgd Tertiary Granodiorite
- Tqmp Tertiary Quartz Monzonite Porphyry Dike
- pCg Pre-Cambrian Granite
- pCdb Pre-Cambrian Diabase

0 1,000 ft

No vertical exaggeration

FREEPORT-MCMORAN COPPER & GOLD

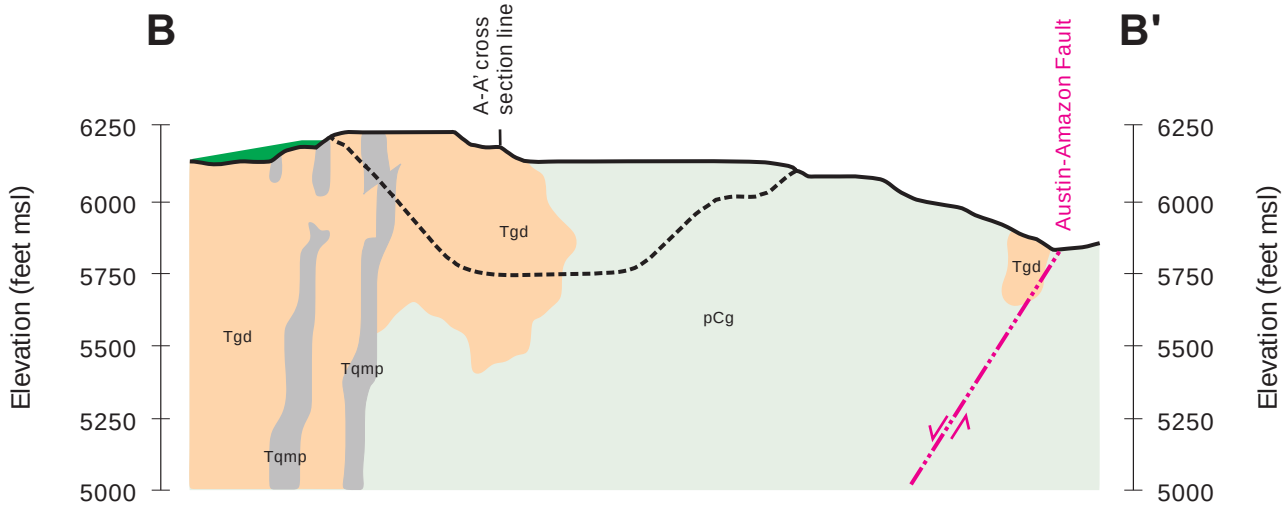
PROJECT No. 113-01155

PROJECT/REPORT
FREEPORT MCMORAN TYRONE, INC
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

Figure 2-5

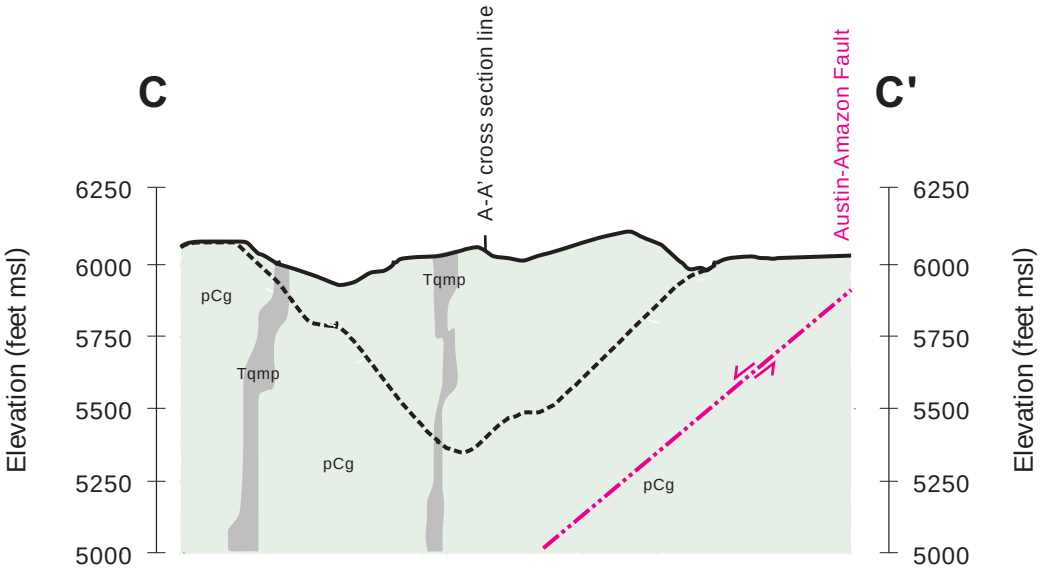
TITLE
West to East Geologic Cross Section A-A'

S:\Projects\Mine_Tyrone\Projects\ES12.0184_Little_Rock_Modeling\VR_Drawings\ES12_0184_05CS_cross_section_2.cdr



Notes:

1. Conceptual open pit configuration at End of Mine Life provided by Tyrone (received 5/8/2013).
2. Surface geology based on Tyrone block model (received 12/16/2013), Tyrone (2003), and Hedlund (1978)
3. Pre-mining land surface topography provided by Tyrone (dated 11/9/2007).
4. Faults within Little Rock conceptual open pit extent provided by Tyrone (received 1/27/2014).
5. Figure modified from Figure 10 -South to North Geologic Cross Section B-B' and C-C' for Little Rock Mine (Daniel B. Stephens & Assoc, Inc. 6/3/2014)



Legend

Explanation

- Pre-mining land surface topography
- Conceptual open pit extent at End of Mine Life
- Fault (minor faults not shown)

Lithology

- Reclaimed Copper Leach Stockpile and P-Plant Area
- Tgd — Tertiary Granodiorite
- Tqmp — Tertiary Quartz Monzonite Porphyry Dike
- pCg — Pre-Cambrian Granite

0 750 ft

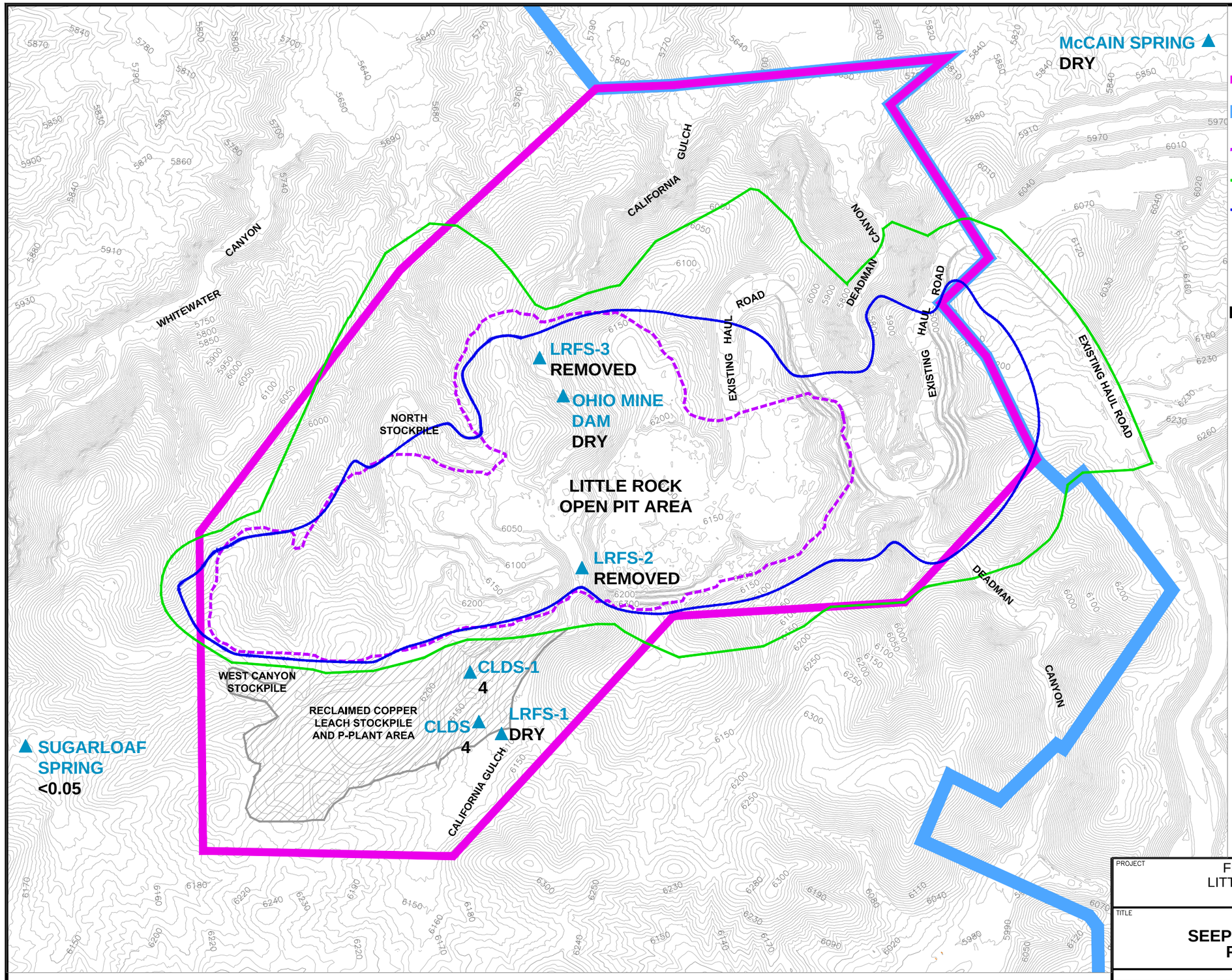
No vertical exaggeration

FREEPORT-MCMORAN COPPER & GOLD

PROJECT No. 113-01155

PROJECT/REPORT
FREEPORT MCMORAN TYRONE, INC
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

TITLE
Figure 2-6 **South to North Geologic Cross Section B-B' and C-C'**



LEGEND

- EXISTING LITTLE ROCK MINE PERMIT BOUNDARY
- EXISTING TYRONE MINE PERMIT BOUNDARY
- APPROVED OPEN PIT DESIGN LIMIT (PERMIT MODIFICATION 13-2 TO MMD PERMIT GR007RE)
- PROPOSED MINING AREA DESIGN LIMIT
- PROJECTED EXTENT OF OPEN PIT EOY 2017
- ▲4 SURFACE WATER LOCATION AND MEASURED FLOW RATE IN GPM
- **DRY** SPRING OR POND DRY
- **REMOVED** REMOVED DUE TO MINING ACTIVITY IN AREA

NOTES:
1. SOURCE: TOPOGRAPHIC SURFACE FROM JANUARY 2012 FLY-OVER SURVEY PROVIDED BY FREEPORT MCMORAN TYRONE, INC.
2. SOURCE: FIGURE ORIGINALLY CREATED BY TELESTO SOLUTIONS INCORPORATED.
3. CONTOUR INTERVAL AT 10 FEET.
4. COORDINATE SYSTEM IN TYRONE LOCAL MINE.
5. VALUES FROM DP-1236 MONITORING REPORT (09/30/13).

800 0 800
SCALE FEET

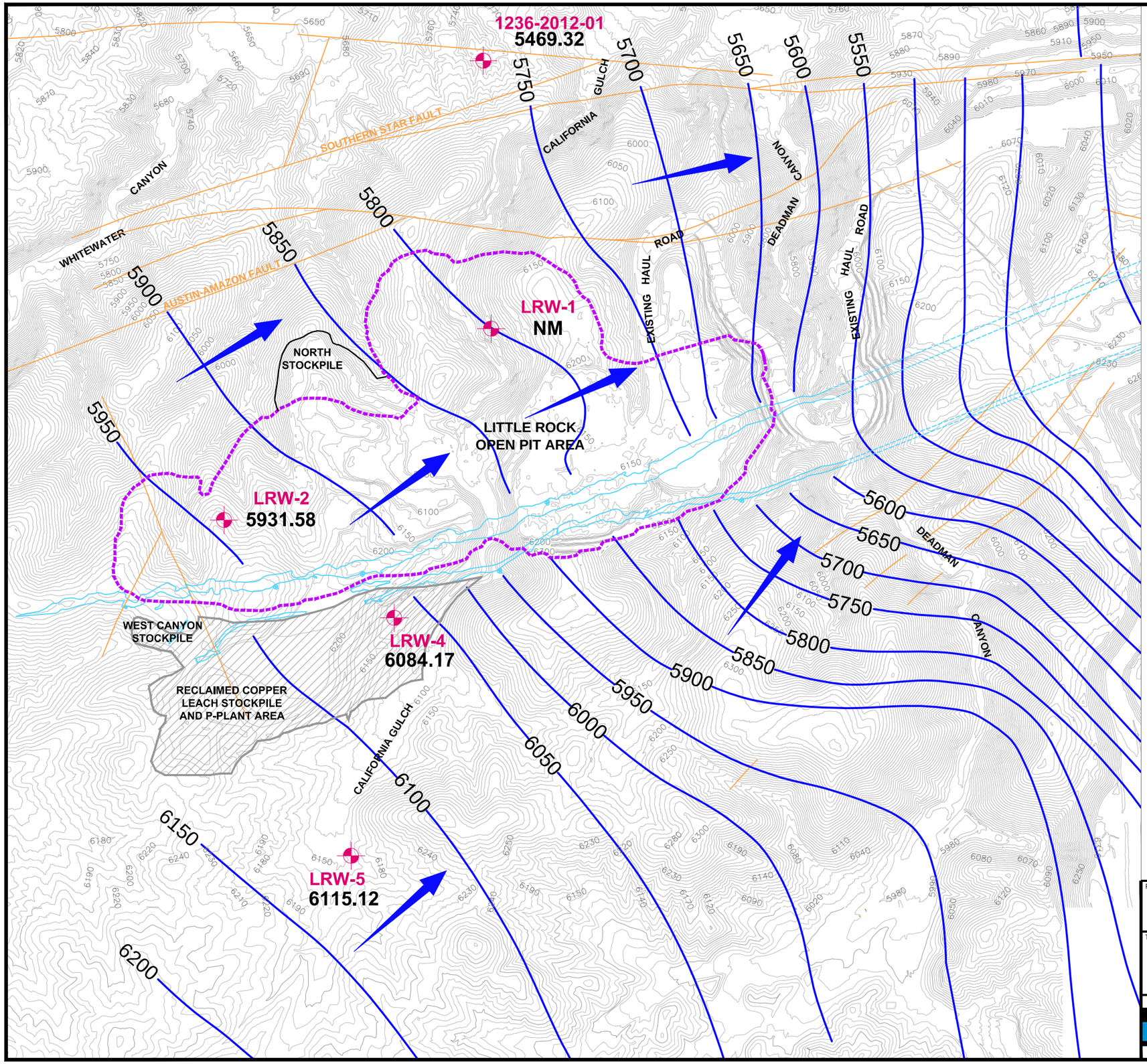
PROJECT
FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

TITLE
THIRD QUARTER 2013 SEEP, SPRING AND POND FLOW RATES FOR LITTLE ROCK MINE AREA

FREEPORT-MCMORAN COPPER & GOLD

PROJECT No.		11301155	FILE No.	11301155B002–7
DESIGN	TS	01/30/14	SCALE AS SHOWN	REV. 0
CADD	CM	05/07/14		
CHECK	TS	05/07/14		
REVIEW	TS	05/07/14		

FIGURE 2-7



LEGEND

- APPROVED OPEN PIT DESIGN LIMIT (PERMIT MODIFICATION 13-2 TO MMD PERMIT GR007RE)
- FAULTS (MINOR FAULTS ARE NOT SHOWN)
- DIKE
- DIKE (INFERRED EXTENT)
- Well GW_Elev — LOCATION OF GROUND WATER MONITOR WELL SHOWING WELL DESIGNATION AND WATER TABLE ELEVATION (FT)
- 5800 — POTENTIOMETRIC SURFACE FEET ABOVE MSL
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:
1. SOURCE: TOPOGRAPHIC SURFACE FROM JANUARY 2012 FLY-OVER SURVEY PROVIDED BY FREEPORT MCMORAN TYRONE, INC.
2. SOURCE: FAULTS, DIKES AND GROUNDWATER CONTOURS PROVIDED BY DBS & A ON 02/04/2014.
3. CONTOUR INTERVAL AT 10 FEET.
4. COORDINATE SYSTEM IN TYRONE LOCAL MINE.
5. VALUES FROM DP-1236 MONITORING REPORT (09/30/13).

800 0 800
SCALE FEET

PROJECT
FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

TITLE
FOURTH QUARTER 2013 REGIONAL GROUNDWATER ELEVATIONS FOR LITTLE ROCK MINE AREA

FREEPORT-McMoRan COPPER & GOLD

PROJECT No.		11301155	FILE No.	11301155B002-8
DESIGN	TS	01/30/14	SCALE AS SHOWN	REV. 0
CADD	CM	05/07/14		
CHECK	TS	05/07/14		
REVIEW	TS	05/07/14		

FIGURE 2-8

DEWATERING PIPELINE ALIGNMENT #1 TO LINED 1X1 POND

DEWATERING PIPELINE ALIGNMENT #2 TO LINED 1X1 POND

NEW POWERLINE

CALIFORNIA GULCH

WHITEWATER CANYON

DEADMAN CANYON

NORTH STOCKPILE

LITTLE ROCK OPEN PIT AREA

OPERATIONAL IN-PIT STOCKPILE

WEST CANYON STOCKPILE

RECLAIMED COPPER LEACH STOCKPILE AND P-PLANT AREA

SEEPAGE COLLECTION PIPELINE

CALIFORNIA GULCH

DEADMAN CANYON

008 009 017 016 020 021

LEGEND

- PROPOSED MINING AREA DESIGN LIMIT
- PROJECTED EXTENT OF OPEN PIT EOY 2017
- EXISTING LITTLE ROCK MINE PERMIT BOUNDARY
- EXISTING TYRONE MINE PERMIT BOUNDARY
- PROPOSED CHANGE TO LITTLE ROCK MINE PERMIT BOUNDARY
- AREA WITHIN APPROVED TYRONE MINE DESIGN LIMIT (PERMIT MODIFICATION 06-1 TO PERMIT GR010RE)
- APPROVED OPEN PIT DESIGN LIMIT (PERMIT MODIFICATION 13-2 TO MMD PERMIT GR007RE)
- PROPOSED WILDLIFE HABITAT POST MINING LAND USE AREA

NOTES:
1. SOURCE: TOPOGRAPHY FROM FMI EOY 2017 MINE PLAN.
2. CONTOUR INTERVAL AT 10 FEET
3. COORDINATE SYSTEM IN TYRONE LOCAL MINE.
4. SECTION LINES FROM LITTLE ROCK AREA IN WIND MOUNTAIN, NM QUAD MAP (T19S R15W SECTIONS 8,9,16,17,20 AND 21)

N

700 0 700

SCALE FEET

PROJECT

FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

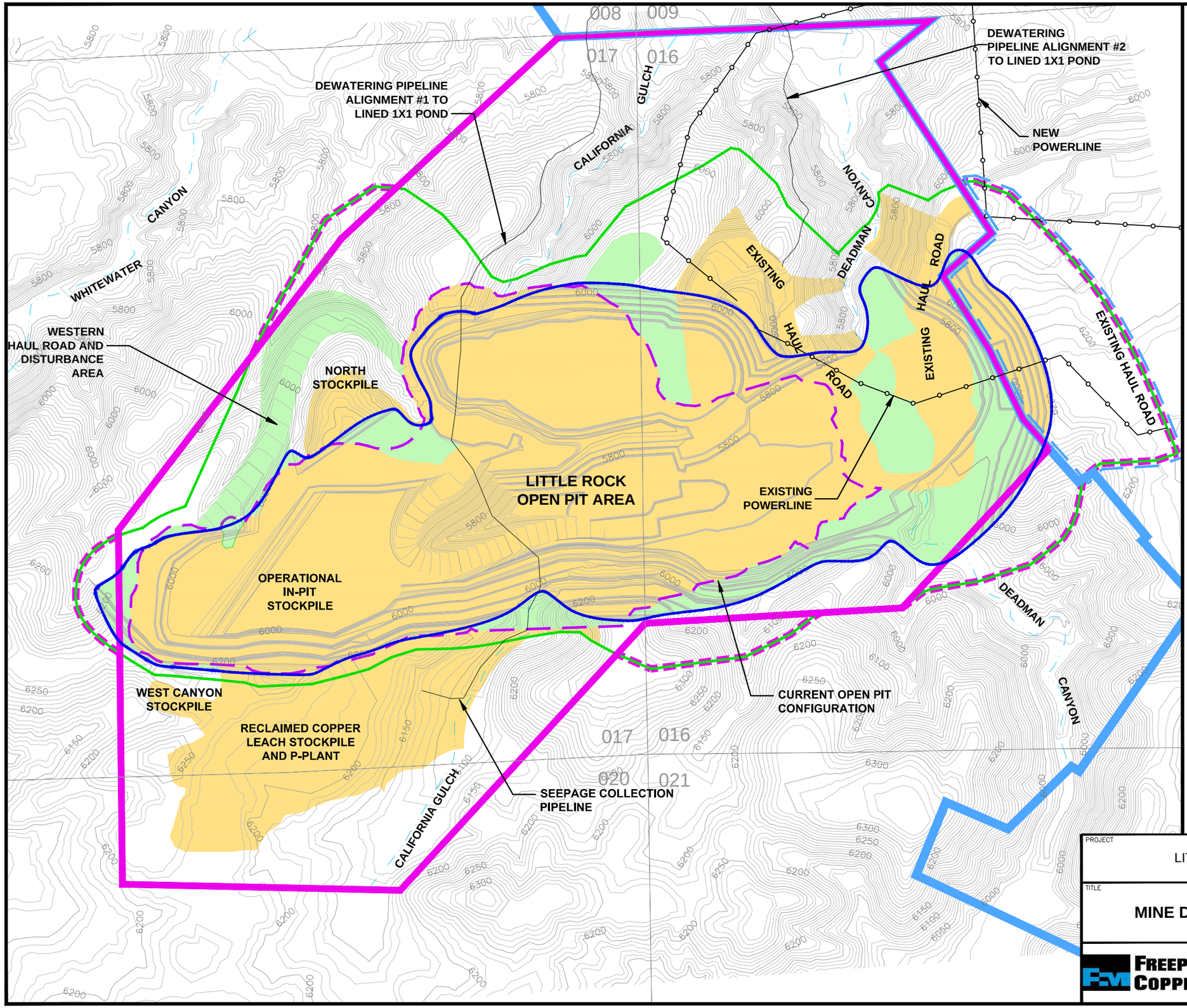
TITLE

PROPOSED WILDLIFE HABITAT POST MINE LAND USE AREA

FREEPORT-MCMORAN COPPER & GOLD

PROJECT No.		11301155	FILE No.		11301155B007–1
DESIGN	TS	01/07/14	SCALE	AS SHOWN	REV. 0
CADD	CM	05/08/14			
CHECK	TS	05/08/14			
REVIEW	TS	05/08/14			

FIGURE 7-1



LEGEND

- PROPOSED MINING AREA DESIGN LIMIT
- PROJECTED EXTENT OF OPEN PIT EOY 2017
- EXISTING LITTLE ROCK MINE PERMIT BOUNDARY
- EXISTING TYRONE MINE PERMIT BOUNDARY
- PROPOSED CHANGE TO LITTLE ROCK MINE PERMIT BOUNDARY
- AREA WITHIN APPROVED TYRONE MINE DESIGN LIMIT (PERMIT MODIFICATION 06-1 TO PERMIT GR010RE)
- APPROVED OPEN PIT DESIGN LIMIT (PERMIT MODIFICATION 13-2 TO MMD PERMIT GR007RE)
- EXISTING UNIT AT EOY 2017 (EARLIER, EXISTING, AND APPROVED DISTURBANCE)
- NEW UNIT AT EOY 2017 (INCLUDES NEW DISTURBANCES OUTSIDE THE CURRENT OPEN PIT DESIGN LIMIT AND NEW DISTURBANCES IDENTIFIED IN PERMIT REVISION 13-2 TO MMD PERMIT GROO7RE)

NOTES:
1. SOURCE: TOPOGRAPHY FROM FMI EOY 2017 MINE PLAN.
2. CONTOUR INTERVAL AT 10 FEET
3. COORDINATE SYSTEM IN TYRONE LOCAL MINE.
4. SECTION LINES FROM LITTLE ROCK AREA IN WIND MOUNTAIN, NM QUAD MAP (T19S R15W SECTIONS 8,9,16,17,20 AND 21).

700 0 700
SCALE FEET

PROJECT
FREEPORT MCMORAN TYRONE, INC.
LITTLE ROCK CLOSURE/CLOSEOUT PLAN
GRANT COUNTY, NEW MEXICO

TITLE
MINE DISTURBANCE AREAS AT THE EOY 2017

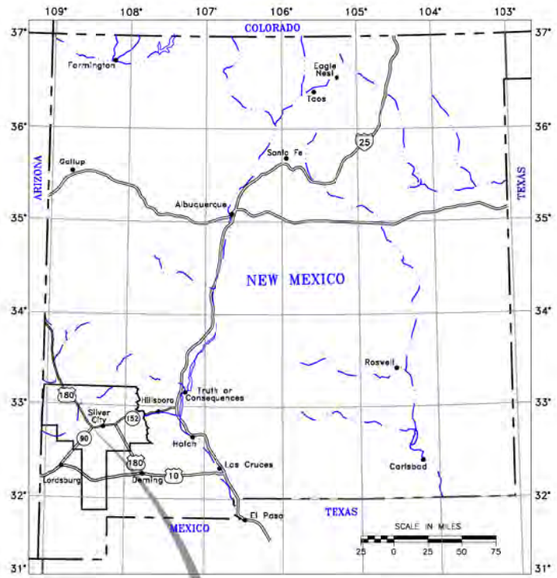
FREEPORT-MCMORAN COPPER & GOLD

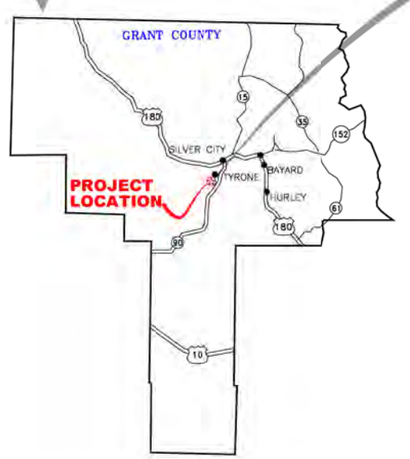
PROJECT No.		11301155	FILE No.		11301155B007-2
DESIGN	TS	01/07/14	SCALE	AS SHOWN	REV. 0
CADD	CM	05/08/14			
CHECK	TS	05/08/14			
REVIEW	TS	05/08/14			

FIGURE 7-2

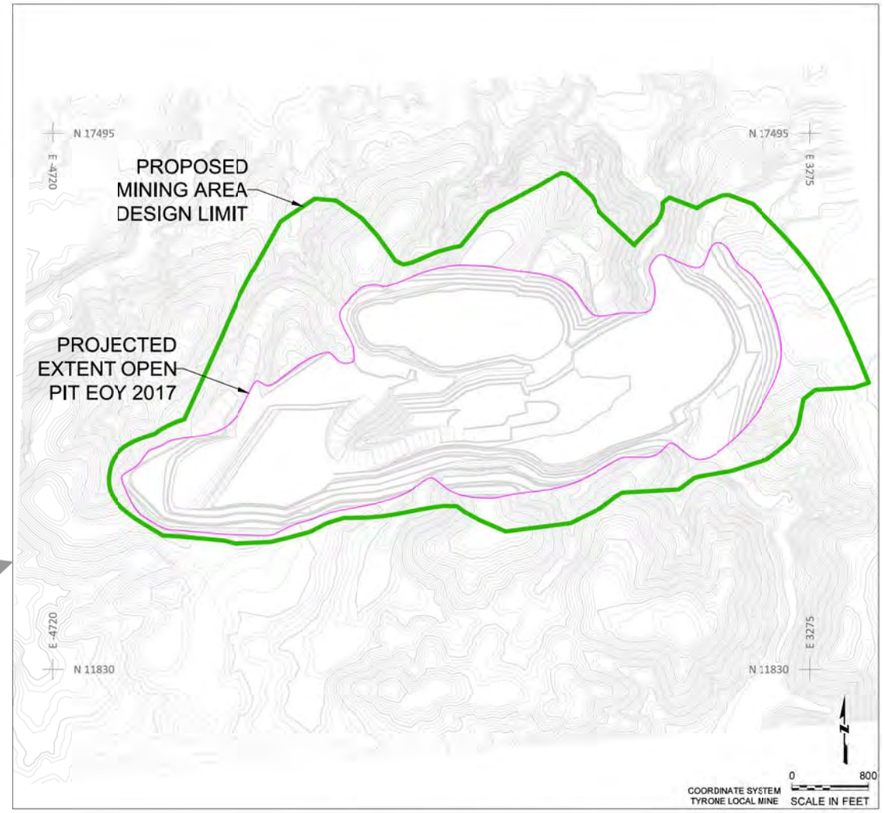
APPENDIX A
RECLAMATION DESIGN DRAWINGS

APPENDIX A UPDATED CLOSURE/CLOSEOUT PLAN FOR THE LITTLE ROCK MINE JUNE 2014
ISSUED FOR FINANCIAL ASSURANCE RECLAMATION COST ESTIMATE





NORTH



SHEET LIST TABLE	
SHEET NUMBER	SHEET TITLE
1	TITLE SHEET
2	EOY 2017 PLANNED CONTOURS
3	EOY 2017 RECLAIMED CONTOURS CROSS SECTION LOCATIONS
4	CROSS SECTIONS
5	POST RECLAMATION

CROSS SECTION REFERENCE
A / 1 — SECTION IDENTIFICATION NUMBER OR LETTER
NUMBER OF SHEET ON WHICH SECTION IS SHOWN

LEGEND / NOTES

NOTE:
1. END OF YEAR ABBREVIATED EOY
2. TOPO SOURCE FREEPORT MCMORAN TYRONE INC. EOY 2017 MINE PLAN

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVED
0	ISSUED FOR AGENCY REVIEW	6/9/14	DO	AT

DATE	6/9/14
PROJECT	200540
TASK NUMBER	001-03
DRAWN BY	DAVID OLSON
PROJECT ENGINEER	APRIL TISCHER
CHECKED BY	

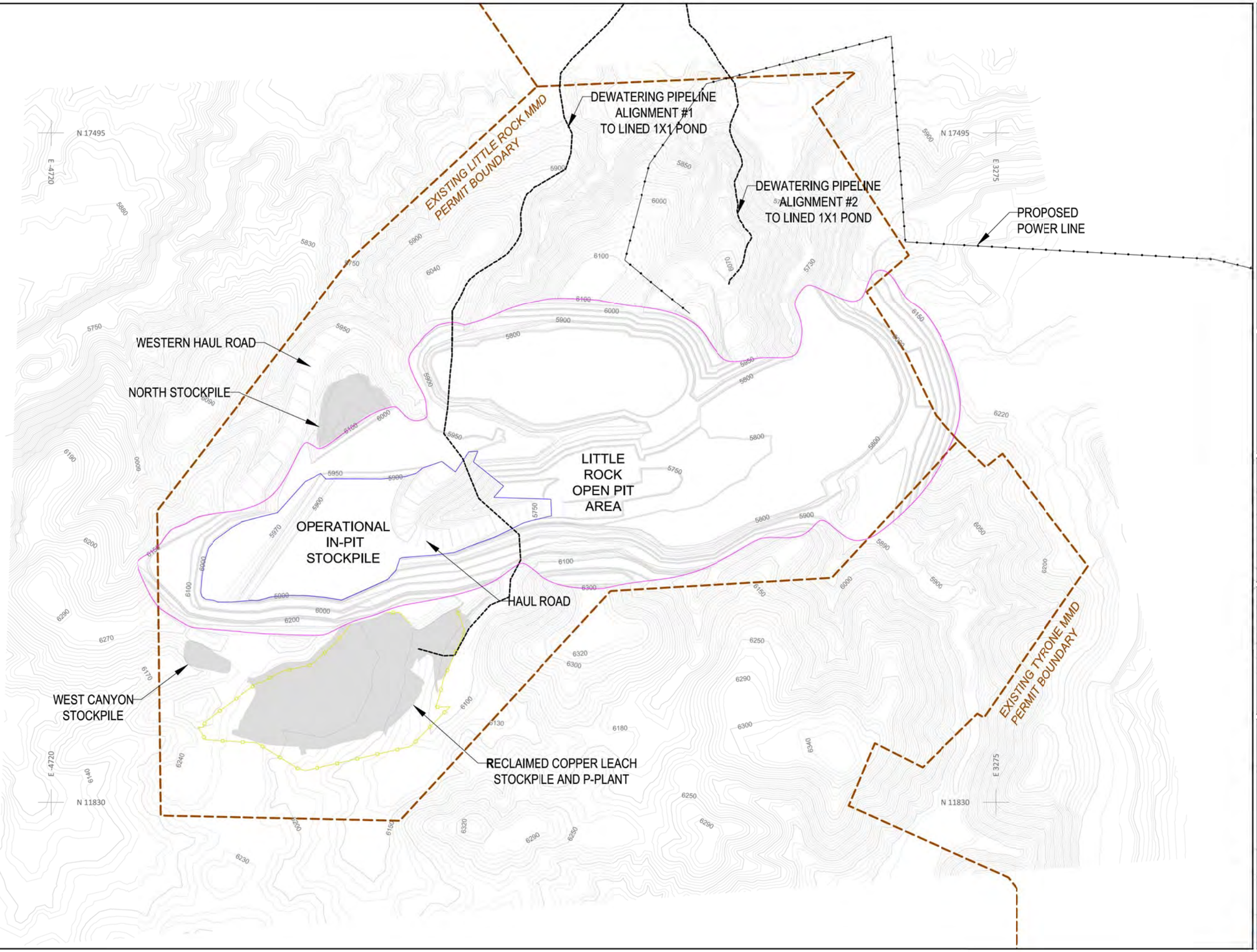
LITTLE ROCK MINE CCP

TITLE SHEET

SHEET NUMBER:	REVISION NUMBER:
1	0

PREPARED BY:
TELESTO SOLUTIONS INCORPORATED
Fort Collins, Colorado (970) 484-7704
www.telesto-inc.com

PREPARED FOR:
FREEPORT-MCMORAN TYRONE, INC.



LEGEND / NOTES

- EXISTING PERMIT BOUNDARIES
- EOY 2017 CONTOURS (10 FT. INTERVAL)
- PROJECTED EXTENT OPEN PIT EOY 2017
- EXISTING LIVESTCCK FENCE
- OPERATIONAL IN-PIT STOCKPILE
- REVEGETATED AREA

NOTE:
1. TOPO SOURCE FREEPORT MCMORAN TYRONE INC. EOY 2017 MINE PLAN

0 400
SCALE IN FEET
COORDINATE SYSTEM TYRONE LOCAL MINE

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVED
0	ISSUED FOR AGENCY REVIEW	6/9/14	DO	AT

DATE	6/9/14
PROJECT	200540
TASK NUMBER	001-03
DRAWN BY	DAVID OLSON
PROJECT ENGINEER	APRIL TISCHER
CHECKED BY	-

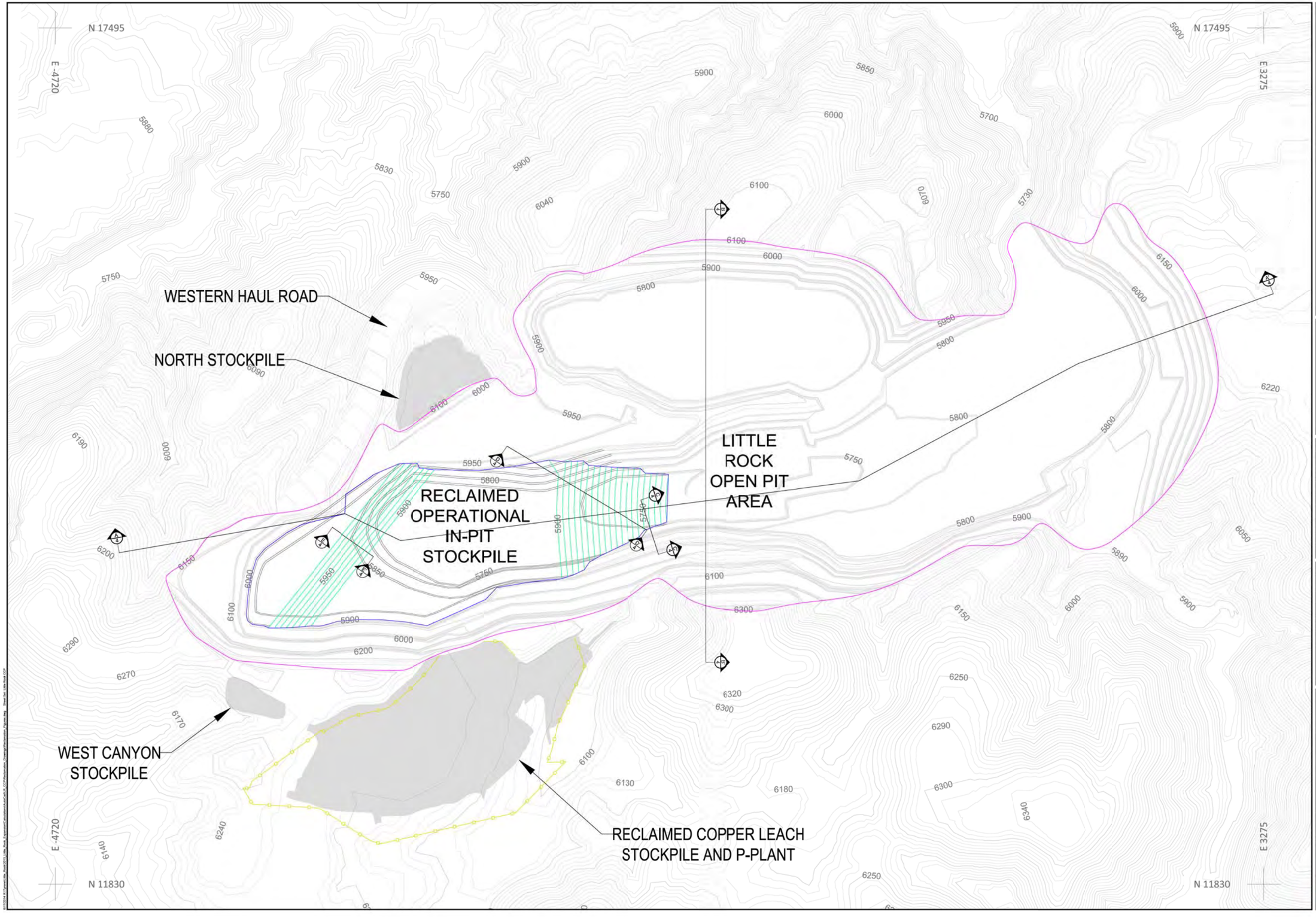
LITTLE ROCK MINE CCP

EOY 2017 PLANNED CONTOURS

SHEET NUMBER: 2
REVISION NUMBER: 0

PREPARED BY:
TELESTO SOLUTIONS INCORPORATED
Fort Collins, Colorado (970) 484-7704
www.telesto-inc.com

PREPARED FOR:
FREEPORT-MCMORAN TYRONE, INC.



LEGEND / NOTES

- EOY 2017 CONTOURS (10 FT. INTERVAL)
- 2017 PRE IN-PIT STOCKPILE OPEN PIT CONTOURS (10 FT. INTERVAL)
- RECLAIMED CONTOURS (10 FT INTERVAL)
- PROJECTED EXTENT OPEN PIT EOY 2017
- EXISTING LIVESTOCK FENCE
- OPERATIONAL IN-PIT STOCKPILE
- REVEGETATED AREA
- CROSS SECTIONS

NOTE:
1. TOPO SOURCE FREEPORT MCMORAN TYRONE INC. EOY 2017 MINE PLAN

0 300
SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVED
0	ISSUED FOR AGENCY REVIEW	6/9/14	DO	AT

DATE	6/9/14
PROJECT	200540
TASK NUMBER	001-03
DRAWN BY	DAVID OLSON
PROJECT ENGINEER	APRIL TISCHER
CHECKED BY	-

LITTLE ROCK MINE CCP

EOY 2017 RECLAIMED CONTOURS CROSS SECTION LOCATIONS

SHEET NUMBER: 3
REVISION NUMBER: 0

PREPARED BY:
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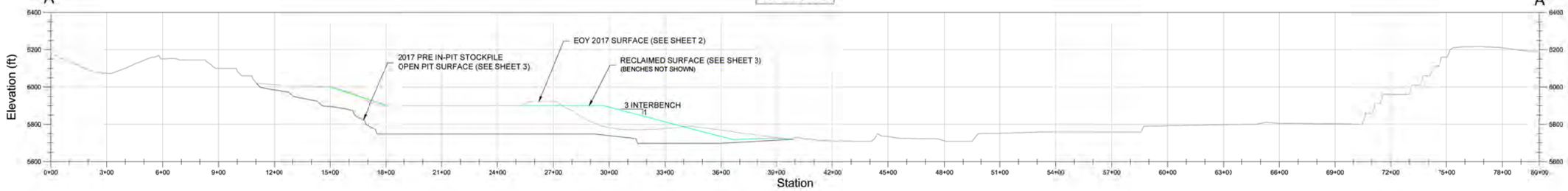
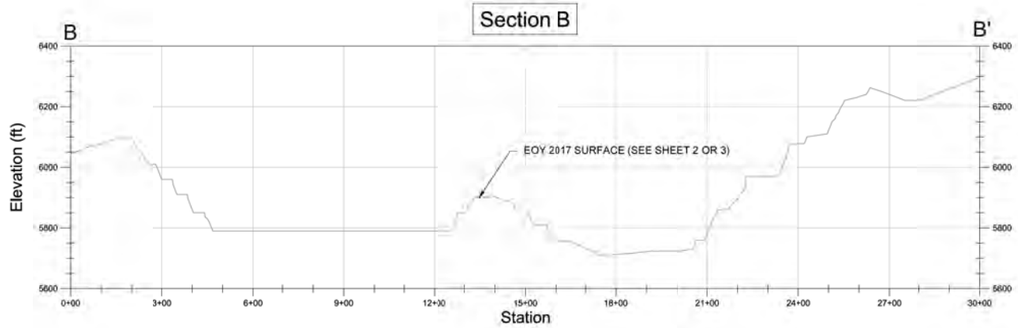
PREPARED FOR:
FREEPORT-MCMORAN TYRONE, INC.

Section A



Section B



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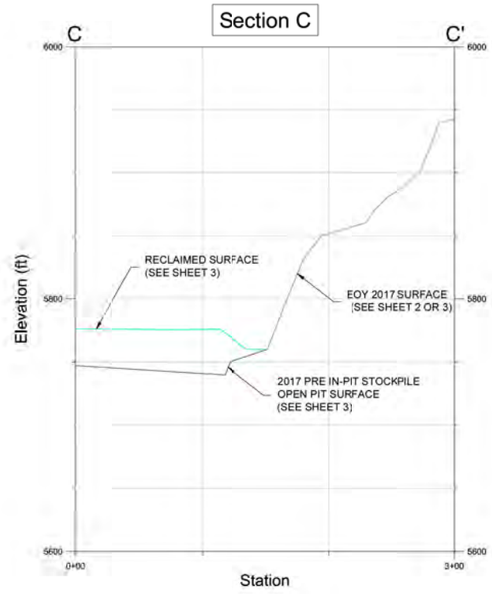
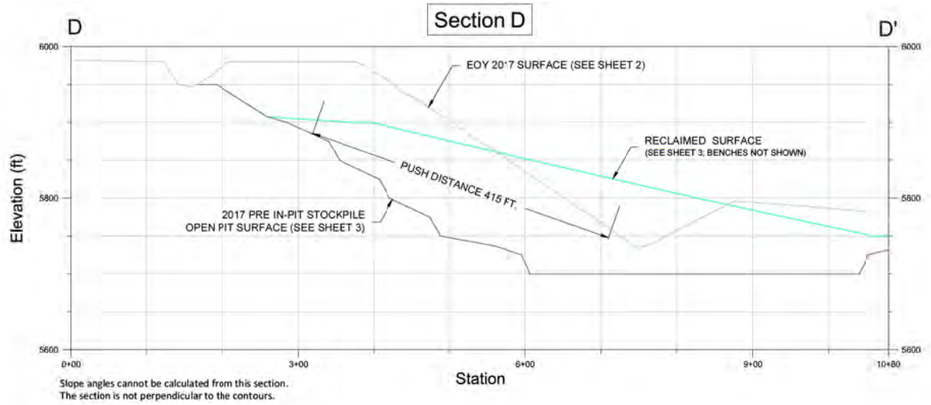
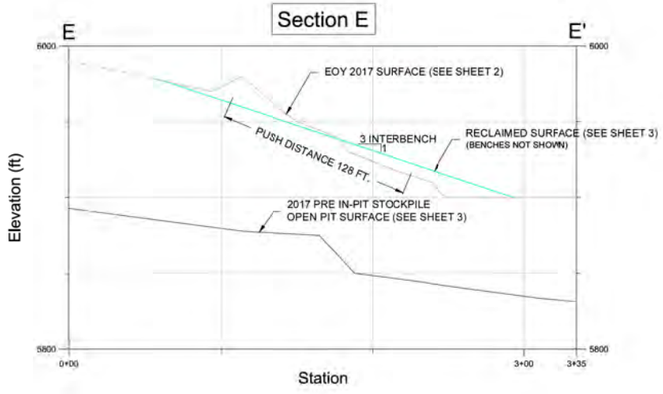


Section D



Slope angles cannot be calculated from this section.
The section is not perpendicular to the contours.

Section E



LEGEND / NOTES

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVED
0	ISSUED FOR AGENCY REVIEW	6/9/14	DO	AT

DATE	6/9/14
PROJECT	200540
TASK NUMBER	001-03
DRAWN BY	DAVID OLSON
PROJECT ENGINEER	APRIL TISCHER
CHECKED BY	

LITTLE ROCK MINE CCP

CROSS SECTIONS

SHEET NUMBER: 4

REVISION NUMBER: 0

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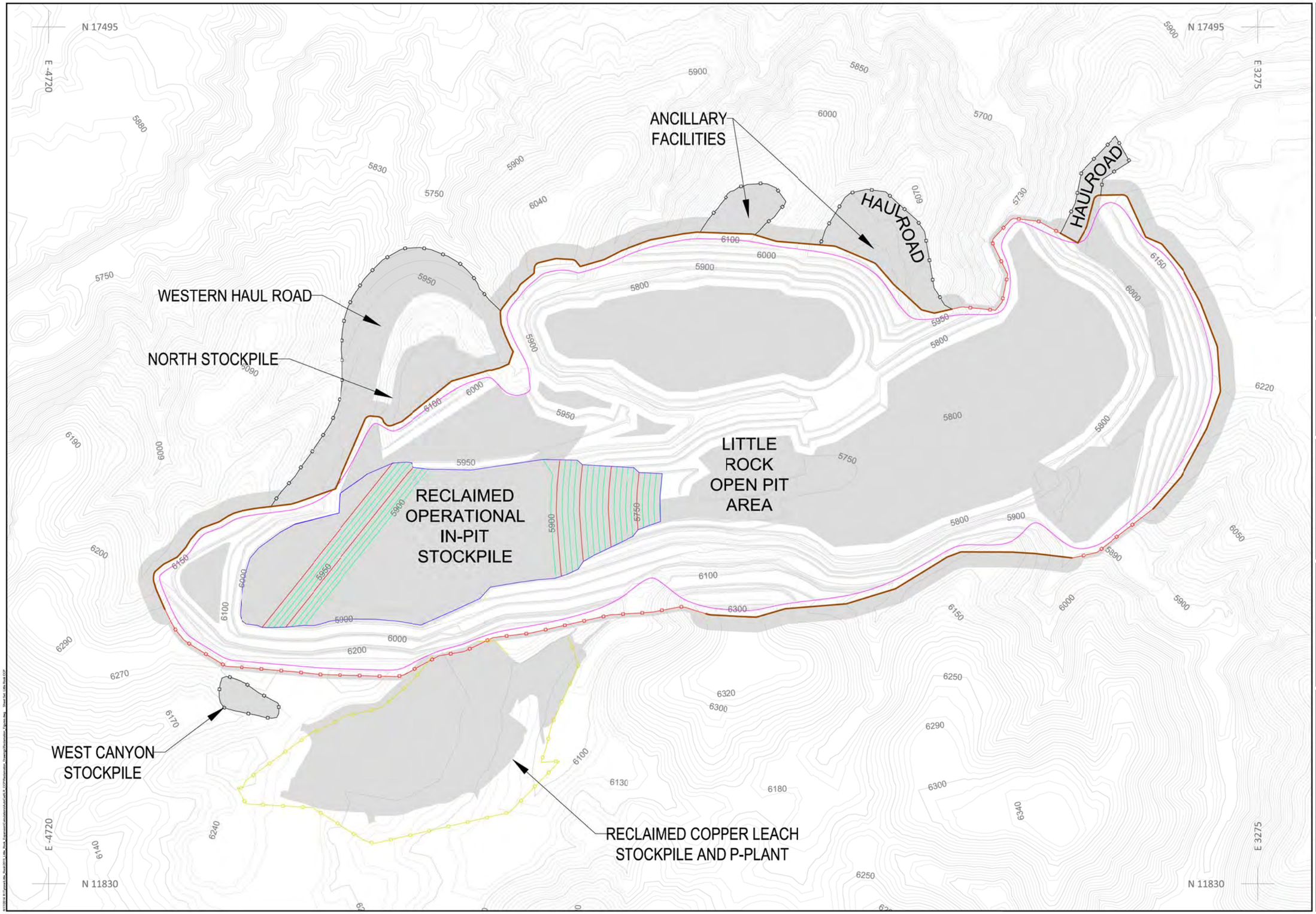

LEGEND / NOTES

- EOY 2017 CONTOURS (10 FT. INTERVAL)
- RECLAIMED CONTOURS
- PROJECTED EXTENT OPEN PIT EOY 2017
- BENCHES
- CHAIN LINK FENCE
- LIVESTOCK FENCE
- EXISTING LIVESTOCK FENCE
- BERMS
- OPERATIONAL IN-PIT STOCKPILE
- REVEGETATED AREA

NOTE:
1. TOPO SOURCE FREEPORT MCMORAN TYRONE INC. EOY 2017 MINE PLAN

0 300
SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVED
0	ISSUED FOR AGENCY REVIEW	6/9/14	DO	AT

DATE	6/9/14
PROJECT	200540
TASK NUMBER	001-03
DRAWN BY	DAVID OLSON
PROJECT ENGINEER	APRIL TISCHER
CHECKED BY	

LITTLE ROCK MINE CCP
POST RECLAMATION

SHEET NUMBER: 5
REVISION NUMBER: 0

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APPENDIX B
RECLAMATION COST ESTIMATE SUMMARY REPORT

Little Rock Mine
Third Party Reclamation Cost Estimate for Little Rock Mine

Prepared for

Freeport-McMoRan Tyrone Inc.
P.O. Box 571
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Prepared by

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June 2014

TELESTO
SOLUTIONS • INCORPORATED

Signature Page

Little Rock Mine
Third Party Reclamation Cost Estimate for the Little Rock Mine

June 2014

Report Authors and Contributors

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_____

April Tischer – Primary Author

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1.0 INTRODUCTION

As part of the Little Rock Mine Closure/Closeout Plan (CCP) update, the reclamation cost estimate for financial assurance has been prepared by Telesto Solutions, Inc. (Telesto) for Freeport-McMoRan Tyrone, Inc. (Tyrone). The reclamation activities and quantities used in this estimate are consistent with the Little Rock Mine – Amendment to the Mine Plan of Operations NMNM091644 (MPO Amendment) submitted to the U.S. Department of the Interior, Bureau of Land Management in September 2013 (Tyrone, 2013). Tyrone is in the process of applying to the New Mexico Energy, Minerals and Natural Resources Department, Mining and Mineral Division (MMD) for a modification of the Little Rock Mine permit to account for the mine expansion proposed in the MPO Amendment. The estimate presented herein is based on the configuration of facilities as described in the end-of-year (EOY) 2017 mine plan, and assumes reclamation would begin in 2018 (Year 1). The reclamation drawings that provide the basis for this cost estimate can be found in Appendix A of the CCP.

This document is organized into several major sections. Sections 1 and 2 provide an introduction and a listing of assumptions that are common throughout the reclamation cost estimate. Section 3 describes the assumptions for the overall site reclamation, open pit reclamation, and post-closure operation and maintenance. Section 4 and Table 1 present a brief summary of the reclamation cost estimate for the Little Rock Mine. Post-reclamation water quality monitoring costs, as required by the New Mexico Environmental Department, are also included in Table 1. The cost calculations are presented in Appendix A. Supporting documentation is provided in Appendix B. Engineering quantities are presented in Appendix C. An electronic copy of the reclamation cost estimate is provided in Appendix D. The cost calculations (Appendix A and Appendix D) are organized by worksheet (Sheet) number and name. Throughout this document, the items described are followed by the reference to the location of the corresponding calculation sheet. Table 2 provides a brief description of each sheet contained in the cost estimate. Unit cost basis for fuel, labor, and equipment costs are

summarized in Table 3. Miscellaneous unit cost basis are provided in Table 4 and equipment production factors are provided in Table 5.

2.0 COST ESTIMATE ASSUMPTIONS

The earthwork reclamation cost estimate for Little Rock Mine was developed based on a template originally created by MMD (1996). Calculation documentation can be found in Appendix B.1. The following paragraphs describe the basis and assumptions used in the cost estimate.

Labor Rates: Labor rates were developed based on the New Mexico Department of Labor Type H (Heavy Engineering) labor rates effective January 1, 2013. These rates include the base, fringe benefit, and apprenticeship contribution rates. The following were added to the labor rates to obtain the total per hour labor rate: FICA (6.2%), Medicare (1.45%), federal un-employment (0.6% on first $7,000), state un-employment (2.0% on first $22,900), and workman's compensation insurance (See Table 3 and Appendix B.2, Labor Rates, also listed at the bottom of Sheet 13).

Equipment Unit Operating Costs: The earth-moving equipment used in the estimate would commonly be available to a contractor. The equipment unit operating costs were taken from EquipmentWatch Custom Cost Evaluator (Penton Media, Inc., 2013; Table 3, Appendix B.3, and bottom of Sheet 13).

Fuel Costs: The off-road diesel fuel cost of $3.15/gal was based on a quote obtained on October 29, 2013 from Western Refining for delivery to Tyrone (Table 3, Sheet 13).

Revegetation Unit Costs: The revegetation unit cost of $977 per acre was based on a quote obtained on October 31, 2013 from Rocky Mountain Reclamation of Laramie, WY, and includes, scarifying, discing, rangeland drill seeding, mulching, crimping, and daily per diem (Table 3 and Sheet 14). The base quote of $1,475 per acre was modified to

remove the New Mexico Gross Receipt Tax and indirect costs. Indirect costs were re-applied to the total direct costs which include the revegetation costs.

Equipment Production Factors: Production factors for each type of equipment are presented in Table 5. References for the production factors used can be found in Appendix B.4 and B.5 and they are used in Sheets 4, 5, and 7.

Miscellaneous Unit Costs: Miscellaneous unit costs were taken from several sources including R.S. Means (2013). All costs taken from R.S. Means were adjusted using the location factor for Las Cruces, NM (84.4%). Miscellaneous unit costs are summarized in Table 4. Unit cost development for the berm and bench construction can be found in Appendix B.6. R.S. Means cost pages and other unit cost documentation can be found in Appendix B.7. Miscellaneous unit costs are shown in Sheets 2 and 15.

Dust Suppression and Site Maintenance: A water truck and a motor grader are included as part of the equipment fleet during reclamation. The water truck and grader are assumed to run 1 hour, twice a day, for the duration of dozer operations (assuming an 8 hour work day). The costs for the water truck and motor grader are located near the bottom of Sheet 13.

Fencing: Livestock fencing consists of a 4-strand wire fence for protection of revegetated areas after seeding (Sheet 15). A combination of 6-foot chain link fence and berms will be located along the Little Rock open pit boundary.

Exploration Hole Abandonment: All exploration holes located outside of the open pit boundary that were found and could be plugged were plugged in the first quarter of 2010 (Tyrone, 2011). All exploration holes drilled since the first quarter of 2010 were closed immediately. Thus, no costs have been included for exploration hole abandonment.

Capital Indirect Costs: Total indirect costs of 42.5% were applied to the capital direct costs per MMD (1996) and OSM (2000) guidance (Table 1 and Sheets 16, 17, and 18). The indirect costs are comprised of: Mobilization and Demobilization (5%), Contingencies (7%), Engineering Redesign Fee (6%), Contractor Profit and Overhead (20%), and Project Management Fee/State Procurement Costs (4.5%). The method used to estimate indirect cost percentages are consistent with the methods presented to MMD and the New Mexico Environment Department (NMED) in meetings with Tyrone on September 20, 2012 and November 2, 2012.

Operations and Maintenance Indirect Costs: Total indirect costs of 32.5% were applied for long term operations and maintenance per MMD (1996) and OSM (2000) guidance (Table 1 and Sheet 22). The values used are the same as the capital indirect costs with the exception of Contractor Profit and Overhead, which has been reduced to 10.0% to account for the long term contract and repetitive annual work. Indirect cost percentages are consistent with the methods presented to MMD and the NMED in meetings with Tyrone on September 20, 2012 and November 2, 2012.

Indirect costs usually consist of the following (except when it is a direct item): salaried and admin personnel, field office, shop and facilities, temporary utilities, fees and insurance except those applicable to labor and equipment, MSHA and site specific safety training, performance and payment bonds, quality assurance/quality control, safety, surveying, and construction equipment general (salaried pickups, buses, ambulance, etc.). The aforementioned activities apply only to reclamation related activities. Therefore, indirect costs are not applied to post-closure water quality monitoring and reporting.

3.0 RECLAMATION

This section outlines the activities that will occur during reclamation. Appendix C, Table 1 provides quantities for the major activities associated with the reclamation cost estimate.

3.1 Overall Site

Reclamation costs for areas located outside the approximate EOY 2017 open pit configuration and within the Little Rock Mine permit boundary, include:

- **Rip and Revegetate:** Haul roads, the western haul road, North Stockpile, West Canyon Stockpile, and ancillary facility areas will be ripped to a depth of 18 to 24 inches and revegetated (Sheet 7 and 14).
- **North Stockpile and West Canyon Stockpile:** The North Stockpile and West Canyon Stockpile are naturally revegetated. Reclamation costs are included in this estimate until financial assurance is released. Costs include ripping to a depth of 18 to 24 inches and revegetated (Sheets 7, 13, and 14).
- **Reclaimed Copper Leach Stockpile and Precipitation Plan (P-Plant):** This area was reclaimed in 2010 and revegetated in August, 2010. On June 20, 2011 partial financial assurance was released. In a letter from Tyrone dated January 15, 2013, release of the remaining financial assurance was requested with the exception of the vegetation and erosion control monitoring. MMD assigned modification number 13-1 to Permit No. GR007RE for this request. Ripping to a depth of 18 to 24 inches, revegetation, and erosion control costs are included until the 12-year vegetation establishment period has ended (Sheets 7, 13, and 14). Erosion control and maintenance costs are described in Section 3.3.
- **Allowance for Other Disturbed Areas:** Tyrone is including additional costs to account for the dynamic nature of mining. This approach is intended to allow for greater flexibility in meeting the mine planning schedule and reduce the number of financial assurance amendments. Other disturbed area allowance may include small staging areas, utility corridors, haul roads, pull-offs, stockpile expansions, or other miscellaneous unforeseen changes in the mine plan. The reclamation cost are calculated assuming ripping to a depth of 18 to 24 inches and revegetation for an additional 10 acres (Sheets 7, 13, and 14).
- **Demolition:** The demolition of a 46 kilovolt power line, substation, and two dewatering pipelines located within the Little Rock Mine permit boundary (GR007RE) are included in the estimate. (Sheet 2).
- **Deadman Canyon Spanning Arch Culvert:** The existing spanning arch culvert will be removed by mining. The estimate assumes a new spanning arch culvert, similar in design and material quantities to the existing structure, will be constructed by EOY 2017. Reclamation costs assume the spanning arch culvert will be demolished at the end of the 30-year monitoring period. Reclamation quantities were estimated from the existing spanning arch culvert as-builts, completed September 15, 2011. Earth fill will be excavated and hauled an average of 300 feet and spread over the primary haul road. Concrete and metal debris will be hauled to the in-pit stockpile and buried.

- **Monitoring Well Abandonment:** Seven monitoring wells will be abandoned after 30 years of post-reclamation sampling. The wells will be plugged with a bentonite based plugging material, to within 10 feet of the ground surface, and followed by a 10-foot concrete surface plug. This is in accordance with New Mexico Administrative Code 19.10.3.302.L. Estimated unit costs for plugging monitoring wells are shown in Table 4 and cost calculations are in Sheet 15. Unit rates are based on MMD Exploration Reclamation Guidance (MMD, 2013).
- **Fencing:** Livestock fencing will be constructed around the revegetated haul roads outside the open pit, around the outer edge of the western haul road (including the North Stockpile), the West Canyon Stockpile, and ancillary facility areas to exclude livestock while vegetation is becoming established (Sheet 15).

3.2 Little Rock Open Pit

The in-pit stockpile material will be comprised of mined overburnden containing a wide range of particle sizes and relatively high rock fragment content compared to a typical soil. Thus, the in-pit stockpile slope is expected to be mechanically stable over time. Placement of this material into the west side of the open pit prior to the cessation of mining will allow time for consolidation prior to final shaping. The in-pit stockpile, which will consist primarily of leach cap, is not anticipated to require any additional cover because the materials are non-acid generating, and have few apparent limitations as a plant growth media when compared to the native soils. Due to the relatively coarse-texture of the surface materials, large quantities of runoff are not expected from the in-pit stockpile or haul road areas. Thus, large scale surface water runoff control features are not planned for the in-pit stockpile surface. Storm water from the in-pit stockpile will be routed along the inside of the benches to the stockpile and pit wall contact (consisting of bedrock and non-ore mined rock material).

California Gulch and the Heap Leach Northwest Diversion, as described in the *Little Rock Mine Leach Pad and Precipitation Plant Reclamation Construction Design and Quality Assurance Plan* (CDQAP; Telesto, 2009), will also be routed along the bedrock at the in-pit stockpile and pit wall contact.

Reclamation costs for areas located inside the projected extent of open pit by EOY 2017 include:

- **Grading:** Minor grading of the in-pit stockpile and haul road to smooth the surface and provide positive drainage toward the open pit bottom. Overall outslopes at 3.5:1 and interbench slopes at 3:1 or flatter to enhance slope stability and reduce erosion potential (Sheet 5 and 13).
- **Benches:** Rough and finish grade 32-foot-wide benches, 2% inslope, 2% longitudinal slope, and 200-foot maximum interbench slope length (Sheet 15).
- **Rip and Revegetate:** In-pit stockpile and accessible open pit flat areas will be ripped to a depth of 18 to 24 inches and revegetated (Sheet 7, 13, and 14). For the purposes of this cost estimate, accessible open pit flat areas are defined as pit haul road driving surfaces and flat areas 50-feet from a highwall.
- **Fencing and Berms:** A combination of 6-foot chain link fencing and berms will be constructed approximately 40 feet from the open pit highwalls for public safety (Sheet 15). Signs posted every 500 feet. Revegetation is included for an approximately 25-foot-wide disturbance area used to construct the chain link fencing, and approximately 100-foot-wide disturbance area used to construct the berm (Sheet 14).

3.3 Operations and Maintenance

Little Rock Mine reclamation costs assume operations and maintenance begin Year 1 and include 12 years of erosion control and monitoring, 30 years of water quality monitoring and reporting, and 30 years of road maintenance. The reclaimed Copper Leach Stockpile and P-Plant were revegetated in August 2010. The remaining erosion control and monitoring period for the reclaimed Copper Leach Stockpile and P-Plant has been included in the estimate as a separate line item.

Erosion Control and Monitoring: Little Rock Mine annual erosion control and monitoring cost estimates are based on an erosion control crew engaged for 12 days per year for the first year and then 4 days per year for an additional 11 years, for a total of 12 years of monitoring (Sheet 21). The reclaimed Copper Leach Stockpile and P-Plant were revegetated in August 2010, leaving 5 years of erosion control and monitoring remaining before vegetation is established. Costs associated with the reclaimed Copper Leach Stockpile and P-Plant include an erosion control crew engaged 1 day per year from 2018 to 2022 (Sheet 21).

Water Quality Monitoring and Reporting: Sampling will be conducted quarterly the first 2 years after reclamation, semi-annual for the next 8 years, and yearly for the remaining 20 years, for a total of 44 sampling events over 30 post-closure years.

- The Ohio Dam area will be mined-out by the open pit and thus requires no post-closure sampling.
- LRW-1, LRW-2, LRW-3, LRW-6, and LRW-7 will be mined out or closed prior to 2017.
- Wells LRW-4, LRW-5, and 1236-2012-01 will remain.
- Installing a total of four new monitoring wells prior to 2017, for a total of seven post-closure monitoring wells (monitoring wells are plugged after 30 years of post-reclamation sampling as described in Section 3.1).
- Two of the three sampling locations on California Gulch will be mined out and replaced with a flow sampler located downstream of the final open pit rim.
- It is assumed that open pit water will be present and sampled at one location.
- Estimated sampling frequencies for California Gulch surface water and seepage collection water is based on sampling conducted in 2008. The seep collections are assumed to be dry two quarters a year and sampled the other two quarters. The two surface water sampling ports in California Gulch will be checked monthly for the presence of water, and it is assumed that water will be present once a year.
- Groundwater samples will be analyzed for temperature, pH, Eh, specific conductance, and dissolved constituents.
- Groundwater samples will be analyzed semi-annually for Fe3+ and Fe2+.
- The open pit lake water and California Gulch surface water samples will be analyzed for total and dissolved constituents.

In summary, water quality monitoring and reporting for a 30-year period includes: seven groundwater monitoring wells, open pit water quality and elevation, North and South seep collection water quality and flow rates, California Gulch surface water quality (two locations) and flow rates, McCain and Sugarloaf springs flow rates, and precipitation data. Sheets 19, 20, and 21, provide the unit cost, sampling points summary, and cost development.

Road Maintenance: Road maintenance costs for post-reclamation years 13 through 30 is included for the seven monitoring wells and the powerline access road (Sheet 21). Road maintenance consists of a motor grader engaged for 12 hours prior to each sampling

event annually (Sheet 21). Road maintenance for post-reclamation years 1 through 12 is covered by erosion control and monitoring costs.

4.0 COST ESTIMATE

The costs are summarized in Table 1. The estimated current dollar costs for reclamation, maintenance, and monitoring, including water quality monitoring related costs, is estimated to be $1,922,000.

5.0 REFERENCES

Caterpillar, Inc. 2013. *Caterpillar Performance Handbook*, 43rd ed. Peoria, Illinois: Caterpillar Inc. June.

MMD (Mining and Minerals Division). 1996. *Closeout Plan Guidelines for Existing Mines*. Santa Fe, New Mexico: New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division. April 30.

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OSM (Office of Surface Mining Reclamation and Enforcement). 2000. *Handbook for Calculation of Reclamation Bond Amounts.* Washington, D.C.: U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement . April 5.

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R.S. Means. 2103. *Heavy Construction Cost Data,* 27th ed. Norwell, Massachusetts: R.S. Means Company, Inc.

Telesto (Telesto Solutions Inc.). 2009. *Little Rock Mine Leach Pad and Precipitation Plant Reclamation Construction Design and Quality Assurance Plan.* May.

Tyrone (Freeport-McMoRan Tyrone, Inc.). 2011. "Little Rock Mine exploration drillhole plugging report." Letter to MMD and NMED. May 31.

Tyrone (Freeport-McMoRan Tyrone, Inc.). 2013. *Little Rock Mine Amendment to Mine Plan of Operations, NMNM091644.* Tyrone, New Mexico. September.

TABLES

Table 1 Cost Estimate Summary

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs 42.50%	Total Cost
Earthwork			
Primary Haul Road	$39,900	$16,900	$56,800
Open Pit Flat Areas	$137,300	$58,300	$195,600
Western Haul Road	$29,000	$12,300	$41,300
North Stockpile[1]	$5,700	$2,400	$8,100
Open Pit Perimeter Safety Berms and Fencing	$175,400	$74,500	$249,900
West Canyon Stockpile[1]	$6,000	$2,600	$8,600
Ancillary Facilities and Structures[2]	$122,300	$52,000	$174,300
Reclaimed Copper Leach Stockpile and P-Plant[1]	$39,700	$16,900	$56,600
Allowance for Other Disturbed Areas	$13,200	$5,600	$18,800
In-pit Stockpile	$438,000	$186,100	$624,100
Total Earthwork	$1,006,400	$427,700	$1,434,100
Operations and Maintenance			
		32.50%	
Erosion Control and Monitoring	$184,500	$59,900	$244,400
Erosion Control and Monitoring, Reclaimed Copper Leach Stockpile and P-Plant[1]	$16,500	$5,400	$21,800
Water Quality Monitoring and Reporting[3]	$162,600	$0	$162,600
Road Maintenance	$44,500	$14,500	$59,000
Total O&M	$408,100	$79,800	$487,900
Total Cost	$1,414,500	$507,500	$1,922,000

[1]Area is revegetated, remains in estimate until financial assurance release.
[2] Includes: demolition of power lines, substation, dewatering pipeline; well abandonment; and reclamation of small ancillary facility areas.
[3] Indirect costs apply only to reclamation related activities. Therefore, indirect costs are not applied to post-closure water quality monitoring and reporting.

Table 2 Cost Estimate Sheet Descriptions

Mining_Capital_Costs.xls	
1 General	Cover sheet
2 Demo	Demolition direct cost calculations
3 Material	General overview of tasks, locations, and equipment
4 Earthwork	General overview of material quantities
5 Dozer	Task time calculation for regrading stockpiles
6 Grading	Cover material grading is not utilized in this earthwork cost estimate. Sheet 6 is blank and remains in the spreadsheet to maintain consistency with previous cost estimates.
7 Ripper	Task time calculations for ripping
8 Excavator	Excavators are not utilized in this cost estimate. Sheet 8 is blank and remains in the spreadsheet to maintain consistency with previous cost estimates.
9 Trucks	Trucks are not utilized in this cost estimate. Sheet 9 is blank and remains in the spreadsheet to maintain consistency with previous cost estimates.
10 Loader	Loaders are not utilized in this cost estimate. Sheet 10 is blank and remains in the spreadsheet to maintain consistency with previous cost estimates.
11 Scraper	Scrapers are not utilized in this earthwork cost estimate. Sheet 11 is blank and remains in the spreadsheet to maintain consistency with previous cost estimates.
12 M'grader	Motor graders are utilized for road maintenance and post-closure road maintenance. Motor grader use and task times are described in Section 2. Motor grader costs are accounted for in Sheet 13 and Sheet 21. Sheet 12 is blank and remains in the spreadsheet to maintain consistency with previous cost estimates.
13 EarthSum	Earthwork indirect cost calculation summary; utilizes the task times calculated in Sheets 5 and 7
14 Revegetation	Revegetation direct cost calculations
15 Other	Miscellaneous direct cost calculations including costs for fence installation, berms, benches, and abandoning monitoring wells
16 Sum	Total direct earthwork cost summation and indirect cost calculation based on the direct costs calculated in Sheets 2, 13, 14 and 15
17 Detailed Sum	Detailed summary of direct and indirect costs for each item
18 Facility Characteristics	Capital cost per acre calculations for each item
Mining_O&M.xls	
19 Sampling Unit Cost	Water sampling unit cost development
20 Sampling	Quarterly, semi-annual, and annual water sampling cost development
21 O&M	Operation and maintenance direct cost calculations for erosion control, water quality monitoring, and road maintenance
22 Sum	Total direct cost summation and indirect cost calculation based on the direct costs calculated in Sheet 21

Table 3 Fuel, Labor, and Equipment Unit Costs

Parameter	Value	Comment
Revegetation	$977/acre	Rocky Mountain Reclamation Quote (10/31/13, $1,475 acre minus 42.5% indirect costs and 5.94% gross receipts tax)
Fuel	$3.155/gal	Western Refining Quote 10/29/13
Dozer Operator (IV)	$46.59/hr	Based on NM DOL Rates
Motor Grader (IV)	$46.59/hr	Based on NM DOL Rates
Mechanic (VI)	$46.76/hr	Based on NM DOL Rates
Truck Driver (III)	$48.59	Based on NM DOL Rates
Environmental Sampler	$60/hr	Judgment
Environmental Sampling Reviewer	$70/hr	Judgment
Caterpillar D11T CD*	$505.72/hr	Standard Crawler Dozer
Caterpillar D11T CD* w/ Multishank Ripper	$535.71/hr	Standard Crawler Dozer ($505.72/hr + $29.99/hr)
Caterpillar D9T	$226.34/hr	Standard Crawler Dozer
Caterpillar 16M	$159.61/hr	Articulated Frame Motor Grader
Off-Highway Water Tanker Truck	$169.54/hr	10,000 Gallon

Notes: Equipment rates from Equipment Watch (Version 6.9.3B. Penton Media, Inc.) using $3.15/gal fuel cost, $46.76/hr mechanics wage, 0.0% gross receipts (i.e. sales) tax, and annual use hours increased to reflect a 60-min work hour (50-min work hour adjustment is used in the equipment production calculation)

*D11T CD equipment unit rates were unavailable, the D11T Equipment Watch unit rate list price was adjusted from D11T $2,200,000 to D11T CD $2,240,000 based on Wagner Equipment quotes.

Table 4 Miscellaneous Unit Costs

Activity	Direct Cost Unit Cost $/unit	Units	Direct Scaled Cost Las Cruces 84.4%[2]	Means[3] Line Item	Means Page	Reference
Erosion Control Crew[1]	3902	day	3,294	Modified Crew B-13A	541	Bare Costs: 1-Foreman ($37.45/hr, $299.60/day), 2-laborers ($35.45/hr, $567.20/day), 1-equip. operator ($47.50/hr, $380/day), 1-truck driver ($36.60/hr, $292.80/day), 1-crawler loader (4 cy) ($191.25/hr, $1530/day), 1-dump truck (8 cy) ($104.13/hr, $833/day)
Environmental Sampling	230	sample	-	-	-	23 Constituents. Energy Laboratories, Inc., 2013. Published price list (**www.energylab.com**).
Shipping Environmental Sampling	70	cooler	-	-	-	Energy Labs prepaid shipping Overnight UPS or FedEx $70 for a 10 lb. package 30”x18”x18” Silver City, NM to any Energy Labs location; Quote 11/26/2013.
Abandon 4-inch Monitoring Wells[1]	9.82	ft	-	-	-	$14.00/ft minus 42.5% indirect costs. “Estimated costs for abandoning boreholes using bentonite cement grout ranges from approximately $14.00 to $25.00 per foot. For the purposes of estimating a simplified cost of abandoning boreholes the MMD cost is $14.00/ft. The FA cost estimate could be higher or lower based on site specific characteristics” (MMD, 2013).
Barbed wire fence, complete[1]	3.75	ft	-	-	-	$5.35/ft minus 42.5% indirect costs. Barbed wire fence, complete based on post at 10', using a 24,500 lb, 2-axle truck with an 8’ x 16’ flat bed and small tools 3-strand barbed wire fence, galvanized (total bare costs). 2013 New Mexico Heavy Construction Costs, Page 262. $4.99/ft, $0.36 per additional strand, 4 strands total $5.35/ft. (http://www.get-a-quote.net/QuoteEngine/costbook.asp?WCI=CostFrameSet&BookId=48)
Chain Link Fence[1]	24.36	ft	20.56	323113.20-0800	320	Fence, chain link industrial, schedule 40, including concrete, 6 gage wire, 6' high, but omit barbed wire, galv. steel. (total bare costs)
Open Pit Perimeter Signage[1]	63.00	each	53.17	101453.20-0600	148	Traffic signs, guide and directional signs 12" x 18" reflectorized. (total bare costs)
Open Pit Dewatering Pipeline Removal[1]	1.91	ft	1.61	024113.38-1700	29	Demolition, water, and sewer piping and fittings, excludes excavation, plastic pipe 6"-8" in diameter. (total bare costs)
Substation and Power line Demolition[1]	3,968	day	3,349	Crew B-12N Crew B-17 Crew B-68C	540 542 551	Bare Costs: 2-laborers (B17: $35.45/hr, $567.2/day), 1-equipment operator (light) (B17: $45.8/hr, $366.4/day), 1-truck driver (heavy) (B17: $36.6/hr, $292.8/day), 1-48 HP backhoe loader (B17: $45.925/hr, $367.4/day), 1-8 cy 220 HP dump truck (B17: $52.075/hr, $416.6/day), 1-electrician ($412.40/day) (B68C: $52.4/hr, $419.2/day), 1-25-ton hydraulic crane ($697.20/day) (B12N: $143.5/hr, $1148/day), 1-crane operator ($382.40/day) (B12N: $48.8/hr, $390.4/day)
Spanning Arch Culvert Demolition Dozer excavate haul and spread	5.53	bcy	4.67	312316.46-6070	238	Earth fill is hauled an average of 300 feet and spread over the primary haul road. Excavating Bulk Dozer 700 HP 300' haul common earth
Spanning Arch Culvert Demolition excavate and load concrete and metal arch	1.64	bcy	1.38	312316.46-6010	238	Concrete and metal are excavated and loaded onto a truck. A 60% swell factor was used for the concrete foundations and metal arch volume was reduced by 50% assuming it is partially crushed. Excavating Bulk Dozer 700 HP 50' haul common earth
Spanning Arch Culvert Demolition haul and dump concrete foundation and metal arch	4.73	lcy	3.99	312323.20-5040	257	Concrete and metal are hauled to in-pit stockpile and buried. A 60% swell factor was used for the concrete foundations and metal arch volume was reduced by 50% assuming it is partially crushed. 22 cy off road, 15 min. cycle time, 5 mph, 1 mile cycle.
Bench Grading[1]	2.18	ft	-	-	-	Excavate benches D11T CD, 87-foot push, 200-foot interbench length, 9.26 cy/lf, and 31.6-foot-wide benches. Finish grade channel benches using D9T. Three passes per bench, 1 MPH operating speed. See Appendix B.6 (Bench_&_Berm_Linear_Ft_Cost.xls.
Open Pit Berm[1]	1.94	ft	-	-	-	Cut & fill common earth, D9T, 100-foot push to excavate and build, 3.24 CY/LF assumes 5 feet high, 1.5:1 side slopes, and 10-foot top width. Finish grade with D9T, 50-foot push, unit volume (ft) /perimeter length (ft) (1 CY/LF based on 24-foot perimeter) Uses dozer production factors. See Appendix B.6 (Bench_&_Berm_Linear_Ft_Cost.xls.

[1] Overhead and Profit are added in with the indirect costs.
[2] City Cost Index Las Cruces-Total 84.4% (weighted average) R.S. Means Heavy Construction Cost Data, 27th Annual Edition, 2013, pg. 592.
[3] R.S. Means Heavy Construction Cost Data, 27th Annual Edition, 2013.

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Table 5 Equipment Production Factors

Parameter	Value	Comment/Reference
Material Bulking Factor	0% loose stockpiled material	No bank materials are moved during reclamation. Thus a swell factor is not applied.
Grading		
Material Factor	1.2	(CPH 43, 18-55, loose stockpile)
Grade Factor – Tops	1.0	(CPH 43, 18-55, 0% slope)
Grade Factor - Outslopes	1.58	1.66 – 29% Slopes (CPH 43, 18-55)
Material Weight (lb/cy)	3,600	Dump pile unit weight used by Tyrone Engineering (15 cf/ton, 12/3/2013)
Production Method/Blade Factor	1.2 Stockpile 1.0 Benches, Berms	(CPH 43, 18-55, slot dozing) No correction factor applied
Operator Factor	0.75	(CPH 43, 18-55, average)
Work Hour (min/hr)	50	-
Visibility Factor	1	Clear (CPH 43, 18-55)
Elevation Factor	1	(CPH 43, 29-5)
Direct Drive Trans. Factor	1	-
Ripper (D11T CD)		
Ripping Length (ft)	1,000	-
Penetration (in)	18	-
Pocket Spacing (in)	69	(CPH 43, 18-72)
Number of Pockets	3	(CPH 43, 18-72)
Turn Time (min/pass)	0.25	-
Speed (mph)	1	-
Work Hour (min/hr)	50	-
Distance between passes (in)	69	Maintain pocket spacing between passes

APPENDIX A
COST CALCULATIONS

General Information

Applicant	Little Rock Mine
Reclaimed Surface Area (acres)	252.4
Type of Operation	Existing/Surface/Copper
Total Earthwork Cost	**$1,434,100**

Demolition

Item	Material	Quantity	Unit	Cost ($/unit)	Cost ($)	Reference	Means Line Item	Page	Description
46 kV power lines	Wiring	2	days	$3,349	$6,698	R.S. Means	Crew B-12N Crew B-17 Crew B-68C	540 542 551	Bare Costs: 2-laborers (B17: $35.45/hr, $567.2/day), 1-equipment operator (light) (B17: $45.8/hr, $366.4/day), 1-truck driver (heavy) (B17: $36.6/hr, $292.8/day), 1-48 HP backhoe loader (B17: $45.925/hr, $367.4/day), 1-8 cy 220 HP dump truck (B17: $52.075/hr, $416.6/day), 1-electrician ($412.40/day) (B68C: $52.4/hr, $419.2/day), 1-25-ton hydraulic crane ($697.20/day) (B12N: $143.5/hr, $1148/day), 1-crane operator ($382.40/day) (B12N: $48.8/hr, $390.4/day)
Substation	Misc.	4	days	$3,349	$13,396	R.S. Means	Crew B-12N Crew B-17 Crew B-68C	540 542 551	Bare Costs: 2-laborers (B17: $35.45/hr, $567.2/day), 1-equipment operator (light) (B17: $45.8/hr, $366.4/day), 1-truck driver (heavy) (B17: $36.6/hr, $292.8/day), 1-48 HP backhoe loader (B17: $45.925/hr, $367.4/day), 1-8 cy 220 HP dump truck (B17: $52.075/hr, $416.6/day), 1-electrician ($412.40/day) (B68C: $52.4/hr, $419.2/day), 1-25-ton hydraulic crane ($697.20/day) (B12N: $143.5/hr, $1148/day), 1-crane operator ($382.40/day) (B12N: $48.8/hr, $390.4/day)
Dewatering Pipeline #1	6"-8" Diameter Plastic	2,460	ft	$1.61	$3,966	R.S. Means	024113.38-1700	29	Demolition, water and sewer piping and fittings, excludes excavation, plastic pipe 6"-8" in diameter.
Dewatering Pipeline #2	6"-8" Diameter Plastic	1,900	ft	$1.61	$3,063	R.S. Means	024113.38-1700	29	Demolition, water and sewer piping and fittings, excludes excavation, plastic pipe 6"-8" in diameter.
Spanning Arch Culvert Demolition	Earth Fill Removal (dozer excavate, haul, spread)	3,430	cy	$4.67	$16,009	R.S. Means	312316.46-6070	238	Earth fill is hauled an average of 300 feet and spread over the primary haul road. Excavating Bulk Dozer 700 HP 300' haul common earth
Spanning Arch Culvert Demolition	Concrete Foundation and Metal Arch (excavate and load)	1,520	cy	$1.38	$2,104	R.S. Means	312316.46-6010	238	Concrete and metal are excavated and loaded onto a truck. A 60% swell factor was used for the concrete foundations and metal arch volume was reduced by 50% assuming it is partially crushed. Excavating Bulk Dozer 700 HP 50' haul common earth
Spanning Arch Culvert Demolition	Concrete Foundation and Metal Arch (haul and dump)	1,520	cy	$3.99	$6,068	R.S. Means	312323.20-5040	257	Concrete and metal are hauled to in-pit stockpile area and buried. A 60% swell factor was used for the concrete foundations and metal arch volume was reduced by 50% assuming it is partially crushed. 22 cy off road, 15 min. cycle time, 5 mph, 1 mile cycle.

Total Direct Cost $51,303

Data Sources:
RS Means Heavy Construction Cost Data (27th Annual Edition 2013)
Location adjusted: New Mexico 880 Las Cruces 84.4%

Material Handling Plan Summary Sheet

Item	Description	Location 1	Location 2	Total Haul/Push Distance (ft)	Grade (%)	Equipment
1100	Regrade Outslopes	In-pit Stockpile West Slope	-	128	-29	D11T CD
1101	Regrade Outslopes	In-pit Stockpile East Slope	-	415	-29	D11T CD
1500	Rip Existing Surface	Primary Haul Road	-	1,000	-	D11T CD
1501	Rip Existing Surface	Open Pit Flat Areas	-	1,000	-	D11T CD
1502	Rip Existing Surface	Western Haul Road	-	1,000	-	D11T CD
1503	Rip Existing Surface	North Stockpile	-	1,000	-	D11T CD
1505	Rip Existing Surface	West Canyon Stockpile	-	1,000	-	D11T CD
1506	Rip Existing Surface	Ancillary Facilities and Structures	-	1,000	-	D11T CD
1507	Rip Existing Surface	Reclaimed Copper Leach Stockpile and P-Plant	-	1,000	-	D11T CD
1508	Rip Existing Surface	Allowance for Other Disturbed Areas	-	1,000	-	D11T CD
1509	Rip Existing Surface	In-pit Stockpile	-	1,000	-	D11T CD

Earthwork Quantity Worksheet

Item	Description	Location	Location 2	Area (ac)	Cover Depth (in)	Stockpile/bank Volume (bcy)	Swell Factor (%)	Stockpile/loose Volume (lcy)
1100	Regrade Outslopes	In-pit Stockpile West Slope	-			55,946	0%	55,946
1101	Regrade Outslopes	In-pit Stockpile East Slope	-			508,508	0%	508,508
1500	Rip Existing Surface	Primary Haul Road	-	3.8	-	-	-	-
1501	Rip Existing Surface	Open Pit Flat Areas	-	104.1	-	-	-	-
1502	Rip Existing Surface	Western Haul Road	-	14.8	-	-	-	-
1503	Rip Existing Surface	North Stockpile	-	4.3	-	-	-	-
1505	Rip Existing Surface	West Canyon Stockpile	-	1.5	-	-	-	-
1506	Rip Existing Surface	Ancillary Facilities and Structures	-	5.3	-	-	-	-
1507	Rip Existing Surface	Reclaimed Copper Leach Stockpile and P-Plant	-	30.1	-	-	-	-
1508	Rip Existing Surface	Allowance for Other Disturbed Areas	-	10.0	-	-	-	-
1509	Rip Existing Surface	In-pit Stockpile	-	48.5	-	-	-	-

Productivity and Hours Required for Dozer Use---Earthmoving

							PERFORMANCE FACTORS											
Task Description	Location 1	Location 2	Equipment	Stockpile/loose Volume (lcy)	Productivity (cy/hr)	Total Task Time (hours)	Material	Grade Factor	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.	Grade (%)
Regrade Outslopes	In-pit Stockpile West Slope	-	D11T CD	55,946	2,204	25	1.2	1.58	3,600	1.20	128	2427	0.75	50	1.00	1.00	1.00	-29
Regrade Outslopes	In-pit Stockpile East Slope	-	D11T CD	508,508	799	636	1.2	1.58	3,600	1.20	415	880	0.75	50	1.00	1.00	1.00	-29

Equipment production factors are also shown on Table 5 in the main text.

Productivity and Hours Required for Dozer Use---Grading

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Productivity and Hours Required for Ripper-Equipped Dozer Use

						PERFORMANCE FACTORS								
Task Description	Location 1	Equipment	Area (acres)	Volume (cy)	Productivity (acres/hr)	Task Time (hours)	Ripping Length (feet)	Ripper Penetration (in)	Pocket Spacing (in)	No. of Pockets	Turn Time (min/pass)	Work Hour (min/hr)	Speed (mph)	1000 ft passes/acre	Ripper Path Width (feet)
Rip Existing Surface	Primary Haul Road	D11T CD	3.8	9,196	1.70	2	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	Open Pit Flat Areas	D11T CD	104.1	251,922	1.70	61	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	Western Haul Road	D11T CD	14.8	35,816	1.70	9	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	North Stockpile	D11T CD	4.3	10,406	1.70	3	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	West Canyon Stockpile	D11T CD	1.5	3,630	1.70	1	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	Ancillary Facilities and Structures	D11T CD	5.3	12,753	1.70	3	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	Reclaimed Copper Leach Stockpile and P-Plant	D11T CD	30.1	72,890	1.70	18	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	Allowance for Other Disturbed Areas	D11T CD	10.0	24,200	1.70	6	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3
Rip Existing Surface	In-pit Stockpile	D11T CD	48.5	117,370	1.70	28	1,000	18.0	69.0	3	0.25	50	1	2.53	17.3

Equipment production factors are also shown on Table 5 in the main text.

Productivity and Hours Required for Hydraulic Excavator

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Productivity and Hours Required for Truck Use

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Productivity for Front End Loader

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Productivity and Hours Required for Scraper Use

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Productivity and Hours Required for Motor grader Use---Grading

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Summary Calculation of Earthmoving Costs

Equipment Type	Task	Location 1	Location 2	Owning and Operating Cost ($/hr)	Labor Cost ($/hr)	Number of Units (Equipment)	Time Required (hours)	Total Cost ($)	Total Production	Prod. Unit	Unit Cost ($/unit)
Dozers-Grading											
D11T CD	Regrade Outslopes	In-pit Stockpile West Slope	-	$505.72	$46.59	1	25	$14,017	55,946	cy	0.25
D11T CD	Regrade Outslopes	In-pit Stockpile East Slope	-	$505.72	$46.59	1	636	$351,367	508,508	cy	0.69
Rippers											
D11T CD	Rip Existing Surface	Primary Haul Road	-	$535.71	$46.59	1	2	$1,298	9,196	cy	0.14
D11T CD	Rip Existing Surface	Open Pit Flat Areas	-	$535.71	$46.59	1	61	$35,554	251,922	cy	0.14
D11T CD	Rip Existing Surface	Western Haul Road	-	$535.71	$46.59	1	9	$5,055	35,816	cy	0.14
D11T CD	Rip Existing Surface	North Stockpile	-	$535.71	$46.59	1	3	$1,469	10,406	cy	0.14
D11T CD	Rip Existing Surface	West Canyon Stockpile	-	$535.71	$46.59	1	1	$512	3,630	cy	0.14
D11T CD	Rip Existing Surface	Ancillary Facilities and Structures	-	$535.71	$46.59	1	3	$1,800	12,753	cy	0.14
D11T CD	Rip Existing Surface	Reclaimed Copper Leach Stockpile and P-Plant	-	$535.71	$46.59	1	18	$10,287	72,890	cy	0.14
D11T CD	Rip Existing Surface	Allowance for Other Disturbed Areas	-	$535.71	$46.59	1	6	$3,415	24,200	cy	0.14
D11T CD	Rip Existing Surface	In-pit Stockpile	-	$535.71	$46.59	1	28	$16,565	117,370	cy	0.14
Water Truck and Grader*											
10,000 gal	Off-Hwy Water Tanker Truck		-	$169.54	$48.59	1	159	$34,693			
16M	Motor Grader		-	$159.61	$46.59	1	159	$32,795			

*Assume there is a water truck and motor grader running 1 hour
twice a day when the dozers are running over an 8 hour work day.

Primary Haul Road	$1,298
Open Pit Flat Areas	$35,554
Western Haul Road	$5,055
North Stockpile	$1,469
Safety Berm and Fencing around Pit Perimeter	$0
West Canyon Stockpile	$512
Ancillary Facilities and Structures	$69,288
Reclaimed Copper Leach Stockpile and P-Plant	$10,287
Allowance for Other Disturbed Areas	$3,415
In-pit Stockpile	$381,948
Total Direct Cost	**$508,826**

Equipment, Fuel, and Labor Costs

EQUIPMENT

Equipment Description	Fuel Consumption (gal/hr)	Fuel Cost ($/hr)	Owning and Operating Cost (w/out fuel) ($/hr)	Fuel-Adjusted Own/Op Cost ($/hr)	Reference
Cat D11T CD Bulldozer w/universal blade	29.70	$93.71	$412.01	$505.72	1
Cat D11T CD Bulldozer w/ adjustable parallelogram multishank ripper	29.70	$93.71	$442.00	$535.71	1
Cat 16M Motor Grader	9.50	$29.99	$129.62	$159.61	1
Off-Hwy Water Tanker Truck, 10,000-gal.	15.35	$48.41	$121.13	$169.54	1

FUEL

Oil Broker Quote		$3.155	per gallon	2

LABOR

Labor Description	NMDOL Type A Operator Group	NMDOL Type A Operator Classification	Nominal Total Rate ($/hr)	
Cat D11T CD Bulldozer w/universal blade	Equipment Operator IV	Bulldozer (mult. Units)	$46.59	3
Cat D11T CD Bulldozer w/ adjustable parallelogram	Equipment Operator IV	Bulldozer (mult. Units)	$46.59	3
Cat 16M Motor Grader	Equipment Operator IV	Motor Grader	$46.59	3
Off-Hwy Water Tanker Truck, 10,000-gal.	Equipment Operator III	Teamster	$48.59	3

References:

1. EquipmentWatch Version Version 6.9.3B. Penton Media, Inc (http://www.equipmentwatch.com). Revised Date: 2nd Half 2013 See attachments for rate development.
2. Western Refining Quote 10/29/13
3. Labor rates based on NM Department of Labor Type H (Heavy Engineering) labor rates. See attachments for rate development.

Revegetation Costs

Description:
Scarifying, discing, rangeland drill seeding, mulching, crimping.

Unit or Disturbance	Area (acres)	Unit Cost ($/acre)	Subtotal Cost ($)	Reference	Notes
Primary Haul Road	3.8	$977	$3,713	Rocky Mountain Reclamation, Laramie WY (10/31/13)	
Open Pit Flat Areas	104.1	$977	$101,725	Rocky Mountain Reclamation, Laramie WY (10/31/13)	
Western Haul Road	14.8	$977	$14,462	Rocky Mountain Reclamation, Laramie WY (10/31/13)	
North Stockpile	4.3	$977	$4,202	Rocky Mountain Reclamation, Laramie WY (10/31/13)	Area is naturally vegetated, remains in estimate until financial assurance is released.
Open Pit Perimeter Safety Berm and Fencing	30	$977	$29,316	Rocky Mountain Reclamation, Laramie WY (10/31/13)	
West Canyon Stockpile	1.5	$977	$1,466	Rocky Mountain Reclamation, Laramie WY (10/31/13)	Area is naturally vegetated, remains in estimate until financial assurance is released.
Ancillary Facilities and Structures	5.3	$977	$5,150	Rocky Mountain Reclamation, Laramie WY (10/31/13)	
Reclaimed Copper Leach Stockpile and P-Plant	30.1	$977	$29,433	Rocky Mountain Reclamation, Laramie WY (10/31/13)	Area was vegetated August, 2010. Remains in estimate for a 12-year vegetation establishment period.
Allowance for Other Disturbed Areas	10.0	$977	$9,772	Rocky Mountain Reclamation, Laramie WY (10/31/13)	
In-pit Stockpile	48.5	$977	$47,394	Rocky Mountain Reclamation, Laramie WY (10/31/13)	

Total Direct Cost **$246,633**

Other Reclamation Activity Costs

Item	Activity	Quantity	Unit	Unit Cost ($/unit)	Current Item Cost ($)	Reference	Line Item	Page	Description
Fencing									
Primary Haul Road	Livestock Fence Perimeter	2,850	ft	$3.75	$10,688	2013 New Mexico Heavy Construction Costs	-	262	$5.35/ft minus 42.5% indirect costs. Barbed wire fence, complete based on post at 10', using a 24,500 lb. 2-axle truck with an 8' x 16' flat bed and small tools 3-strand barbed wire fence, galvanized (total bare costs). 2013 New Mexico Heavy Construction Costs, Page 262. $4.99/ft, $0.36 per additional strand, 4 strands total $5.35/ft. (http://www.get-a-quote.net/QuoteEngine/costbook.asp?WCI=CostFrameSet&BookId=48)
Little Rock Open Pit	Chain Link Fence Perimeter	5,820	ft	$20.56	$119,658	R.S. Means	323113.20-0800	320	Fence, chain link industrial, schedule 40, including concrete, 6 gage. wire, 6' high, but omit barbed wire, galv. Steel. (total bare costs)
Little Rock Open Pit	Signs Posted every 500 ft	38	each	$53.17	$2,021	R.S. Means	101453.20-0600	148	Traffic Signs, Guide and directional signs 12" x 18" reflectorized. (total bare costs)
Western Haul Road & North Stockpile	Livestock Fence Perimeter	2,520	ft	$3.75	$9,450	2013 New Mexico Heavy Construction Costs	-	262	$5.35/ft minus 42.5% indirect costs. Barbed wire fence, complete based on post at 10', using a 24,500 lb. 2-axle truck with an 8' x 16' flat bed and small tools 3-strand barbed wire fence, galvanized (total bare costs). 2013 New Mexico Heavy Construction Costs, Page 262. $4.99/ft, $0.36 per additional strand, 4 strands total $5.35/ft. (http://www.get-a-quote.net/QuoteEngine/costbook.asp?WCI=CostFrameSet&BookId=48)
West Canyon Stockpile	Livestock Fence Perimeter	1,080	ft	$3.75	$4,050	2013 New Mexico Heavy Construction Costs	-	262	$5.35/ft minus 42.5% indirect costs. Barbed wire fence, complete based on post at 10', using a 24,500 lb. 2-axle truck with an 8' x 16' flat bed and small tools 3-strand barbed wire fence, galvanized (total bare costs). 2013 New Mexico Heavy Construction Costs, Page 262. $4.99/ft, $0.36 per additional strand, 4 strands total $5.35/ft. (http://www.get-a-quote.net/QuoteEngine/costbook.asp?WCI=CostFrameSet&BookId=48)
Other Disturbed Area	Livestock Fence Perimeter	1,070	ft	$3.75	$4,013	2013 New Mexico Heavy Construction Costs	-	262	$5.35/ft minus 42.5% indirect costs. Barbed wire fence, complete based on post at 10', using a 24,500 lb. 2-axle truck with an 8' x 16' flat bed and small tools 3-strand barbed wire fence, galvanized (total bare costs). 2013 New Mexico Heavy Construction Costs, Page 262. $4.99/ft, $0.36 per additional strand, 4 strands total $5.35/ft. (http://www.get-a-quote.net/QuoteEngine/costbook.asp?WCI=CostFrameSet&BookId=48)
Benches									
In-pit Stockpile	Rough Grade/Finish grade benches	3,970	ft	$2.18	$8,655	Estimate	-	-	Excavate benches D11T CD, 87-foot push, 200-foot interbench length, 9.26 cy/lf, and 31.6-foot-wide benches. Finish grade channel benches using D9T. Three passes per bench, 1 MPH operating speed. See Appendix B.6 (Bench_&_Berm_Linear_Ft_Cost.xls.
Other									
Little Rock Open Pit	Berm	12,560	ft	$1.94	$24,366	Estimate	-	-	Cut & fill common earth, D9T, 100-foot push to excavate and build, 3.24 CY/LF assumes 5 feet high, 1.5:1 side slopes, and 10-foot top width. Finish grade with D9T, 50-foot push, unit volume (ft) /perimeter length (ft) (1 CY/LF based on 24-foot perimeter) Uses dozer production factors. See Appendix B.6 (Bench_&_Berm_Linear_Ft_Cost.xls.
Abandon Monitoring Well	Abandon 4" holes	1705	ft	$9.82	$16,743				$14.00/ft minus 42.5% indirect costs. "Estimated costs for abandoning boreholes using bentonite cement grout ranges from approximately $14.00 to $25.00 per foot. For the purposes of estimating a simplified cost of abandoning boreholes the MMD cost is $14.00/ft. The FA cost estimate could be higher or lower based on site specific characteristics" (MMD, 2013).

Primary Haul Road	$10,688
Open Pit Flat Areas	$0
Western Haul Road	$9,450
North Stockpile	$0
Open Pit Perimeter Safety Berm and Fencing	$146,045
West Canyon Stockpile	$4,050
Ancillary Facilities and Structures	$20,756
Reclaimed Copper Leach Stockpile and P-Plant	$0
Allowance for Other Disturbed Areas	$0
In-pit Stockpile	$8,655
Total Direct Cost	**$199,643**

<- fenced with western haul road

Data Sources:
R.S. Means Heavy Construction Cost Data, 27th Annual Edition, 2013.
Location adjustment:
84.4% New Mexico 880 Las Cruces

Capital Reclamation Cost Estimate

Little Rock
Worksheet #16
6/17/2014

Capital Cost Summary

			Current Dollar Value
DIRECT COSTS	Facility and Structure Removal		$51,303
	Earthmoving		$508,826
	Vegetation		$246,633
	Other[1]		$199,643
	Subtotal, Direct Costs		**$1,006,405**
INDIRECT COSTS[2]	Mobilization and Demobilization (0%-10%)	5.0%	$50,320
	Contingencies (3%-5%)	7.0%	$70,448
	Engineering Redesign Fee (2.5%-6%)	6.0%	$60,384
	Contractor Profit and Overhead (15%-30%)	20.0%	$201,281
	Project Management Fee and State Procurement Cost (2%-7%)	4.5%	$45,288
	Indirect Percentage Sum =	42.5%	
	Subtotal, Indirect Costs		**$427,722**
TOTAL COST			**$1,434,100**

[1]Includes: Fencing, benches, berms, and abandon monitoring wells.

[2]Data Sources:

MMD. 1996. Closeout Plan Guidelines for Existing Mines, Mining Act Reclamation Bureau Mining and Minerals Division New Mexico Energy, Minerals and Natural Resources Department. April 30, 1996.

OSM. 2000. U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement Handbook for Calculation of Reclamation Bond Amounts. April 5, 2000.

Capital Reclamation Cost Estimate

Little Rock
Worksheet #17
6/17/2014

Detailed Reclamation Summary

		Primary Haul Road	Open Pit Flat Areas	Western Haul Road	North Stockpile	Open Pit Perimeter Safety Berm and Fencing	West Canyon Stockpile	Ancillary Facilities and Structures*	Reclaimed Copper Leach Stockpile and P-Plant	Allowance for Other Disturbed Areas	In-pit Stockpile	Totals
DIRECT COSTS												
Facility and Structure Removal		$24,181	$0	$0	$0	$0	$0	$27,122	$0	$0	$0	**$51,303**
Earthmoving		$1,298	$35,554	$5,055	$1,469	$0	$512	$69,288	$10,287	$3,415	$381,948	**$508,826**
Vegetation		$3,713	$101,725	$14,462	$4,202	$29,316	$1,466	$5,150	$29,433	$9,772	$47,394	**$246,633**
Other		$10,688	$0	$9,450	$0	$146,045	$4,050	$20,756	$0	$0	$8,655	**$199,643**
Subtotal, Direct Costs		**$39,880**	**$137,280**	**$28,967**	**$5,671**	**$175,361**	**$6,028**	**$122,315**	**$39,720**	**$13,187**	**$437,996**	**$1,006,405**
INDIRECT COSTS												
Mobilization and Demobilization (0%-10%)	5.0%	$1,994	$6,864	$1,448	$284	$8,768	$301	$6,116	$1,986	$659	$21,900	**$50,320**
Contingencies (3%-5%)	7.0%	$2,792	$9,610	$2,028	$397	$12,275	$422	$8,562	$2,780	$923	$30,660	**$70,448**
Engineering Redesign Fee (2.5%-6%)	6.0%	$2,393	$8,237	$1,738	$340	$10,522	$362	$7,339	$2,383	$791	$26,280	**$60,384**
Contractor Profit and Overhead (15%-30%)	20.0%	$7,976	$27,456	$5,793	$1,134	$35,072	$1,206	$24,463	$7,944	$2,637	$87,599	**$201,281**
Project Management Fee and State Procurement Cost (2%-7%)	4.5%	$1,795	$6,178	$1,304	$255	$7,891	$271	$5,504	$1,787	$593	$19,710	**$45,288**
Indirect Percentage Sum =	42.5%											
Subtotal, Indirect Costs		**$16,949**	**$58,344**	**$12,311**	**$2,410**	**$74,528**	**$2,562**	**$51,984**	**$16,881**	**$5,605**	**$186,148**	**$427,722**
TOTAL COST PER AREA		**$56,828**	**$195,624**	**$41,278**	**$8,081**	**$249,889**	**$8,590**	**$174,299**	**$56,601**	**$18,792**	**$624,145**	**$1,434,128**
TOTAL COST		**$1,434,128**										

*Includes: demolition of power lines, substation, dewatering pipeline; well abandonment; and reclamation of small ancillary facility areas.

Capital Reclamation Cost Estimate

Little Rock
Worksheet #18
6/17/2014

Facility Characteristics

Facility	Primary Haul Road	Open Pit Flat Areas	Western Haul Road	North Stockpile	Open Pit Perimeter Safety Berm and Fencing	West Canyon Stockpile	Ancillary Facilities and Structures*	Reclaimed Copper Leach Stockpile and P-Plant	Allowance for Other Disturbed Areas	In-pit Stockpile
Reclaimed Acres	3.8	104.1	14.8	4.3	30.0	1.5	5.3	30.1	10.0	48.5
Item	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost	Capital Cost
Demolition	$34,458	$0	$0	$0	$0	$0	$38,649	$0	$0	$0
Ripping	$1,849	$50,665	$7,203	$2,093	$0	$730	$2,565	$14,659	$4,867	$23,605
Top/Outslope Adjustment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$520,671
Seed & Mulch	$5,291	$144,959	$20,609	$5,988	$41,775	$2,089	$7,338	$41,942	$13,925	$67,536
Channels, Berms, & Benches	$0	$0	$0	$0	$34,722	$0	$0	$0	$0	$12,333
Fencing	$15,230	$0	$13,466	$0	$173,392	$5,771	$5,718	$0	$0	$0
Water Truck and Motor Grader	$0	$0	$0	$0	$0	$0	$96,170	$0	$0	$0
Abandon Wells/Exploration Holes	$0	$0	$0	$0	$0	$0	$23,859	$0	$0	$0
Capital Cost Totals	$56,828	$195,624	$41,278	$8,081	$249,889	$8,590	$174,299	$56,601	$18,792	$624,145
Capital Cost/Acre	$14,955	$1,879	$2,789	$1,879	$8,330	$5,727	$33,074	$1,879	$1,879	$12,869
Capital Cost/Acre Ripping	$487	$487	$487	$487	$0	$487	$487	$487	$487	$487
Capital Cost/Acre Top/Outslope Adjustment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$10,735
Capital Cost/Acre Earthwork Total	$487	$487	$487	$487	$0	$487	$18,735	$487	$487	$11,222
Capital Cost/Acre Veg	$1,392	$1,392	$1,392	$1,392	$1,392	$1,392	$1,392	$1,392	$1,392	$1,392
Capital Cost/Acre Other	$4,008	$0	$910	$0	$6,937	$3,848	$5,612	$0	$0	$254

*Includes: demolition of power lines, substation, dewatering pipeline; well abandonment; and reclamation of small ancillary facility areas.

O&M Reclamation Cost Summary

Little Rock
Worksheet #19 Sampling Unit Cost
6/17/2014

	Shipping and Analysis					Collection and Reporting						Total Cost
Sample Basis Type	Coolers per Sample	Shipping ($/cooler)	Shipping Cost ($/sample)	Analysis ($/sample)[1]	Analysis and Shipping Cost	Work per Sample (hours)	Reporting (hours)	Work Rate ($/hour)	Review Work per Sample (hours)	Review Work Rate ($/hour)	Reporting Cost ($/sample)	($/sample)
Quarterly Sampling	0.09	$70	$6	$230	$236	1.0	0.5	$60	0.10	$70	$100	$336

[1] 23 Constituents. Energy Laboratories, Inc, 2013. Published price list (www.energylab.com).

Energy Labs Unit Rates[1]:

aluminum	$	10	
arsenic	$	10	
bicarbonate	$	10	
boron	$	10	
cadmium	$	10	
calcium	$	10	
carbonate	$	-	included w/ bicarbonate
chloride	$	10	
chromium	$	10	
cobalt	$	10	
copper	$	10	
ferrous iron	$	5	$10/2 only need to sample twice per year as opposed to each quarter
fluoride	$	15	
iron	$	10	
magnesium	$	10	
manganese	$	10	
nickel	$	10	
potassium	$	10	
selenium	$	10	
sodium	$	10	
sulfate	$	10	
total dissolved solids	$	20	
zinc	$	10	
Total	$	230	

O&M Reclamation Cost Summary

Little Rock
Worksheet #20 Sampling
6/17/2014

Item	Quantity
Monitoring Wells[1]	7
California Gulch[2,3]	1
Little Rock Open Pit Water[3]	2
North and South Seep Collections [4]	1
Quarterly Samples/ Location	11
Sampling ($/sample)[5]	$336
Quarterly Cost	$3,696
Quarterly Sampling Yearly Cost	$14,784
Semi-Annual Sampling Yearly Cost	$ 7,392
Annual Sampling Yearly Cost	$3,696

[1] LRW 1-3, 6, and 7 will be mined out or closed prior to 2017, LRW 4, 5, and 1236-2012-01 remain. Installing total of four new monitoring wells prior to 2017 for a total of 7 post closure monitoring wells.

[2] Two of three sampling locations are mined out and one is replaced. Based on sampling in 2008, the estimate assumes water for sampling the two locations in California Gulch is present once a year.

[3] Little Rock Open Pit water, and California Gulch are sampled for both total and dissolved constituents (DP-1236), which doubles the number of samples taken each quarter.

[4] Assumes seep collections are dry two quarters a year.

[5] Assumes flow rates for California Gulch, McCain Springs, and Sugar Loaf Springs are monitored at the same time as sampling.

O&M Reclamation Cost Summary

Little Rock
Worksheet #21 O&M
6/17/2014

EROSION CONTROL AND MONITORING[1]

	Years 1	Years 2-12	
Base:	$4,364	$4,364	$/day
Time:	12	4	days/year
Annual:	$52,371	$17,457	$/year

Year	Annual Current Cost ($)
1	$52,371
2	$17,457
3	$17,457
4	$17,457
5	$17,457
6	$17,457
7	$17,457
8	$17,457
9	$17,457
10	$17,457
11	$17,457
12	$17,457
13	$0
14	$0
15	$0
16	$0
17	$0
18	$0
19	$0
20	$0
21	$0
22	$0
23	$0
24	$0
25	$0
26	$0
27	$0
28	$0
29	$0
30	$0
Subtotals	**$244,400**

Total Cost **$487,859**

EROSION CONTROL AND MONITORING[1]
Reclaimed Copper Leach Stockpile and P-Plant vegetated in August 2010

	Years 1	Years 2-12	
Base:	$4,364	$4,364	$/day
Time:	2	1	day/year
Annual:	$8,729	$4,364	$/year

Year	Annual Current Cost ($)
2018	$4,364
2019	$4,364
2020	$4,364
2021	$4,364
2022	$4,364
2023	$0
2024	$0
2025	$0
2026	$0
2027	$0
2028	$0
2029	$0
2030	$0
2031	$0
2032	$0
2033	$0
2034	$0
2035	$0
2036	$0
2037	$0
2038	$0
2039	$0
2040	$0
2041	$0
2042	$0
2043	$0
2044	$0
2045	$0
2046	$0
2047	$0
Subtotals	**$21,821**

WATER QUALITY MONITORING AND REPORTING [2]

	Years 1-2	Years 3-8	Years 9-30	
Base:	$3,696	$3,696	$3,696	$/event
Time:	4	2	1	events
Annual:	$14,784	$7,392	$3,696	$/year

Year	Annual Current Cost ($)
1	$14,784
2	$14,784
3	$7,392
4	$7,392
5	$7,392
6	$7,392
7	$7,392
8	$7,392
9	$7,392
10	$7,392
11	$3,696
12	$3,696
13	$3,696
14	$3,696
15	$3,696
16	$3,696
17	$3,696
18	$3,696
19	$3,696
20	$3,696
21	$3,696
22	$3,696
23	$3,696
24	$3,696
25	$3,696
26	$3,696
27	$3,696
28	$3,696
29	$3,696
30	$3,696
Subtotals	**$162,624**

ROAD MAINTENANCE (MONITORING WELL AND POWERLINE ACCESS ROADS) [3]

	Years 13-30	
Base:	$3,279	$/event
Time:	1	events
Annual:	$3,279	$/year

Year	Annual Current Cost ($)
1	---
2	---
3	---
4	---
5	---
6	---
7	---
8	---
9	---
10	---
11	---
12	---
13	$3,278.58
14	$3,278.58
15	$3,278.58
16	$3,278.58
17	$3,278.58
18	$3,278.58
19	$3,278.58
20	$3,278.58
21	$3,278.58
22	$3,278.58
23	$3,278.58
24	$3,278.58
25	$3,278.58
26	$3,278.58
27	$3,278.58
28	$3,278.58
29	$3,278.58
30	$3,278.58
Subtotals	**$59,014**

[1] Erosion Control
Modified Crew B-13A (1 Labor Foreman, 2 laborers, 1 equip. operators (med.), 1 truck drivers (heavy), 1 crawler loader (4 cy), 1 dump trucks (8 cy, 220 HP)
RS Means Heavy Construction Cost Data (27th Annual Edition, 2013)

Item	#	$/hour	$/day
Labor Foreman (outside)	1	$37.45	$299.60
Laborers	2	$35.45	$567.20
Equipment Operators	1	$47.50	$380.00
Truck Drivers (heavy)	1	$36.60	$292.80
		$/day	$/day
Crawler Loader, 4 C.Y.	1	$1,530	$1,530
Dump Trucks, 8 C.Y., 220 H.P.	1	$833	$833

	$3,903	$/day
	84.40%	Location Adjustment
Total Direct Cost	$3,294	$/day (Adjusted)
Indirect Cost Percentage	32.5%	
Total Cost	$4,364	

[2] Water Quality Monitoring and Reporting
See Sheet 19 Sampling Unit Cost and Sheet 20 Sampling.

[3] Road Maintenance Crew
Equipment - Equipment Watch Version 6.9.3B
Labor -NM Department of Labor Type H (Heavy Engineering)
See attachments for rate development.

Item	#	$/hour
Cat 16M Mo	1	$159.61
Equipment C	1	$46.59

Hours per Event	12	hours
Total Direct Cost	$2,474	$/event
Indirect Cost Percentage	32.5%	
Total Cost	$3,279	

O&M Reclamation Cost Summary

Little Rock
Worksheet #22 Sum

O&M Cost Summary

6/17/2014

			Current Value
DIRECT COSTS	Facility and Structure Removal		$0
	Earthmoving		$0
	Revegetation		$0
	Other		$245,461
	Subtotal, Direct Costs		**$245,461**
INDIRECT COSTS[1]	Mobilization and Demobilization (0%-10%)	5.0%	$12,273
	Contingencies (3%-5%)	7.0%	$17,182
	Engineering Redesign Fee (2.5%-6%)	6.0%	$14,728
	Contractor Profit and Overhead (15%-30%)	10.0%	$24,546
	Project Management Fee and State Procurement Cost (2%-7%)	4.5%	$11,046
	Indirect Percentage Sum =	32.5%	
	Subtotal, Indirect Costs		**$79,775**
WATER QUALITY MONITORING AND REPORTING			**$162,624**
TOTAL COST			**$487,900**

[1]Data Sources:

MMD. 1996. Closeout Plan Guidelines for Existing Mines, Mining Act Reclamation Bureau Mining and Minerals Division New Mexico Energy, Minerals and Natural Resources Department. April 30, 1996.

OSM. 2000. U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement Handbook for Calculation of Reclamation Bond Amounts. April 5, 2000.

APPENDIX B
SUPPORTING DOCUMENTATION

Appendix B.1
Calculation Documentation

EQUATIONS USED IN CAPITAL COST SPREADSHEET

Sheet #4 Earthwrk:

$$Loose\ Volume\ (lcy) = Bank\ Volume\ (cy) * [1 + Swell\ Factor]$$

Sheet #5 Dozer:

$$\text{Normal Production}\ (cy/hr) = 159372 * \text{Maximum Push Distance}\ (ft)^{-.0.862481}$$

(*Curve Fit Cat Handbook Ed* 42 D11T page 18 - 51)

$$\text{Productivity}\ (cy/hr) = \text{Normal Production}\ (cy/hr) * Operator * Material * \frac{Work\ Hour\ (\text{min}/hr)}{60\ (\text{min}/hr)}$$

$$* Grade\ Factor * \frac{2300(lbs/cy)}{Soil\ Weight\ (lbs/cy)} * \text{Prod}.\ Method * Visibility * Elev.* Drive\ Trans.$$

$$Total\ Task\ Time\ (hr) = \frac{Loose\ Volume\ (cy)}{\text{Productivity}\ (cy/hr)}$$

$$Grade\ (Dozing\ Factor) = -0.02 * Grade\ (\%) + 1$$

(*Curve Fit Cat Handbook Ed* 43 $18 - 55$)

Sheet #7 Ripper:

$$Ripper\ Width\ (ft) = \frac{Pocket\ Spacing\ (in)}{12\ (in/\ ft)} * Number\ of\ \ Pockets$$

$$1000\ \ ft\ Passes / Acre = \frac{43560\ (ft^2\ / acre)}{Ripper\ \ Length\ (ft) * Ripper\ Width\ (ft)}$$

$$Volume\ (cy) = Area\ (acres) * 43560\ (ft^2\ / acre) * \frac{Ripper\ \ Penetration\ (in)}{12\ (in/\ ft) * 27\ (ft^3\ / cy)}$$

$$Productivity\ (acres / hr) = \frac{Work\ \ Hour\ (\min / hr)}{\left[\left(\frac{Ripper\ \ Lenth\ (ft)}{5280\ (ft / mi) * \frac{Speed\ \ (mi / hr)}{60\ (\min / hr)}}\right) + Turn\ Time\ (\min / \ pass)\right] * 1000\ \ ft\ Passes / acre}$$

$$Task\ Time\ (hr) = \frac{Area\ (acres)}{Productivity\ (acres / hr)}$$

Sheet #8 Excavator:

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Sheet #9 Trucks:

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Sheet #10 Loader:

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Sheet #11 Scraper:

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Sheet #12 M'grader:

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Sheet #13 Earth Sum:

$$Total\ Cost\ (\$) = \left[Owning\ \&\ Operating\ Cost\ (\$/hr) + Labor\ Cost\ (\$/hr)\right] * TimeRequired\ (hr)$$

$$Unit\ Cost\ (\$/unit) = \frac{Total\ Cost\ (\$)}{Total\ Production\ (unit)}$$

$$Total\ Cost\ (\$) = \sum Total\ Cost\ (\$)$$

Sheet #14 Reveg:

$$Subtotal\ Cost\ (\$) = Area\ (acres) * Unit\ Cost\ (\$/acre)$$

$$Total\ Reveg\ Cost\ (\$) = \sum\ Subtotal\ Cost\ (\$)$$

Sheet #15 Other:

$$Unit\ Cost\ (\$/unit) = Unadjusted\ Cost\ (\$/unit) * \frac{Location\ Adjustment\ (\%)}{100}$$

$$Current\ Item\ Cost\ (\$) = Quantity\ (units) * Unit\ Cost\ (\$/unit)$$

$$Total\ (\$) = \sum Current\ Item\ Cost\ (\$)$$

Sheet #16 & 17 Sum:

$$SubTotal\ Direct\ Cost\ (\$) = Total\ Earthmoving\ (\$) + Total\ \text{Reveg}\ (\$) + Total\ Other\ (\$)$$

$$Indirect\ Costs(\$) = SubTotal\ Direct\ Cost\ (\$) * \frac{Various\ Costs\ (\%)}{100}$$

$$Total\ \ Amount\ (\$) = Sum\ Direct\ Cost\ (\$) + Indirect\ Cost\ (\$)$$

Appendix B.2
Labor Rates

Labor Rate Detail

Labor	Equipment	Zone	Group	Base rate[1]	Zone Pay	Fringes[1]	Apprentice Rate[1]	Subtotal	FICA[2] 6.200%	Medicare[2] 1.450%	Fed UI	State UI	Workmens Comp	Total per Hour
Power Equipment Operator	Dozer	46.61	IV	$33.88		$6.98	$0.35	$41.21	$2.56	$0.60	$0.02	$0.22	$1.986	**$46.59**
Power Equipment Operator	Motor Grader (Rough)	46.61	IV	$33.88		$6.98	$0.35	$41.21	$2.56	$0.60	$0.02	$0.22	$1.986	**$46.59**
Power Equipment Operator	Mechanic	46.76	VI	$34.03		$6.98	$0.35	$41.36	$2.56	$0.60	$0.02	$0.22	$1.994	**$46.76**
Truck Drivers	Haul Trucks	48.59	III	$33.86		$6.98	$0.35	$41.19	$2.55	$0.60	$0.02	$0.22	$4.012	**$48.59**

	Federal Unemployment - 0.6% on the first $7,000	New Mexico Unemployment - 2% on the first $22,900
$ Max[3,4]	$7,000	$22,900
Unemployment Tax[3,4]	0.60%	2.00% new employees' first 4 yrs
Unemployment Taxes Paid	$42.00	$458.00
Hours per Yr	2,085 (365 * 5/7 * 8 = 2085.71)	2,085
Unemployment rate per Hour	$0.02	$0.22

Class	Group	Class Code	Workmen's Comp (WC) Rate / $100 (include premium limits, terrorist premium)	Base Rate W/ Fringes & Apprentice	WC/Hour (Base rate / $100 * Base Wage per Hour) $/hr
Operators					
Dozer	IV	6217	$4.8200	$41.210	$1.99
Motor Grader (Rou	IV	6217	$4.8200	$41.210	$1.99
Mechanic	VI	-	$4.8200	$41.360	$1.99
Haul Trucks	III	7228	$9.7400	$41.190	$4.01

References 10/30/2013

1. Base Rate, Fringes, Apprentice Rate	http://www.dws.state.nm.us/Portals/0/DM/LaborRelations/Type_H.pdf
2. FICA, Medicare	http://www.ssa.gov/OACT/ProgData/taxRates.html
3. Federal Unemployment Tax	http://workforcesecurity.doleta.gov/unemploy/uitaxtopic.asp
4. New Mexico Unemployment Tax	http://www.dws.state.nm.us/
Workman's Comp	NMCC worker's compensation rates for: 6217 Excavation - $4.82 7228 Trucking-local hauling only-all employees $9.74 Note: Net rates including terrorist and premium.

Appendix B.3
Equipment Rates
(EquipmentWatch)

www.equipmentwatch.com

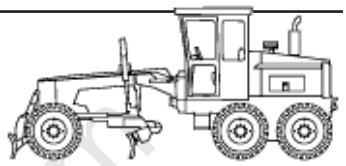
Custom Cost Evaluator

November 8, 2013

Caterpillar 16M

Articulated Frame Graders

Size Class:
250 HP & Over 250 HP & Over
Weight:
59,435 lbs.



Configuration for 16M

Power Mode	**Diesel**	Operator Protection	**EROPS**
Moldboard Size	**16'**	Net Horsepower	**297.0**

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$38.96/hr	$36.31/hr	-6.8%
Cost of Facilities Capital (CFC)	$6.34/hr	$5.23/hr	-17.51%
Overhead	$30.20/hr	$24.61/hr	-18.51%
Overhaul Labor	$6.59/hr	$4.90/hr	-25.64%
Overhaul Parts	$21.99/hr	$17.92/hr	-18.51%
Total Hourly Ownership Cost:	**$104.08/hr**	**$88.97/hr**	**-14.52%**

User Defined Adjustments: Annual Use Hours (1,400 hrs -> 1,718 hrs) Sales Tax (5.5% -> 0%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$5.49/hr	$4.08/hr	-25.68%
Field Parts	$21.32/hr	$17.38/hr	-18.48%
Ground Engaging Component (GEC)	$1.78/hr	$1.45/hr	-18.54%
Tires	$9.00/hr	$9.00/hr	-
Electrical/Fuel	$37.83/hr	$29.99/hr	-20.72%
Lube	$8.74/hr	$8.74/hr	-
Total Hourly Operating Cost:	**$84.16/hr**	**$70.64/hr**	**-16.06%**

User Defined Adjustments: Diesel Cost ($3.98/gal -> $3.15/gal) Mechanics Wage ($51.24 -> $46.76)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$104.08/hr	$88.97/hr	**-14.52%**
Hourly Operating Cost	$84.16/hr	$70.64/hr	**-16.06%**
Total Hourly Cost	**$188.24/hr**	**$159.61/hr**	**-15.21%**

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December 4, 2013

Crawler Tractor Multi-Shank Rippers

Miscellaneous Models

Size Class:
260 HP & Over 260 HP & Over

Configuration for Crawler Tractor Multi-Shank Rippers

Engine Horsepower	**520 - 699**	Number of Shanks	**3**
Ripper Type	**Adj. Parallelogram**		

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$12.77/hr	$12.07/hr	-5.48%
Cost of Facilities Capital (CFC)	$0.85/hr	$0.70/hr	-17.65%
Overhead	$2.95/hr	$2.34/hr	-20.68%
Overhaul Labor	$2.39/hr	$1.73/hr	-27.62%
Overhaul Parts	$4.14/hr	$3.27/hr	-21.01%
Total Hourly Ownership Cost:	**$23.10/hr**	**$20.11/hr**	**-12.94%**

User Defined Adjustments: Annual Use Hours (1,285 hrs -> 1,623 hrs) Sales Tax (5.5% -> 0%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$4.39/hr	$3.17/hr	-27.79%
Field Parts	$4.17/hr	$3.30/hr	-20.86%
Ground Engaging Component (GEC)	$3.47/hr	$2.75/hr	-20.75%
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$0.00/hr	$0.00/hr	-
Lube	$0.66/hr	$0.66/hr	-
Total Hourly Operating Cost:	**$12.69/hr**	**$9.88/hr**	**-22.14%**

User Defined Adjustments: Diesel Cost ($3.98/gal -> $3.15/gal) Mechanics Wage ($51.24 -> $46.76)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$23.10/hr	$20.11/hr	**-12.94%**
Hourly Operating Cost	$12.69/hr	$9.88/hr	**-22.14%**
Total Hourly Cost	**$35.79/hr**	**$29.99/hr**	**-16.21%**

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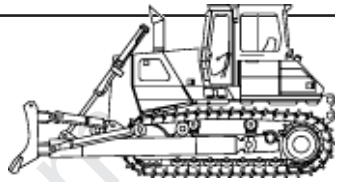
December 4, 2013

Caterpillar D11T

Standard Crawler Dozers

Size Class:
520 HP & Over 520 HP & Over
Weight:
208,885 lbs.



Configuration for D11T

Power Mode	**Diesel**	Dozer Type	**U Blade**
Operator Protection	**EROPS**	Net Horsepower	**850.0**

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$117.05/hr	$111.58/hr	-4.67%
Cost of Facilities Capital (CFC)	$17.44/hr	$14.98/hr	-14.11%
Overhead	$59.40/hr	$49.53/hr	-16.62%
Overhaul Labor	$15.01/hr	$11.42/hr	-23.92%
Overhaul Parts	$102.61/hr	$85.56/hr	-16.62%
Total Hourly Ownership Cost:	**$311.51/hr**	**$273.07/hr**	**-12.34%**

User Defined Adjustments: Annual Use Hours (1,400 hrs -> 1,679 hrs) Sales Tax (5.5% -> 0%) List Price ($2,200,000.00 -> $2,240,000.00)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$17.57/hr	$13.37/hr	-23.9%
Field Parts	$99.94/hr	$83.34/hr	-16.61%
Ground Engaging Component (GEC)	$16.66/hr	$13.89/hr	-16.63%
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$118.41/hr	$93.71/hr	-20.86%
Lube	$28.34/hr	$28.34/hr	-
Total Hourly Operating Cost:	**$280.92/hr**	**$232.65/hr**	**-17.18%**

User Defined Adjustments: Diesel Cost ($3.98/gal -> $3.15/gal) Mechanics Wage ($51.24 -> $46.76)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$311.51/hr	$273.07/hr	**-12.34%**
Hourly Operating Cost	$280.92/hr	$232.65/hr	**-17.18%**
Total Hourly Cost	**$592.43/hr**	**$505.72/hr**	**-14.64%**

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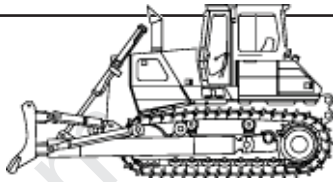
November 8, 2013

Caterpillar D9T

Standard Crawler Dozers

Size Class:
360 - 519 HP 360 - 519 HP
Weight:
105,600 lbs.



Configuration for D9T

Power Mode	**Diesel**	Dozer Type	**Semi-U**
Operator Protection	**EROPS**	Net Horsepower	**405.0**

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$45.97/hr	$43.05/hr	-6.35%
Cost of Facilities Capital (CFC)	$6.94/hr	$5.85/hr	-15.71%
Overhead	$27.58/hr	$22.99/hr	-16.64%
Overhaul Labor	$15.01/hr	$11.42/hr	-23.92%
Overhaul Parts	$40.83/hr	$34.04/hr	-16.63%
Total Hourly Ownership Cost:	**$136.33/hr**	**$117.35/hr**	**-13.92%**

User Defined Adjustments: Annual Use Hours (1,400 hrs -> 1,679 hrs) Sales Tax (5.5% -> 0%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$17.57/hr	$13.37/hr	-23.9%
Field Parts	$39.77/hr	$33.16/hr	-16.62%
Ground Engaging Component (GEC)	$6.63/hr	$5.53/hr	-16.59%
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$56.42/hr	$44.72/hr	-20.74%
Lube	$12.21/hr	$12.21/hr	-
Total Hourly Operating Cost:	**$132.60/hr**	**$108.99/hr**	**-17.81%**

User Defined Adjustments: Diesel Cost ($3.98/gal -> $3.15/gal) Mechanics Wage ($51.24 -> $46.76)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$136.33/hr	$117.35/hr	**-13.92%**
Hourly Operating Cost	$132.60/hr	$108.99/hr	**-17.81%**
Total Hourly Cost	**$268.93/hr**	**$226.34/hr**	**-15.84%**

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November 8, 2013

Off-Highway Water Tanker Trucks

Miscellaneous Models

Size Class:
400 - 499 HP 400 - 499 HP

Configuration for Off-Highway Water Tanker Trucks

Power Mode	**Diesel**	Tank Capacity	**10,000 gal**
Horsepower	**450.0**		

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$37.50/hr	$34.91/hr	-6.91%
Cost of Facilities Capital (CFC)	$4.79/hr	$4.07/hr	-15.03%
Overhead	$11.91/hr	$9.97/hr	-16.29%
Overhaul Labor	$11.27/hr	$8.61/hr	-23.6%
Overhaul Parts	$9.02/hr	$7.55/hr	-16.3%
Total Hourly Ownership Cost:	**$74.49/hr**	**$65.11/hr**	**-12.59%**

User Defined Adjustments: Annual Use Hours (1,500 hrs -> 1,793 hrs) Sales Tax (5.5% -> 0%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$27.33/hr	$20.86/hr	-23.67%
Field Parts	$17.41/hr	$14.56/hr	-16.37%
Ground Engaging Component (GEC)	$0.00/hr	$0.00/hr	-
Tires	$10.47/hr	$10.47/hr	-
Electrical/Fuel	$61.07/hr	$48.41/hr	-20.73%
Lube	$10.13/hr	$10.13/hr	-
Total Hourly Operating Cost:	**$126.41/hr**	**$104.43/hr**	**-17.39%**

User Defined Adjustments: Diesel Cost ($3.98/gal -> $3.15/gal) Mechanics Wage ($51.24 -> $46.76)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$74.49/hr	$65.11/hr	**-12.59%**
Hourly Operating Cost	$126.41/hr	$104.43/hr	**-17.39%**
Total Hourly Cost	**$200.90/hr**	**$169.54/hr**	**-15.61%**

Revised Date: 2nd Half 2013

	Dozer	Ripper	Dozer	Grader	
	2013	2013	2013	2013	2013
	D11T (520 HP)	D11T Ripper (520+ HP)	D9T (360+ HP)	16M	Water Truck
Hours per year	2085	2085	2085	2085	2085
Annual overhaul hours	410	60	410	180	330
Subtotal	1675	2025	1675	1905	1755
50 minute hour	279	338	279	318	293
Annual Use Hours	1396	1688	1396	1588	1463
Adjusted Annual Use Hours	**1679**	**1623**	**1679**	**1718**	**1793**
Equipment Watch Annual Use Hours	1400	1285	1400	1400	1500
Delta	-279	-338	-279	-318	-293

Appendix B.4
Equipment Productivity
Curve Fits

D10T

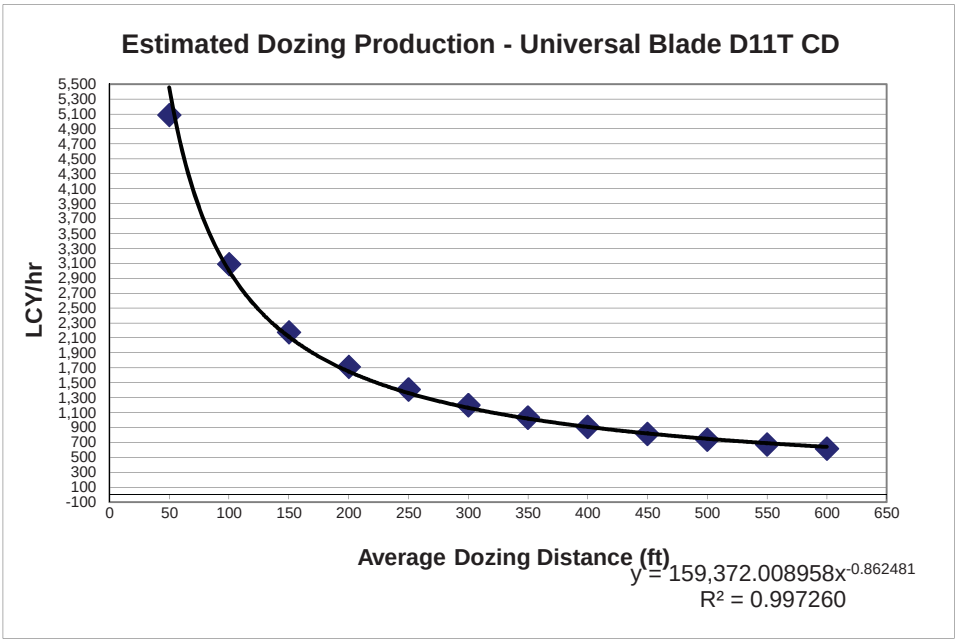
Dozer production data (based on Caterpillar Handbook)

Maximum Push Distance (feet)	Normal Production (cy/hr)
50	5,085
100	3,091
150	2,174
200	1,711
250	1,408
300	1,200
350	1,030
400	907
450	813
500	737
550	671
600	614
650	577

Fitted curve - based on data above

y = 159,372.008958 * x^(-0.862481)

Maximum Push Distance (feet)	Normal Production (cy/hr)	
50	5459	374
75	3848	
100	3002	-88
125	2477	
150	2116	-58
175	1853	
200	1651	-60
225	1492	
250	1362	-46
275	1255	
300	1164	-36
325	1086	
350	1019	-11
375	960	
400	908	1
425	862	
450	820	8
475	783	
500	749	12
525	718	
550	690	19
575	664	
600	640	26
625	618	
650	597	21



Caterpillar Performance Handbook Edition 42 D10T page18-51

D9T

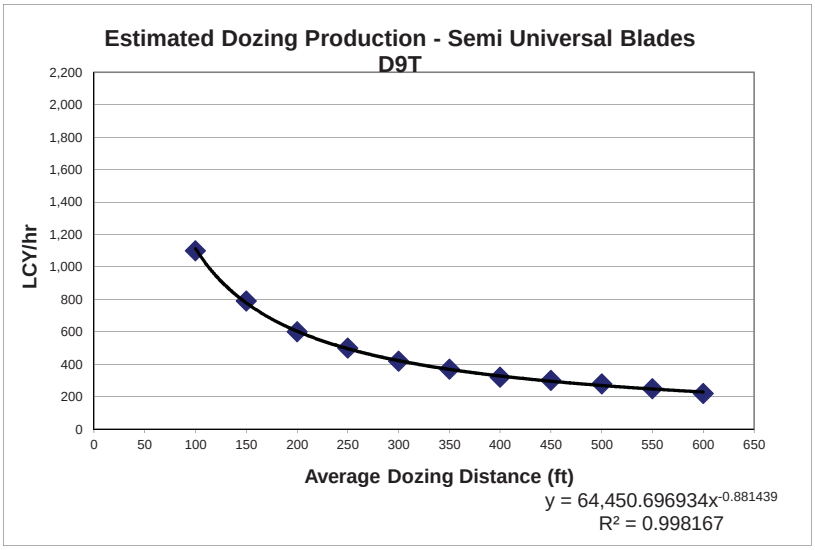
Dozer production data (based on Caterpillar Handbook)

Maximum Push Distance (feet)	Normal Production (cy/hr)
50	1790
100	1,100
150	790
200	600
250	500
300	420
350	370
400	320
450	300
500	280
550	250
600	220

Fitted curve - based on data above and additional data points

y = 64450.696934*A32^-0.881439

Maximum Push Distance (feet)	Normal Production (cy/hr)	
75	1434	
100	1113	13
125	914	
150	778	-12
175	679	
200	604	4
225	544	
250	496	-4
275	456	
300	422	2
325	394	
350	369	-1
375	347	
400	328	8
425	311	
450	296	-4
475	282	
500	269	-11
525	258	
550	248	-2
575	238	
600	229	9



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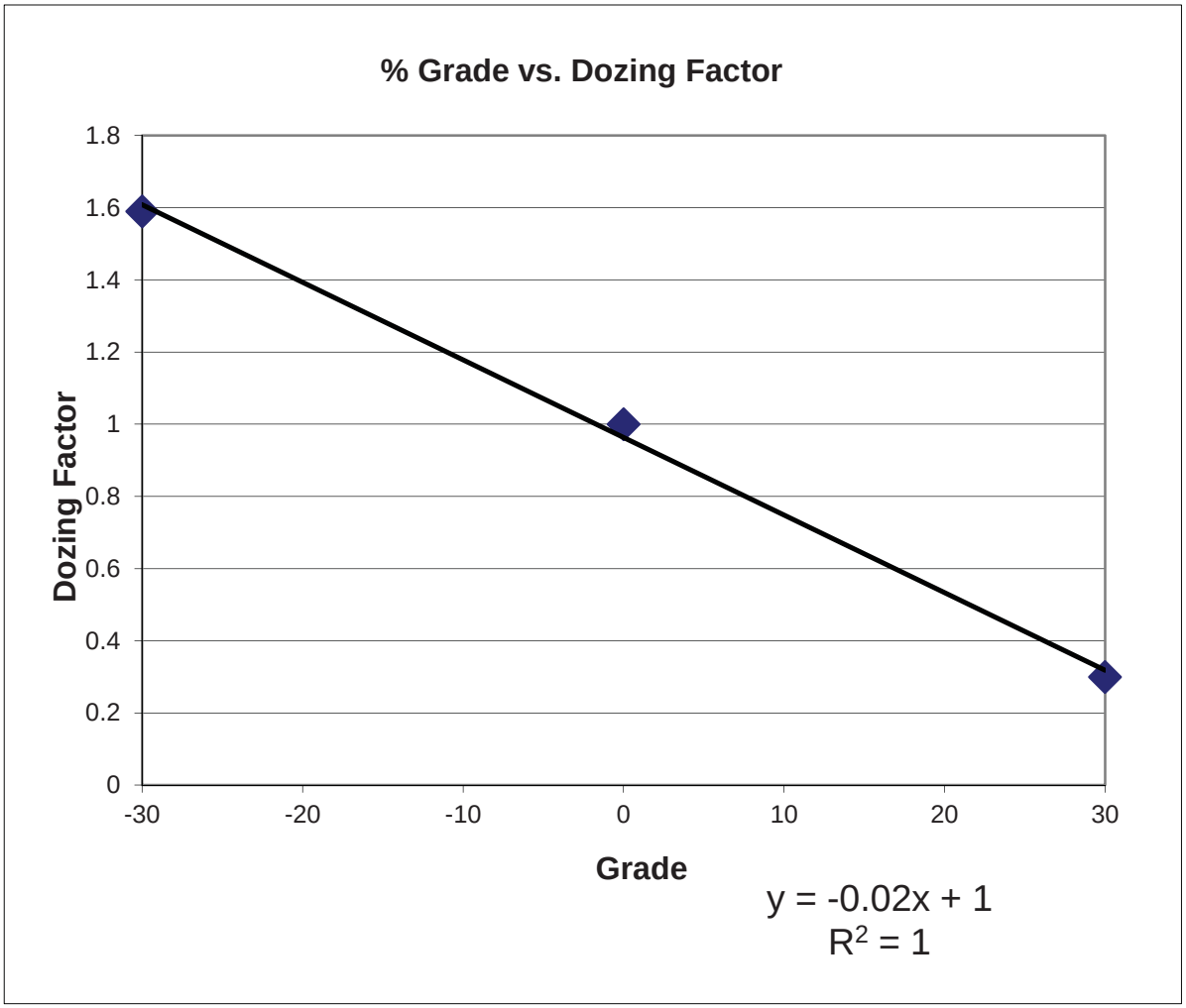
Grade vs. Dozing Factor

Grade %	Dozing Factor
0	1
-30	1.59
30	0.3



Appendix B.5
Caterpillar Performance Handbook
References

CATERPILLAR PERFORMANCE HANDBOOK

a publication by Caterpillar Inc., Peoria, Illinois, U.S.A.

JUNE 2013

Please direct any inquiries about the Performance Handbook to the Caterpillar Performance Handbook Coordinator at *Sherman_Ashley_E@cat.com*.

Performance information in this booklet is intended for estimating purposes only. Because of the many variables peculiar to individual jobs (including material characteristics, operator efficiency, underfoot conditions, altitude, etc.), neither Caterpillar Inc. nor its dealers warrant that the machines described will perform as estimated.

NOTE: Always refer to the appropriate Operation and Maintenance Manual for specific product information.

Materials and specifications are subject to change without notice.

Printed in U.S.A.

SEBD0351-43

MODEL	D9R		D9T	
Flywheel Power	302 kW	**405 hp**	306 kW	**410 hp**
Operating Weight:*				
Power Shift Clutch Brake	48 784 kg	**107,548 lb**	—	
Power Shift Differential Steer	—		48 674 kg	**107,307 lb**
Engine Model	**3408C SCAC**		**C18 ACERT**	
Rated Engine RPM	**1900**		**1800**	
No. of Cylinders	**8**		**6**	
Bore	137 mm	**5.4"**	145 mm	**5.7"**
Stroke	152 mm	**6"**	183 mm	**7.2"**
Displacement	18 L	**1099 in³**	18.1 L	**1104 in³**
Track Rollers (Each Side)	**8**		**8**	
Width of Standard Track Shoe	610 mm	**24"**	610 mm	**24"**
Length of Track on Ground	3.47 m	**11'5"**	3.47 m	**11'5"**
Ground Contact Area (w/Std. Shoe)	4.24 m²	**6569 in²**	4.24 m²	**6569 in²**
Track Gauge	2.25 m	**7'5"**	2.25 m	**7'5"**
GENERAL DIMENSIONS:				
Height** (Stripped Top)***	3.00 m	**9'10"**	—	
Height** (To Top of ROPS Canopy)	3.99 m	**13'1"**	4.00 m	**13'1"**
Height** (To Top of ROPS Cab)	3.82 m	**12'6"**	3.82 m	**12'6"**
Overall Length (with SU Blade)†	6.84 m	**22'5"**	—	
(without Blade)	5.18 m	**17'0"**	—	
(with SU Blade and Ripper)	—		8.33 m	**26'11"**
(without Blade and Ripper)	—		4.91 m	**16'1"**
Width (over Trunnion)	3.30 m	**10'10"**	3.31 m	**10'11"**
Width (w/o Trunnion — Std. Shoe)	2.93 m	**9'8"**	2.87 m	**9'5"**
Ground Clearance	591 mm	**1'11"■**	596 mm	**1'11"**
Blade Types and Widths:				
Universal	4.65 m	**15'3"**	4.65 m	**15'3"**
Semi-U	4.31 m	**14'2"**	4.31 m	**14'2"**
Fuel Tank Refill Capacity	818 L	**216 U.S. gal**	889 L	**235 U.S. gal**

*Operating weight includes ROPS canopy, operator, lubricants, coolant, full fuel tank, hydraulic controls and fluids, semi universal blade with tilt, back-up alarm, seat belts, lights, and single shank ripper.
— D9R equipped with track guides, ROPS/FOPS cab, single shank ripper and SU blade.
**Dimensions measured from ground line. Add grouser height for total dimension on hard surfaces.
***Height (Stripped Top) — without ROPS canopy, exhaust, seat back or other easily removed encumbrances.
†Includes drawbar.
■ SAE J1234.

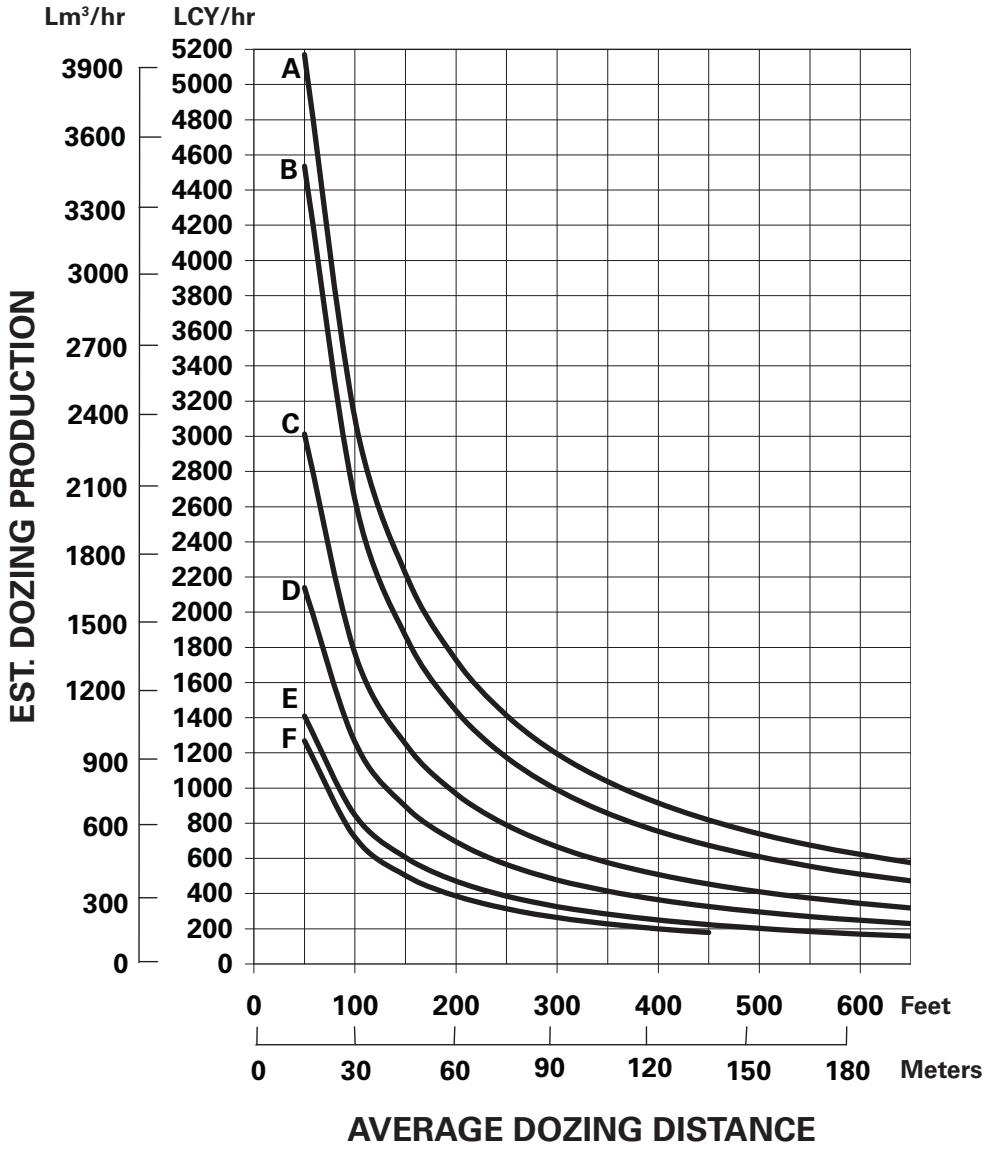


MODEL	D10T		D11T		D11T CD	
Flywheel Power	433 kW	**580 hp**	634 kW	**850 hp**	634 kW	**850 hp**
Operating Weight:*						
Power Shift Clutch Brake	71 000 kg	**154,700 lb**	104 300 kg	**229,800 lb**	112 700 kg	**248,500 lb**
Engine Model	**C27 ACERT**		**C32 ACERT**		**C32 ACERT**	
Rated Engine RPM	**1800**		**1800**		**1800**	
No. of Cylinders	**12**		**12**		**12**	
Bore	137 mm	**5.4"**	145 mm	**5.71"**	145 mm	**5.71"**
Stroke	152 mm	**6"**	162 mm	**6.38"**	162 mm	**6.38"**
Displacement	27 L	**1647.5 in³**	32.1 L	**1959 in³**	32.1 L	**1959 in³**
Track Rollers (Each Side)	**8**		**8**		**8**	
Width of Standard Track Shoe	610 mm	**24"**	710 mm	**28"**	915 mm	**36"**
Length of Track on Ground (Idler to Idler)	3.88 m	**12'9"**	4.44 m	**14'7"**	4.44 m	**14'7"**
Ground Contact Area (w/Std. Shoe)	4.74 m²	**7347 in²**	6.31 m²	**9781 in²**	8.13 m²	**12,605 in²**
Track Gauge	2.55 m	**8'4"**	2.89 m	**9'6"**	2.89 m	**9'6"**
GENERAL DIMENSIONS:						
Height (Stripped Top)**	3.222 m	**10'7"**	3.64 m	**11'11"**	3.64 m	**11'11"**
Height (To Top of ROPS Canopy)	4.26 m	**14'0"**	4.60 m	**15'1"**	4.60 m	**15'1"**
Height (To Top of ROPS Cab)	4.01 m	**13'2"**	4.29 m	**14'1"**	4.29 m	**14'1"**
Overall Length:						
(with SU Blade and SS Ripper)***	9.16 m	**30'1"**	10.59 m	**34'9"**	10.70 m	**35'1"**
(without Blade and Ripper)†	5.331 m	**17'6"**	6.03 m	**19'9"**	6.03 m	**19'9"**
Width (over Trunnion)	3.74 m	**12'3"**	4.38 m	**14'4"**	4.38 m	**14'4"**
Width (w/o Trunnion — Std. Shoe)	3.30 m	**10'10"**	3.78 m	**12'5"**	3.81 m	**12'6"**
Ground Clearance††	571 mm	**1'10"**	574 mm	**1'11"**	574 mm	**1'11"**
Blade Types and Widths:						
CarryDozer	—		—		6.71 m	**22'0"**
Universal	5.26 m	**17'3"**	6.36 m	**20'10"**	—	
Semi-U	4.86 m	**15'11"**	5.60 m	**18'4"**	—	
Fuel Tank Refill Capacity	1204 L	**318 U.S. gal**	1609 L	**425 U.S. gal**	1609 L	**425 U.S. gal**
Fuel Tank Refill Capacity (Extra Capacity)	—		1987 L	**505 U.S. gal**	1987 L	**505 U.S. gal**

*Operating weight includes coolant, lubricants, full fuel tank, ROPS, FOPS cab, SU ABR bulldozer (D10T) or U ABR bulldozer (D11T), dual tilt, single-shank ripper with pin-puller, fast fuel, standard ES shoes, and operator.
D11T CD has 11 Carrydozer and single-shank Carrydozer ripper.
**Height (Stripped Top) — without ROPS canopy, cab, exhaust, lift cylinders, seat back or other easily removed encumbrances.
***Overall length of D11T CD includes Straight (CarryDozer) Blade and SS Ripper.
†Overall length of machine from front tag link trunion to rigid drawbar and excludeds track grouser height.
††SAE J1234.

All dimensions are approximate.

ESTIMATED DOZING PRODUCTION ● Universal Blades ● D7E through D11T CD



KEY

A — D11T CD
B — D11T
C — D10T
D — D9T
E — D8T
F — D7E

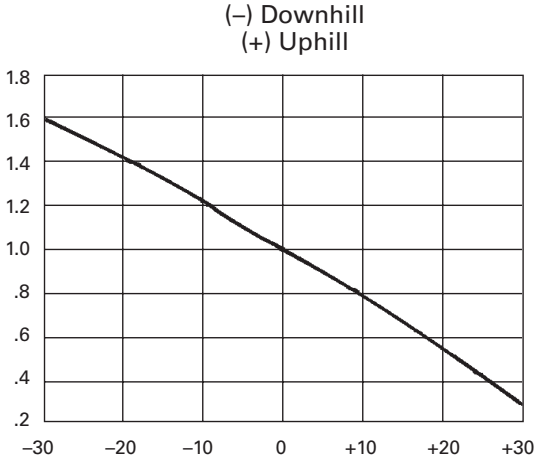
NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.

JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR
OPERATOR —	
Excellent	1.00
Average	0.75
Poor	0.60
MATERIAL —	
Loose stockpile	1.20
Hard to cut; frozen —	
with tilt cylinder	0.80
without tilt cylinder	0.70
Hard to drift; "dead" (dry, non-cohesive material) or very sticky material	0.80
Rock, ripped or blasted	0.60-0.80
SLOT DOZING	1.20
SIDE BY SIDE DOZING	1.15-1.25
VISIBILITY —	
Dust, rain, snow, fog or darkness	0.80
JOB EFFICIENCY —	
50 min/hr	0.83
40 min/hr	0.67
BULLDOZER*	
Adjust based on SAE capacity relative to the base blade used in the Estimated Dozing Production graphs.	
GRADES — See following graph.	

***NOTE:** Angling blades and cushion blades are not considered production dozing tools. Depending on job conditions, the A-blade and C-blade will average 50-75% of straight blade production.

% Grade vs. Dozing Factor



ESTIMATING DOZER PRODUCTION OFF-THE-JOB

Example problem:

Determine average hourly production of a D8T/8SU (with tilt cylinder) moving hard-packed clay an average distance of 45 m (150 feet) down a 15% grade, using a slot dozing technique.

Estimated material weight is 1600 kg/Lm³ (2650 lb/LCY). Operator is average. Job efficiency is estimated at 50 min/hr.

Uncorrected Maximum Production — 458 Lm³/h (600 LCY/hr) (example only)

Applicable Correction Factors:

Hard-packed clay is "hard to cut" material . . .–0.80
Grade correction (from graph) . . . . . .–1.30
Slot dozing . . . . . .–1.20
Average operator . . . . . .–0.75
Job efficiency (50 min/hr) . . . . . .–0.83
Weight correction. . . . . (2300/2650)–0.87

Production = Maximum Production × Correction Factors
= (600 LCY/hr) (0.80) (1.30) (1.20) (0.75) (0.83) (0.87)
= 405.5 LCY/hr

To obtain production in metric units, the same procedure is used substituting maximum uncorrected production in Lm³.

= 458 Lm³/h × Factors
= 309.6 Lm³/h

TRACTOR/RIPPER	D11T		D11T	
Ripper Type	**CD Multi-shank**		**Multi-shank**	
Dimensions:				
Ripper to Track				
Ripper length behind track, shank vertical, ripper up (A)				
A With Pushblock	**N/A**		**N/A**	
B Without Pushblock	1.71 m	**5'8"**	1.69 m	**5'6"**
Ripper length behind track, shank vertical, ripper down (A)				
C With Pushblock	**N/A**		**N/A**	
D Without Pushblock	2.16 m	**7'1"**	2.16 m	**7'1"**
Tip to track distance, shank vertical (A)				
E Ripper Up	0.78 m	**2'7"**	0.78 m	**2'7"**
F Ripper Down	1.96 m	**6'5"**	1.95 m	**6'5"**
Shank*				
G Maximum digging depth	1.01 m	**3'4"**	1.01 m	**3'4"**
H Dig adjustment per hole	280 mm	**11"**	280 mm	**11"**
I Total dig adjustment	280 mm	**11"**	280 mm	**11"**
Pitch Adjustment, ripper down:				
J Forward	**12.2°**		**12.2°**	
K Backward	**31.8°**		**31.8°**	
L Maximum reach at ground line	1.71 m	**5'7"**	1.71 m	**5'7"**
M Maximum ground clearance under tooth (shank pinned in bottom hole)	1.14 m	**3'9"**	1.16 m	**3'10"**
N Maximum ramp angle, ripper up (shank pinned in bottom hole)	**36.4°**		**36.4°**	
Shank Section	100 × 400 mm	**3.9" × 15.7"**	100 × 400 mm	**3.9" × 15.7"**
Ripper Beam				
O Overall width	3.33 m	**10'11"**	3.33 m	**10'11"**
P Height	1.98 m	**6'6"**	1.98 m	**6'6"**
Q Length	1.01 m	**3'4"**	1.01 m	**3'4"**
Clearance under beam, shank vertical				
R Ripper Up	2.06 m	**6'9"**	2.06 m	**6'9"**
S Ripper Down	282 mm	**11.1"**	282 mm	**11.1"**
Number of Pockets	**3**		**3**	
T Pocket Spacing	1500 mm	**5'9"**	1500 mm	**5'9"**
U Shank Gauge	2.99 m	**9'10"**	2.99 m	**9'10"**
V Track Clearance with standard shoe	166 mm	**5.6"**	166 mm	**5.6"**
W Width across widest part of lift cylinders	1.9 m	**6'3"**	1.9 m	**6'3"**
Installed Weights:				
Ripper with standard shank	12 026 kg	**26,513 lb**	9251 kg	**20,395 lb**
Each additional tooth group	668 kg	**1472 lb**	668 kg	**1472 lb**
Ripper Forces:**				
Penetration Force, shank vertical	305.8 kN	**68,739 lb**	277.1 kN	**62,297 lb**
Pryout Force, shank vertical	650.0 kN	**146,118 lb**	646.4 kN	**145,310 lb**

*Hydraulic pin puller is standard with deep ripping shank. Deep Ripping Arrangement maximum digging depth is 2.18 m **(7'2")**.
**Forces are for a ripper on a tractor equipped with an EROPS, U-Dozer and performance track. Forces will vary slightly with other vehicle configurations.

ALTITUDE DERATION

PERCENT FLYWHEEL HORSEPOWER AVAILABLE AT SPECIFIED ALTITUDES

MODEL	0-760 m (0-2500')	760-1500 m (2500-5000')	1500-2300 m (5000-7500')	2300-3000 m (7500-10,000')	3000-3800 m (10,000-12,500')	3800-4600 m (12,500-15,000')
D3K XL	100	100	100	100	88	85
D3K LGP	100	100	100	100	88	85
D4K XL	100	100	100	100	88	85
D4K LGP	100	100	100	100	88	85
D5K XL	100	100	100	100	88	85
D5K LGP	100	100	100	100	88	85
D5N XL & LGP	100	100	100	100	100	100
D6K XL & LGP	100	100	100	100	N/A	N/A
D6N XL & LGP	100	100	100	100	N/A	N/A
D6N XL & LGP**	100	100	100	100	100	100
D6G	100	100	100	100	94	87
D6G Series 2 XL	100	100	100	94	87	80
D6G Series 2 LGP	100	100	100	94	87	80
D6R	100	100	100	100	92	84
D6R Series 3 (All)	100	100	100	100	92	84
D6T (Tier 4 Interim/Stage IIIB)	100	100	100	100	100	88
D7E	100	100	100	98	95	88
D7G	100*	100*	100*	94	86	80
D7G Series 2	100	100	100	100	100	94
D7R Series 2 (All)	100	100	100	100	100	96
D8R	100	100	100	93	85	77
D8T	100	100	100	100	100	93
D9R	100	100	100	93	85	77
D9T	100	100	100	100	100	93
D10T	100	100	100	100	97	89
D11T/D11T CD	100	100	100	93	85	77
120H STD	100	100	100	100	100	100
120M	100	100	100	100	95	88
135H STD	100	100	100	100	100	98
12H STD	100	89	83	77	71	65
12M	100	100	100	100	95	88
140H STD	100	100	100	100	97	89
140M	100	100	100	100	**	**
160H STD	100	100	100	97	89	82
160M	100	100	100	100	**	**
14M	100	100	100	100	100	**
16M	100	100	100	100	100	100
24M	100	100	100	100	**	**

*Refer to "Captive Vehicle Engine Fuel Specifications" microfiche at your local dealer.
**Information not available at time of printing.

Appendix B.6
Channels, Berm, and Bench Linear Foot Cost

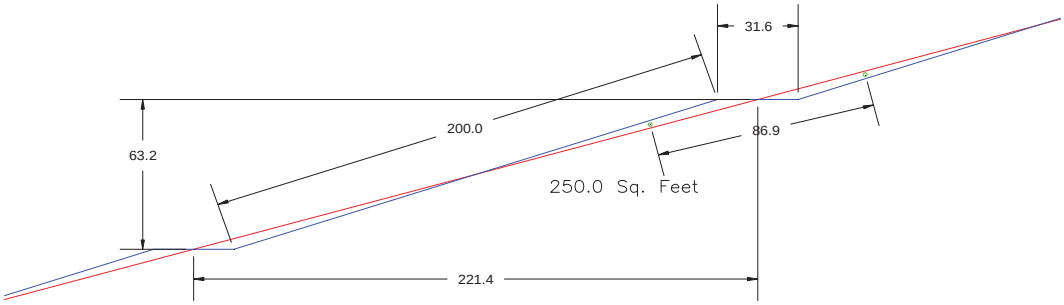
Outslope Bench Grading Unit Cost Development

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D11T CD	2760.4	1.2	1.7	3600	1.0	86.9	3389	0.75	50.0	1.0	1.0	1.0

		Productivity (lf/hr)	Time (hrs/lf)	# passes	Material	Grade	Task Weight (lb/cy)	Blade	Width (feet)	Soil Speed (miles/hr)	Method/ Operator	Blade Hour (min/hr)	Visibility	Elevation
Finish Grade	D9T	843.3	0.0012	3	1.2	1.0	3600	1.0	14.17	1.0	0.75	50.0	1.0	1.0

Notes:
1. Bench width: Stockpiles 31 ft

Bench Volume (e›	Equipment	9.26 cy/lf		Equuipment Cost ($/hr)	Operator Cost (IV) ($/hr)	Dozer Cost ($/hr)	Bench Cost ($/lf)
Excavate	D11T CD	0.0034	hrs/lf	505.72	46.61	552.33	1.85
Finish Grade	D9T	0.0012	hrs/lf	226.34	46.61	272.95	0.32
Excavate + Finish Grade							**2.18**
Finish Grade Only							**0.32**



Pit Berm Unit Cost Development

Task Description	Equipment	Productivity (cy/hr)	Material	Grade Factor	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D9T	533	1.2	1.00	3,600	1.00	100	1113	0.75	50	1.00	1.00	1.00
Finish	D9T	982	1.2	1.00	3,600	1.00	50	2050	0.75	50	1.00	1.00	1.00

Berm Excavate Berm Finish Grade	Equipment	3.24 1	cy/lf cy/lf	Equipment Cost ($/hr)	Operator Cost (IV) ($/hr)	Dozer Cost ($/hr)	Bench Cost ($/lf)
Excavate	D9T	0.0061	hrs/lf	226.34	46.61	$272.95	$1.66
Finish Grade	D9T	0.0010	hrs/lf	226.34	46.61	$274.11	$0.28
Total							**$1.94**

Berm 1.5:1 slope, 5' high, 10' top width

Excavate			
10	5	50	ft3/lf
7.5	5	37.5	ft3/lf
		87.5	ft3/lf
		3.24	cy/lf

Finish Grade			
	slope length x	9.0	ft
	slope length x	9.0	ft
	top length	10	ft
	length =	28.0	ft
	depth	1	ft
	width	1	ft
	vol	28.0	ft3/lf
	vol	1.0	cy/lf

Appendix B.7
Miscellaneous Unit Costs

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02 41 Demolition

02 41 13 – Selective Site Demolition

	02 41 13.33 Minor Site Demolition	Crew	Daily Output	Labor-Hours	Unit	2013 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
4450	For disposal on site, add	B-11A	232	.069	C.Y.		2.86	5.75	8.61	10.65
4500	To 5 miles, add	B-34D	76	.105	"		3.85	9.90	13.75	16.80
6850	Runways, remove rubber skid marks, 4-6 passes	B-59A	35	.686	M.S.F.	36	24.50	14.55	75.05	93.50
6860	6-10 passes	"	35	.686	"	54	24.50	14.55	93.05	114
	02 41 13.34 Selective Demolition, Utility Materials									
0010	**SELECTIVE DEMOLITION, UTILITY MATERIALS** R024119-10									
0015	Excludes excavation									
0020	See other utility items in Section 02 41 13.33									
0100	Fire Hydrant extensions	B-20	14	1.714	Ea.		68		68	105
0200	Precast Utility boxes up to 8' x 14' x 7'	B-13	2	28			1,075	365	1,440	2,050
0300	Handholes and meter pits	B-6	2	12			465	184	649	915
0400	Utility valves 4"-12"	B-20	4	6			238		238	365
0500	14"-24"	B-21	2	14			575	68.50	643.50	955
	02 41 13.36 Selective Demolition, Utility Valves and Accessories									
0010	**SELECTIVE DEMOLITION, UTILITY VALVES & ACCESSORIES**									
0015	Excludes excavation									
0100	Utility valves 4"-12" diam.	B-20	4	6	Ea.		238		238	365
0200	14"-24" diam.	B-21	2	14			575	68.50	643.50	955
0300	Crosses 4"-12"	B-20	8	3			119		119	184
0400	14"-24"	B-21	4	7			287	34.50	321.50	480
0500	Utility cut-in valves 4"-12" diam.	B-20	20	1.200			47.50		47.50	73.50
0600	Curb boxes	"	20	1.200			47.50		47.50	73.50
	02 41 13.38 Selective Demo., Water & Sewer Piping & Fittings									
0010	**SELECTIVE DEMOLITION, WATER & SEWER PIPING AND FITTINGS**									
0015	Excludes excavation									
0020	See other utility items in Section 02 41 13.33									
0090	Concrete pipe 4"-10" dia	B-6	250	.096	L.F.		3.73	1.47	5.20	7.30
0100	42"-48" diameter	B-13B	96	.583			22.50	11.60	34.10	47.50
0200	60"-84" diameter	"	80	.700			27	13.95	40.95	57
0300	96" diameter	B-13C	80	.700			27	21	48	64.50
0400	108"-144" diameter	"	64	.875			34	26	60	80
0450	Concrete fittings 12" diameter	B-6	24	1	Ea.		39	15.30	54.30	76.50
0480	Concrete end pieces 12" diameter		200	.120	L.F.		4.67	1.84	6.51	9.15
0485	15" diameter		150	.160			6.20	2.45	8.65	12.20
0490	18" diameter		150	.160			6.20	2.45	8.65	12.20
0500	24" -36" diameter		100	.240			9.35	3.67	13.02	18.30
0600	Concrete fittings 24"-36" diameter		12	2	Ea.		78	30.50	108.50	153
0700	48"-84" diameter	B-13B	12	4.667			180	93	273	380
0800	96" diameter	"	8	7			270	139	409	570
0900	108"-144" diameter	B-13C	4	14			540	415	955	1,275
1000	Ductile iron pipe 4" diameter	B-21B	200	.200	L.F.		7.70	3.23	10.93	15.35
1100	6"-12" diameter		175	.229			8.80	3.69	12.49	17.55
1200	14"-24" diameter		120	.333			12.85	5.40	18.25	25.50
1300	Ductile iron fittings 4"-12" diameter		24	1.667	Ea.		64	27	91	128
1400	14"-16" diameter		18	2.222			85.50	36	121.50	171
1500	18"-24" diameter		12	3.333			128	54	182	256
1600	Plastic pipe 3/4"-4" diameter	B-20	700	.034	L.F.		1.36		1.36	2.10
1700	6"-8" diameter		500	.048			1.91		1.91	2.94
1800	10"-18" diameter		300	.080			3.18		3.18	4.90
1900	20"-36" diameter		200	.120			4.76		4.76	7.35
1910	42"-48" diameter		180	.133			5.30		5.30	8.15
1920	54"-60" diameter		160	.150			5.95		5.95	9.20

10 05 Common Work Results for Specialties

10 05 05 – Selective Specialties Demolition

10 05 05.10 Selective Demolition, Specialties	Crew	Daily Output	Labor-Hours	Unit	2013 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010 **SELECTIVE DEMOLITION, SPECIALTIES**									
4000 Removal of traffic signs, including supports	B-80B	16	2	Ea.		76	15.20	91.20	134
4020 To 10 S.F.	"	5	6.400			243	48.50	291.50	430
4030 11 S.F. to 20 S.F.	B-14	1.80	26.667			1,000	204	1,204	1,750
4040 21 S.F. to 40 S.F.	B-13	1.30	43.077			1,675	560	2,235	3,175
4050 41 S.F. to 100 S.F.	B-6	100	.240			9.35	3.67	13.02	18.35
4070 Remove traffic posts to 12'-0" high									

10 14 Signage

10 14 53 – Traffic Signage

10 14 53.20 Traffic Signs									
0010 **TRAFFIC SIGNS**	B-80	70	.457	Ea.	83	17.65	10.85	111.50	130
0012 Stock, 24" x 24", no posts, .080" alum. reflectorized		70	.457		83	17.65	10.85	111.50	130
0100 High intensity		70	.457		170	17.65	10.85	198.50	226
0300 30" x 30", reflectorized		70	.457		170	17.65	10.85	198.50	226
0400 High intensity		70	.457		34.50	17.65	10.85	63	77
0600 Guide and directional signs, 12" x 18", reflectorized		70	.457		51	17.65	10.85	79.50	95.50
0700 High intensity		70	.457		46	17.65	10.85	74.50	90
0900 18" x 24", stock signs, reflectorized		70	.457		51	17.65	10.85	79.50	95.50
1000 High intensity		70	.457		56	17.65	10.85	84.50	100
1200 24" x 24", stock signs, reflectorized		70	.457		61	17.65	10.85	89.50	106
1300 High intensity		200	.160		32.50	6.15	3.80	42.45	49.50
1500 Add to above for steel posts, galvanized, 10'-0" upright, bolted		140	.229		39	8.80	5.40	53.20	62.50
1600 12'-0" upright, bolted		350	.091	S.F.	32	3.53	2.17	37.70	43
1800 Highway road signs, aluminum, over 20 S.F., reflectorized		350	.091		32	3.53	2.17	37.70	43
2000 High intensity		165	.194		29.50	7.50	4.60	41.60	49
2200 Highway, suspended over road, 80 S.F. min., reflectorized		165	.194		29.50	7.50	4.60	41.60	49
2300 High intensity		500	.064	Ea.	25	2.47	1.52	28.99	33.50
2350 Roadway delineators and reference markers		500	.064		18	2.47	1.52	21.99	25.50
2360 Delineator post only, 6'								30,800	33,900
2400 Highway sign bridge structure, 45' to 80'								20%	20%
2410 Cantilever structure, add									
5200 Remove and relocate signs, including supports	B-80B	5	6.400	Ea.	345	243	48.50	636.50	870
5210 To 10 S.F.	"	1.70	18.824		775	715	143	1,633	2,200
5220 11 S.F. to 20 S.F.	B-14	.56	85.714		820	3,225	655	4,700	6,500
5230 21 S.F. to 40 S.F.	B-13	.32	175		1,350	6,750	2,275	10,375	14,300
5240 41 S.F. to 100 S.F.									
8000 For temporary barricades and lights, see Section 01 56 23.10									

31 23 Excavation and Fill

31 23 16 – Excavation

	31 23 16.46 Excavating, Bulk, Dozer	Crew	Daily Output	Labor-Hours	Unit	2013 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
5420	Common earth	B-10M	410	.029	B.C.Y.		1.27	4.46	5.73	6.85
5440	Clay		250	.048			2.09	7.30	9.39	11.20
5500	460 H.P., 50' haul, sand & gravel	B-10X	1930	.006			.27	1.26	1.53	1.79
5506	Sandy clay & loam		1880	.006			.28	1.29	1.57	1.84
5510	Common earth		1680	.007			.31	1.44	1.75	2.06
5520	Clay		1050	.011			.50	2.31	2.81	3.29
5530	150' haul, sand & gravel		1290	.009			.40	1.88	2.28	2.68
5535	Sandy clay & loam		1250	.010			.42	1.94	2.36	2.76
5540	Common earth		1120	.011			.47	2.16	2.63	3.09
5550	Clay		700	.017			.75	3.46	4.21	4.94
5560	300' haul, sand & gravel		660	.018			.79	3.67	4.46	5.25
5565	Sandy clay & loam		640	.019			.82	3.79	4.61	5.40
5570	Common earth		575	.021			.91	4.22	5.13	6
5580	Clay		350	.034			1.49	6.95	8.44	9.85
6000	700 H.P., 50' haul, sand & gravel	B-10V	3500	.003			.15	1.27	1.42	1.63
6006	Sandy clay & loam		3400	.004			.15	1.31	1.46	1.67
6010	Common earth		3035	.004			.17	1.47	1.64	1.89
6020	Clay		1925	.006			.27	2.31	2.58	2.96
6030	150' haul, sand & gravel		2025	.006			.26	2.20	2.46	2.83
6035	Sandy clay & loam		1960	.006			.27	2.27	2.54	2.91
6040	Common earth		1750	.007			.30	2.55	2.85	3.25
6050	Clay		1100	.011			.47	4.05	4.52	5.20
6060	300' haul, sand & gravel		1030	.012			.51	4.33	4.84	5.55
6065	Sandy clay & loam		1005	.012			.52	4.44	4.96	5.65
6070	Common earth		900	.013			.58	4.95	5.53	6.35
6080	Clay		550	.022			.95	8.10	9.05	10.35
6090	For dozer with ripper, see Section 31 23 16.32									

31 23 16.48 Excavation, Bulk, Drag Line

0010	**EXCAVATION, BULK, DRAG LINE**									
0011	Excavate and load on truck, bank measure									
0012	Bucket drag line, 3/4 C.Y., sand/gravel	B-12I	440	.036	B.C.Y.		1.53	2.01	3.54	4.53
0100	Light clay		310	.052			2.17	2.85	5.02	6.45
0110	Heavy clay		280	.064			2.70	3.53	6.23	8
0120	Unclassified soil		250	.057			2.41	3.15	5.56	7.15
0200	1-1/2 C.Y. bucket, sand/gravel	B-12P	575	.028			1.17	2.06	3.23	4.06
0210	Light clay		440	.036			1.53	2.69	4.22	5.30
0220	Heavy clay		352	.045			1.91	3.37	5.28	6.60
0230	Unclassified soil		300	.053			2.25	3.95	6.20	7.75
0300	3 C.Y., sand/gravel	B-12V	720	.022			.94	2.10	3.04	3.74
0310	Light clay		700	.023			.96	2.16	3.12	3.84
0320	Heavy clay		600	.027			1.12	2.52	3.64	4.48
0330	Unclassified soil		550	.029			1.23	2.74	3.97	4.89

31 23 16.50 Excavation, Bulk, Scrapers

0010	**EXCAVATION, BULK, SCRAPERS**									
0100	Elev. scraper 11 C.Y., sand & gravel 1500' haul, 1/4 dozer	B-33F	690	.020	B.C.Y.		.89	2.36	3.25	3.95
0150	3000' haul		610	.023			1.01	2.67	3.68	4.47
0200	5000' haul		505	.028			1.22	3.22	4.44	5.40
0300	Common earth, 1500' haul		600	.023			1.03	2.71	3.74	4.56
0350	3000' haul		530	.026			1.16	3.07	4.23	5.15
0400	5000' haul		440	.032			1.40	3.70	5.10	6.20
0410	Sandy clay & loam, 1500' haul		648	.022			.95	2.51	3.46	4.21
0420	3000' haul		572	.024			1.08	2.84	3.92	4.77

31 23 23 – Fill

	31 23 23.20 Hauling	Crew	Daily Output	Labor-Hours	Unit	2013 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
4632	cycle 4 miles	B-34D	220	.036	L.C.Y.		1.33	3.43	4.76	5.80
4634	cycle 6 miles		200	.040			1.46	3.77	5.23	6.40
4636	cycle 8 miles		180	.044			1.63	4.19	5.82	7.10
4638	cycle 10 miles		160	.050			1.83	4.71	6.54	8
4640	25 MPH ave, cycle 4 miles		240	.033			1.22	3.14	4.36	5.30
4642	cycle 6 miles		220	.036			1.33	3.43	4.76	5.80
4644	cycle 8 miles		180	.044			1.63	4.19	5.82	7.10
4646	cycle 10 miles		180	.044			1.63	4.19	5.82	7.10
4650	30 MPH ave, cycle 4 miles		240	.033			1.22	3.14	4.36	5.30
4652	cycle 6 miles		220	.036			1.33	3.43	4.76	5.80
4654	cycle 8 miles		200	.040			1.46	3.77	5.23	6.40
4656	cycle 10 miles		180	.044			1.63	4.19	5.82	7.10
4660	35 MPH ave, cycle 4 miles		260	.031			1.13	2.90	4.03	4.91
4662	cycle 6 miles		240	.033			1.22	3.14	4.36	5.30
4664	cycle 8 miles		220	.036			1.33	3.43	4.76	5.80
4666	cycle 10 miles		200	.040			1.46	3.77	5.23	6.40
4668	cycle 20 miles		140	.057			2.09	5.40	7.49	9.10
4670	cycle 30 miles		120	.067			2.44	6.30	8.74	10.65
4672	cycle 40 miles		100	.080			2.93	7.55	10.48	12.80
4674	40 MPH, cycle 6 miles		240	.033			1.22	3.14	4.36	5.30
4676	cycle 8 miles		220	.036			1.33	3.43	4.76	5.80
4678	cycle 10 miles		200	.040			1.46	3.77	5.23	6.40
4680	cycle 20 miles		160	.050			1.83	4.71	6.54	8
4682	cycle 30 miles		120	.067			2.44	6.30	8.74	10.65
4684	cycle 40 miles		100	.080			2.93	7.55	10.48	12.80
4686	cycle 50 miles		80	.100			3.66	9.40	13.06	15.95
4694	45 MPH ave, cycle 8 miles		220	.036			1.33	3.43	4.76	5.80
4696	cycle 10 miles		220	.036			1.33	3.43	4.76	5.80
4698	cycle 20 miles		160	.050			1.83	4.71	6.54	8
4700	cycle 30 miles		140	.057			2.09	5.40	7.49	9.10
4702	cycle 40 miles		100	.080			2.93	7.55	10.48	12.80
4704	cycle 50 miles		100	.080			2.93	7.55	10.48	12.80
4706	50 MPH ave, cycle 10 miles		220	.036			1.33	3.43	4.76	5.80
4708	cycle 20 miles		180	.044			1.63	4.19	5.82	7.10
4710	cycle 30 miles		140	.057			2.09	5.40	7.49	9.10
4712	cycle 40 miles		120	.067			2.44	6.30	8.74	10.65
4714	cycle 50 miles		100	.080			2.93	7.55	10.48	12.80
5000	22 C.Y. off-road, 15 min. wait/Ld./Uld., 5 MPH, cycle 2000 ft	B-34F	528	.015			.55	2.80	3.35	3.93
5010	cycle 3000 ft		484	.017			.61	3.05	3.66	4.29
5020	cycle 4000 ft		440	.018			.67	3.36	4.03	4.71
5030	cycle 0.5 mile		506	.016			.58	2.92	3.50	4.10
5040	cycle 1 mile		374	.021			.78	3.95	4.73	5.55
5050	cycle 2 miles		264	.030			1.11	5.60	6.71	7.85
5060	10 MPH, cycle 2000 ft		594	.013			.49	2.49	2.98	3.50
5070	cycle 3000 ft		572	.014			.51	2.58	3.09	3.62
5080	cycle 4000 ft		528	.015			.55	2.80	3.35	3.93
5090	cycle 0.5 mile		572	.014			.51	2.58	3.09	3.62
5100	cycle 1 mile		506	.016			.58	2.92	3.50	4.10
5110	cycle 2 miles		374	.021			.78	3.95	4.73	5.55
5120	cycle 4 miles		264	.030			1.11	5.60	6.71	7.85
5130	15 MPH, cycle 2000 ft		638	.013			.46	2.32	2.78	3.25
5140	cycle 3000 ft		594	.013			.49	2.49	2.98	3.50
5150	cycle 4000 ft		572	.014			.51	2.58	3.09	3.62

	32 31 13.20 Fence, Chain Link Industrial	Crew	Daily Output	Labor-Hours	Unit	2013 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**FENCE, CHAIN LINK INDUSTRIAL**									
0011	Schedule 40, including concrete									
0020	3 strands barb wire, 2" post @ 10' O.C., set in concrete, 6' H	B-80C	240	.100	L.F.	19.55	3.55	1.14	24.24	28
0200	9 ga. wire, galv. steel, in concrete				S.F.	.55			.55	.61
0248	Fence, add for vinyl coated fabric	B-80C	240	.100	L.F.	20	3.55	1.14	24.69	28.50
0300	Aluminized steel		240	.100		21.50	3.55	1.14	26.19	30
0500	6 ga. wire, galv. steel		240	.100		24.50	3.55	1.14	29.19	33.50
0600	Aluminized steel		250	.096		19.85	3.41	1.10	24.36	28.50
0800	6 ga. wire, 6' high but omit barbed wire, galv. steel		250	.096		24	3.41	1.10	28.51	33
0900	Aluminized steel, in concrete		180	.133		31.50	4.74	1.52	37.76	43.50
0920	8' H, 6 ga. wire, 2-1/2" line post, galv. steel, in concrete		180	.133		38.50	4.74	1.52	44.76	51.50
0940	Aluminized steel, in concrete		10	2.400	Ea.	189	85.50	27.50	302	370
1400	Gate for 6' high fence, 1-5/8" frame, 3' wide, galv. steel		10	2.400	"	189	85.50	27.50	302	370
1500	Aluminized steel, in concrete									
2000	5'-0" high fence, 9 ga., no barbed wire, 2" line post, in concrete									
2010	10' O.C., 1-5/8" top rail, in concrete	B-80C	300	.080	L.F.	19.25	2.84	.91	23	26.50
2100	Galvanized steel, in concrete		300	.080	"	20	2.84	.91	23.75	27.50
2200	Aluminized steel, in concrete		10	2.400	Ea.	151	85.50	27.50	264	325
2400	Gate, 4' wide, 5' high, 2" frame, galv. steel, in concrete		10	2.400	"	166	85.50	27.50	279	345
2500	Aluminized steel, in concrete		38	.632	L.F.	103	22.50	7.20	132.70	155
3100	Overhead slide gate, chain link, 6' high, to 18' wide, in concrete	B-80	30	1.067		103	41	25.50	169.50	204
3105	8' high, in concrete		24	1.333		171	51.50	31.50	254	300
3108	10' high, in concrete		48	.667		119	25.50	15.80	160.30	187
3110	Cantilever type, in concrete		24	1.333		171	51.50	31.50	254	300
3120	8' high, in concrete		18	1.778		199	68.50	42	309.50	370
3130	10' high, in concrete									
5000	Double swing gates, incl. posts & hardware, in concrete	B-80C	3.40	7.059	Opng.	455	251	80.50	786.50	975
5010	5' high, 12' opening, in concrete		2.80	8.571		600	305	98	1,003	1,250
5020	20' opening, in concrete		3.20	7.500		540	266	85.50	891.50	1,100
5060	6' high, 12' opening, in concrete		2.60	9.231		755	330	105	1,190	1,450
5070	20' opening, in concrete	B-80	2.13	15.002		530	580	355	1,465	1,850
5080	8' high, 12' opening, in concrete		1.45	22.069		815	850	525	2,190	2,775
5090	20' opening, in concrete		1.31	24.427		965	945	580	2,490	3,125
5100	10' high, 12' opening, in concrete		1.03	31.068		1,050	1,200	735	2,985	3,775
5110	20' opening, in concrete		1.05	30.476		1,550	1,175	725	3,450	4,300
5120	12' high, 12' opening, in concrete		.85	37.647		1,650	1,450	895	3,995	5,025
5130	20' opening, in concrete					20%				
5190	For aluminized steel add	B-80A	960	.025	L.F.	2.61	.89	.34	3.84	4.62
7055	Braces, galv. steel	"	960	.025	"	3.13	.89	.34	4.36	5.20
7056	Aluminized steel				S.F.	20%				
7075	Fence, for small jobs 100 L.F. or less fence w/or wo gate, add									

	32 31 13.25 Fence, Chain Link Residential									
0010	**FENCE, CHAIN LINK RESIDENTIAL**									
0011	Schedule 20, 11 ga. wire, 1-5/8" post	B-80C	500	.048	L.F.	2.10	1.71	.55	4.36	5.55
0020	10' O.C., 1-3/8" top rail, 2" corner post, galv. stl. 3' high		400	.060		7.20	2.13	.68	10.01	11.95
0050	4' high		200	.120		10.20	4.26	1.37	15.83	19.25
0100	6' high		12	2	Ea.	83	71	23	177	226
0150	Add for gate 3' wide, 1-3/8" frame, 3' high		10	2.400		89	85.50	27.50	202	259
0170	4' high		10	2.400		112	85.50	27.50	225	284
0190	6' high		9	2.667		91	94.50	30.50	216	280
0200	Add for gate 4' wide, 1-3/8" frame, 3' high		9	2.667		98	94.50	30.50	223	288
0220	4' high									

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-12F	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Hyd. Excavator, .75 C.Y.		694.80		764.28	43.42	47.77
16 L.H., Daily Totals		$1368.80		$1791.08	$85.55	$111.94
Crew B-12G	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 15 Ton		668.70		735.57		
1 Clamshell Bucket, .5 C.Y.		37.80		41.58	44.16	48.57
16 L.H., Daily Totals		$1380.50		$1803.95	$86.28	$112.75
Crew B-12H	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 25 Ton		1148.00		1262.80		
1 Clamshell Bucket, 1 C.Y.		47.40		52.14	74.71	82.18
16 L.H., Daily Totals		$1869.40		$2341.74	$116.84	$146.36
Crew B-12I	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 20 Ton		861.60		947.76		
1 Dragline Bucket, .75 C.Y.		20.80		22.88	55.15	60.66
16 L.H., Daily Totals		$1556.40		$1997.44	$97.28	$124.84
Crew B-12J	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Gradall, 5/8 C.Y.		883.80		972.18	55.24	60.76
16 L.H., Daily Totals		$1557.80		$1998.98	$97.36	$124.94
Crew B-12K	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Gradall, 3 Ton, 1 C.Y.		1010.00		1111.00	63.13	69.44
16 L.H., Daily Totals		$1684.00		$2137.80	$105.25	$133.61
Crew B-12L	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 15 Ton		668.70		735.57		
1 F.E. Attachment, .5 C.Y.		58.20		64.02	45.43	49.97
16 L.H., Daily Totals		$1400.90		$1826.39	$87.56	$114.15
Crew B-12M	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 20 Ton		861.60		947.76		
1 F.E. Attachment, .75 C.Y.		62.60		68.86	57.76	63.54
16 L.H., Daily Totals		$1598.20		$2043.42	$99.89	$127.71
Crew B-12N	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 25 Ton		1148.00		1262.80		
1 F.E. Attachment, 1 C.Y.		69.40		76.34	76.09	83.70
16 L.H., Daily Totals		$1891.40		$2365.94	$118.21	$147.87

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-12Q	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 40 Ton		1152.00		1267.20		
1 F.E. Attachment, 1.5 C.Y.		78.60		86.46	76.91	84.60
16 L.H., Daily Totals		$1904.60		$2380.46	$119.04	$148.78
Crew B-12P	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 40 Ton		1152.00		1267.20		
1 Dragline Bucket, 1.5 C.Y.		33.60		36.96	74.10	81.51
16 L.H., Daily Totals		$1859.60		$2330.96	$116.22	$145.69
Crew B-12Q	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Hyd. Excavator, 5/8 C.Y.		596.00		655.60	37.25	40.98
16 L.H., Daily Totals		$1270.00		$1682.40	$79.38	$105.15
Crew B-12S	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Hyd. Excavator, 2.5 C.Y.		1800.00		1980.00	112.50	123.75
16 L.H., Daily Totals		$2474.00		$3006.80	$154.63	$187.93
Crew B-12T	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 75 Ton		1457.00		1602.70		
1 F.E. Attachment, 3 C.Y.		101.00		111.10	97.38	107.12
16 L.H., Daily Totals		$2232.00		$2740.60	$139.50	$171.29
Crew B-12V	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$42.13	$64.17
1 Laborer	35.45	283.60	54.60	436.80		
1 Crawler Crane, 75 Ton		1457.00		1602.70		
1 Dragline Bucket, 3 C.Y.		52.20		57.42	94.33	103.76
16 L.H., Daily Totals		$2183.20		$2686.92	$136.45	$167.93
Crew B-12Y	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$39.00	$56.04
2 Laborers	35.45	567.20	54.60	873.60		
1 Hyd. Excavator, 3.5 C.Y.		2454.00		2699.40	102.25	112.48
24 L.H., Daily Totals		$3411.60		$4163.00	$142.15	$173.46
Crew B-12Z	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$39.00	$56.04
2 Laborers	35.45	567.20	54.60	873.60		
1 Hyd. Excavator, 2.5 C.Y.		1800.00		1980.00	75.00	82.50
24 L.H., Daily Totals		$2757.60		$3443.60	$114.90	$143.48
Crew B-13	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20		
4 Laborers	35.45	1134.40	54.60	1747.20		
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Equip. Oper. Oiler	42.25	338.00	63.85	510.80		
1 Hyd. Crane, 25 Ton		728.60		801.46		
56 L.H., Daily Totals		$2891.00		$4110.66		

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-13A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$39.51	$60.35
1 Laborers	35.45	567.20	54.60	873.60		
1 Equipment Operators (med.)	47.50	760.00	71.75	1148.00		
1 Truck Drivers (heavy)	36.60	585.60	56.05	896.80		
1 Crawler Crane, 75 Ton		1457.00		1602.70		
1 Crawler Loader, 4 C.Y.		1530.00		1683.00		
1 Dump Trucks, 8 C.Y., 220 H.P.		833.20		916.52	68.22	75.04
56 L.H., Daily Totals		$6032.60		$7581.82	$107.72	$135.39
Crew B-13B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$38.61	$59.09
4 Laborers	35.45	1134.40	54.60	1747.20		
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Equip. Oper. Oiler	42.25	338.00	63.85	510.80		
1 Hyd. Crane, 55 Ton		1115.00		1226.50	19.91	21.90
56 L.H., Daily Totals		$3277.40		$4535.70	$58.52	$80.99
Crew B-13C	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$38.61	$59.09
4 Laborers	35.45	1134.40	54.60	1747.20		
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Equip. Oper. Oiler	42.25	338.00	63.85	510.80		
1 Crawler Crane, 100 Ton		1666.00		1832.60	29.75	32.73
56 L.H., Daily Totals		$3828.40		$5141.80	$68.36	$91.82
Crew B-13D	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$42.13	$64.17
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Hyd. Excavator, 1 C.Y.		815.60		897.16		
1 Trench Box		113.40		124.74	58.06	63.87
16 L.H., Daily Totals		$1603.00		$2048.70	$100.19	$128.04
Crew B-13E	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$42.13	$64.17
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Hyd. Excavator, 1.5 C.Y.		1036.00		1139.60		
1 Trench Box		113.40		124.74	71.84	79.02
16 L.H., Daily Totals		$1823.40		$2291.14	$113.96	$143.20
Crew B-13F	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$42.13	$64.17
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Hyd. Excavator, 3.5 C.Y.		2454.00		2699.40		
1 Trench Box		113.40		124.74	160.46	176.51
16 L.H., Daily Totals		$3241.40		$3850.94	$202.59	$240.68
Crew B-13G	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$42.13	$64.17
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Hyd. Excavator, .75 C.Y.		694.80		764.28		
1 Trench Box		113.40		124.74	50.51	55.66
16 L.H., Daily Totals		$1482.20		$1915.82	$92.64	$119.74
Crew B-13H	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$42.13	$64.17
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Gradall, 5/8 C.Y.		883.80		972.18		
1 Trench Box		113.40		124.74	62.33	68.56
16 L.H., Daily Totals		$1671.20		$2123.72	$104.45	$132.71

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-13I	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$42.13	$64.17
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Gradall, 3 Ton, 1 C.Y.		1010.00		1111.00		
1 Trench Box		113.40		124.74	70.21	77.23
16 L.H., Daily Totals		$1797.40		$2262.54	$112.34	$141.41
Crew B-13J	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$42.13	$64.17
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 Hyd. Excavator, 2.5 C.Y.		1800.00		1980.00		
1 Trench Box		113.40		124.74	119.59	131.55
16 L.H., Daily Totals		$2587.40		$3131.54	$161.71	$195.72
Crew B-14	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$37.51	$57.54
4 Laborers	35.45	1134.40	54.60	1747.20		
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Backhoe Loader, 48 H.P.		367.40		404.14	7.65	8.42
48 L.H., Daily Totals		$2167.80		$3166.14	$45.16	$65.96
Crew B-14A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$44.35	$67.37
.5 Laborer	35.45	141.80	54.60	218.40		
1 Hyd. Excavator, 4.5 C.Y.		3057.00		3362.70	254.75	280.23
12 L.H., Daily Totals		$3589.20		$4171.10	$299.10	$347.59
Crew B-14B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$44.35	$67.37
.5 Laborer	35.45	141.80	54.60	218.40		
1 Hyd. Excavator, 6 C.Y.		3541.00		3895.10	295.08	324.59
12 L.H., Daily Totals		$4073.20		$4703.50	$339.43	$391.96
Crew B-14C	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$44.35	$67.37
.5 Laborer	35.45	141.80	54.60	218.40		
1 Hyd. Excavator, 7 C.Y.		3616.00		3977.60	301.33	331.47
12 L.H., Daily Totals		$4148.20		$4786.00	$345.68	$398.83
Crew B-14F	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$44.35	$67.37
.5 Laborer	35.45	141.80	54.60	218.40		
1 Hyd. Shovel, 7 C.Y.		3495.00		3844.50	291.25	320.38
12 L.H., Daily Totals		$4027.20		$4652.90	$335.60	$387.74
Crew B-14G	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (crane)	$48.80	$390.40	$73.75	$590.00	$44.35	$67.37
.5 Laborer	35.45	141.80	54.60	218.40		
1 Hyd. Shovel, 12 C.Y.		4676.00		5143.60	389.67	428.63
12 L.H., Daily Totals		$5208.20		$5952.00	$434.02	$496.00
Crew B-14J	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (med.)	$47.50	$380.00	$71.75	$574.00	$43.48	$66.03
.5 Laborer	35.45	141.80	54.60	218.40		
1 F.E. Loader, 8 C.Y.		2008.00		2208.80	167.33	184.07
12 L.H., Daily Totals		$2529.80		$3001.20	$210.82	$250.10

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-14K	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (med.)	$47.50	$380.00	$71.75	$574.00	$43.48	$66.03
.5 Laborer	35.45	141.80	54.60	218.40		
1 F.E. Loader, 10 C.Y.		2734.00		3007.40	227.83	250.62
12 L.H., Daily Totals		$3255.80		$3799.80	$271.32	$316.65
Crew B-15	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equipment Oper. (med.)	$47.50	$380.00	$71.75	$574.00	$39.55	$60.33
.5 Laborer	35.45	141.80	54.60	218.40		
2 Truck Drivers (heavy)	36.60	585.60	56.05	896.80		
2 Dump Trucks, 12 C.Y., 400 H.P.		1384.80		1523.28		
1 Dozer, 200 H.P.		1333.00		1466.30	97.06	106.77
28 L.H., Daily Totals		$3825.20		$4678.78	$136.61	$167.10
Crew B-16	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$36.24	$55.73
2 Laborers	35.45	567.20	54.60	873.60		
1 Truck Driver (heavy)	36.60	292.80	56.05	448.40		
1 Dump Truck, 12 C.Y., 400 H.P.		692.40		761.64	21.64	23.80
32 L.H., Daily Totals		$1852.00		$2544.84	$57.88	$79.53
Crew B-17	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
2 Laborers	$35.45	$567.20	$54.60	$873.60	$38.33	$58.61
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Truck Driver (heavy)	36.60	292.80	56.05	448.40		
1 Backhoe Loader, 48 H.P.		367.40		404.14		
1 Dump Truck, 8 C.Y., 220 H.P.		416.60		458.26	24.50	26.95
32 L.H., Daily Totals		$2010.40		$2738.00	$62.83	$85.56
Crew B-17A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
2 Labor Foremen (outside)	$37.45	$599.20	$57.65	$922.40	$38.20	$58.88
6 Laborers	35.45	1701.60	54.60	2620.80		
1 Skilled Worker Foreman (out)	48.20	385.60	74.50	596.00		
1 Skilled Worker	46.20	369.60	71.45	571.60		
80 L.H., Daily Totals		$3056.00		$4710.80	$38.20	$58.88
Crew B-17B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
2 Laborers	$35.45	$567.20	$54.60	$873.60	$38.33	$58.61
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Truck Driver (heavy)	36.60	292.80	56.05	448.40		
1 Backhoe Loader, 48 H.P.		367.40		404.14		
1 Dump Truck, 12 C.Y., 400 H.P.		692.40		761.64	33.12	36.43
32 L.H., Daily Totals		$2286.20		$3041.38	$71.44	$95.04
Crew B-18	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$36.12	$55.62
2 Laborers	35.45	567.20	54.60	873.60		
1 Vibrating Plate, Gas, 21"		44.40		48.84	1.85	2.04
24 L.H., Daily Totals		$911.20		$1383.64	$37.97	$57.65
Crew B-19	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Pile Driver Foreman (outside)	$45.15	$361.20	$71.90	$575.20	$44.70	$69.76
4 Pile Drivers	43.15	1380.80	68.70	2198.40		
2 Equip. Oper. (crane)	48.80	780.80	73.75	1180.00		
1 Equip. Oper. Oiler	42.25	338.00	63.85	510.80		
1 Crawler Crane, 40 Ton		1152.00		1267.20		
1 Lead, 90' High		124.80		137.28		
1 Hammer, Diesel, 22k ft-lb		618.00		679.80	29.61	32.57
64 L.H., Daily Totals		$4755.60		$6548.68	$74.31	$102.32

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-19A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Pile Driver Foreman (outside)	$45.15	$361.20	$71.90	$575.20	$44.70	$69.76
4 Pile Drivers	43.15	1380.80	68.70	2198.40		
2 Equip. Oper. (crane)	48.80	780.80	73.75	1180.00		
1 Equip. Oper. Oiler	42.25	338.00	63.85	510.80		
1 Crawler Crane, 75 Ton		1457.00		1602.70		
1 Lead, 90' high		124.80		137.28		
1 Hammer, Diesel, 41k ft-lb		704.00		774.40	35.72	39.29
64 L.H., Daily Totals		$5146.60		$6978.78	$80.42	$109.04
Crew B-19B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Pile Driver Foreman (outside)	$45.15	$361.20	$71.90	$575.20	$44.70	$69.76
4 Pile Drivers	43.15	1380.80	68.70	2198.40		
2 Equip. Oper. (crane)	48.80	780.80	73.75	1180.00		
1 Equip. Oper. Oiler	42.25	338.00	63.85	510.80		
1 Crawler Crane, 40 Ton		1152.00		1267.20		
1 Lead, 90' High		124.80		137.28		
1 Hammer, Diesel, 22k ft-lb		618.00		679.80		
1 Barge, 400 Ton		783.80		862.18	41.85	46.01
64 L.H., Daily Totals		$5539.40		$7410.86	$86.55	$115.73
Crew B-19C	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Pile Driver Foreman (outside)	$45.15	$361.20	$71.90	$575.20	$44.70	$69.76
4 Pile Drivers	43.15	1380.80	68.70	2198.40		
2 Equip. Oper. (crane)	48.80	780.80	73.75	1180.00		
1 Equip. Oper. Oiler	42.25	338.00	63.85	510.80		
1 Crawler Crane, 75 Ton		1457.00		1602.70		
1 Lead, 90' High		124.80		137.28		
1 Hammer, Diesel, 41k ft-lb		704.00		774.40		
1 Barge, 400 Ton		783.80		862.18	47.96	52.76
64 L.H., Daily Totals		$5930.40		$7840.96	$92.68	$122.51
Crew B-20	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$39.70	$61.20
1 Skilled Worker	46.20	369.60	71.45	571.60		
1 Laborer	35.45	283.60	54.60	436.80		
24 L.H., Daily Totals		$952.80		$1469.60	$39.70	$61.23
Crew B-20A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$43.34	$66.81
1 Laborer	35.45	283.60	54.60	436.80		
1 Plumber	55.80	446.40	84.05	672.40		
1 Plumber Apprentice	44.65	357.20	67.25	538.00		
32 L.H., Daily Totals		$1386.80		$2108.40	$43.34	$65.89
Crew B-21	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$41.09	$63.42
1 Skilled Worker	46.20	369.60	71.45	571.60		
1 Laborer	35.45	283.60	54.60	436.80		
.5 Equip. Oper. (crane)	48.80	195.20	73.75	295.00		
.5 S.P. Crane, 4x4, 5 Ton		137.10		150.81	4.28	4.71
28 L.H., Daily Totals		$1285.10		$1915.41	$45.87	$68.41
Crew B-21A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$43.83	$67.26
1 Laborer	35.45	283.60	54.60	436.80		
1 Plumber	55.80	446.40	84.05	672.40		
1 Plumber Apprentice	44.65	357.20	67.25	538.00		
1 Equip. Oper. (crane)	48.80	390.40	73.75	590.00		
1 S.P. Crane, 4x4, 12 Ton		471.00		518.10	9.81	10.79
40 L.H., Daily Totals		$2248.20		$3216.50	$53.64	$78.05

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-63	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$1134.40	$54.60	$1747.20	$37.52	$57.52
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Loader, Skid Steer, 30 H.P.		172.00		189.20	4.30	4.73
32 L.H., Daily Totals		$1672.80		$2490.00	$41.82	$62.25
Crew B-63B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (inside)	$35.95	$287.60	$55.35	$442.80	$38.16	$58.44
4 Laborers	35.45	567.20	54.60	873.60		
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Loader, Skid Steer, 78 H.P.		308.60		339.46	9.64	10.61
40 L.H., Daily Totals		$1529.80		$2209.46	$47.81	$69.05
Crew B-64	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$35.55	$54.60
1 Truck Driver (light)	35.65	285.20	54.60	436.80		
1 Power Mulcher (Small)		158.00		173.80		
1 Dump Truck, Gas, 1.5 Ton		265.80		292.38	26.49	29.14
16 L.H., Daily Totals		$992.60		$1339.78	$62.04	$83.74
Crew B-65	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Laborer	$35.45	$283.60	$54.60	$436.80	$35.55	$54.60
1 Truck Driver (light)	35.65	285.20	54.60	436.80		
1 Power Mulcher (Large)		325.40		357.94		
1 Dump Truck, Gas, 1.5 Ton		265.80		292.38	36.95	40.65
16 L.H., Daily Totals		$1160.00		$1523.92	$72.50	$95.25
Crew B-66	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (light)	$45.80	$366.40	$69.20	$553.60	$45.80	$69.20
1 Loader-Backhoe, 40 H.P.		260.80		286.88	32.60	35.86
8 L.H., Daily Totals		$627.20		$840.48	$78.40	$105.06
Crew B-67	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Millwright	$46.50	$372.00	$68.35	$546.80	$46.15	$68.78
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Forklift, R/T, 4,000 Lb.		310.20		341.22	19.39	21.33
16 L.H., Daily Totals		$1048.60		$1441.62	$65.54	$90.10
Crew B-67B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Millwright Foreman (inside)	$47.00	$376.00	$69.10	$552.80	$46.75	$68.72
1 Millwright	46.50	372.00	68.35	546.80		
16 L.H., Daily Totals		$748.00		$1099.60	$46.75	$68.72
Crew B-68	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
2 Millwrights	$46.50	$744.00	$68.35	$1093.60	$46.27	$68.63
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Forklift, R/T, 4,000 Lb.		310.20		341.22	12.93	14.22
24 L.H., Daily Totals		$1420.60		$1988.42	$59.19	$82.85
Crew B-68A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Millwright Foreman (inside)	$47.00	$376.00	$69.10	$552.80	$46.67	$68.60
2 Millwrights	46.50	744.00	68.35	1093.60		
1 Forklift, 8,000 Lb.		180.80		198.88	7.53	8.29
24 L.H., Daily Totals		$1300.80		$1845.28	$54.20	$76.89

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-68B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Millwright Foreman (inside)	$47.00	$376.00	$69.10	$552.80	$50.91	$75.81
2 Millwrights	46.50	744.00	68.35	1093.60		
2 Electricians	52.40	838.40	78.40	1254.40		
2 Plumbers	55.80	892.80	84.05	1344.80		
1 Forklift, 5,000 Lb.		325.00		357.50	5.80	6.38
56 L.H., Daily Totals		$3176.20		$4603.10	$56.72	$82.20
Crew B-68C	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Millwright Foreman (inside)	$47.00	$376.00	$69.10	$552.80	$50.42	$74.97
1 Millwright	46.50	372.00	68.35	546.80		
1 Electrician	52.40	419.20	78.40	627.20		
1 Plumber	55.80	446.40	84.05	672.40		
1 Forklift, 5,000 Lb.		325.00		357.50	10.16	11.17
32 L.H., Daily Totals		$1938.60		$2756.70	$60.58	$86.15
Crew B-68D	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (inside)	$35.95	$287.60	$55.35	$442.80	$39.07	$59.72
1 Laborer	35.45	283.60	54.60	436.80		
1 Equip. Oper. (light)	45.80	366.40	69.20	553.60		
1 Forklift, 5,000 Lb.		325.00		357.50	13.54	14.90
24 L.H., Daily Totals		$1262.60		$1790.70	$52.61	$74.61
Crew B-68E	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Struc. Steel Foreman (inside)	$50.55	$404.40	$90.20	$721.60	$50.15	$89.48
3 Struc. Steel Workers	50.05	1201.20	89.30	2143.20		
1 Welder	50.05	400.40	89.30	714.40		
1 Forklift, 8,000 Lb.		180.80		198.88	4.52	4.97
40 L.H., Daily Totals		$2186.80		$3778.08	$54.67	$94.45
Crew B-69	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$39.14	$59.84
3 Laborers	35.45	850.80	54.60	1310.40		
1 Equip Oper. (crane)	48.80	390.40	73.75	590.00		
1 Equip Oper. Oiler	42.25	338.00	63.85	510.80		
1 Hyd. Crane, 80 Ton		1613.00		1774.30	33.60	36.96
48 L.H., Daily Totals		$3491.80		$4646.70	$72.75	$96.81
Crew B-69A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$39.06	$59.43
3 Laborers	35.45	850.80	54.60	1310.40		
1 Equip. Oper. (med.)	47.50	380.00	71.75	574.00		
1 Concrete Finisher	43.05	344.40	63.40	507.20		
1 Curb/Gutter Paver, 2-Track		801.20		881.32	16.69	18.36
48 L.H., Daily Totals		$2676.00		$3734.12	$55.75	$77.79
Crew B-69B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$37.45	$299.60	$57.65	$461.20	$39.06	$59.43
3 Laborers	35.45	850.80	54.60	1310.40		
1 Equip. Oper. (med.)	47.50	380.00	71.75	574.00		
1 Cement Finisher	43.05	344.40	63.40	507.20		
1 Curb/Gutter Paver, 4-Track		772.40		849.64	16.09	17.70
48 L.H., Daily Totals		$2647.20		$3702.44	$55.15	$77.13

DIVISION		NEW JERSEY															
		NEW BRUNSWICK			NEWARK			PATERSON			POINT PLEASANT			SUMMIT			TRENTON	
		088 - 089			070 - 071			074 - 075			087			079			085 - 086	
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		98.3	98.3		100.5	100.5		100.5	100.5		98.3	98.3		100.5	100.5		98.3	98.3
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	118.1	104.8	108.8	119.8	104.8	109.3	117.8	105.0	108.8	119.7	104.8	109.2	117.7	104.8	108.6	100.5	104.8	103.4
0310	Concrete Forming & Accessories	98.7	126.6	122.9	94.6	126.7	122.4	94.3	126.8	122.4	93.9	122.7	118.8	95.0	126.7	122.5	96.7	122.8	119.1
0320	Concrete Reinforcing	85.3	122.1	103.6	110.7	122.1	116.4	110.7	122.1	116.4	85.3	122.1	103.6	85.3	122.1	103.6	110.7	117.6	114.1
0330	Cast-in-Place Concrete	104.1	131.3	115.3	108.6	129.1	117.0	104.1	129.1	114.4	104.1	131.0	115.2	87.1	129.1	104.3	100.4	131.0	113.0
03	CONCRETE	110.7	126.3	118.4	107.9	125.8	116.8	105.8	125.8	115.7	110.4	124.5	117.3	94.0	125.8	109.7	104.1	123.7	113.8
04	MASONRY	94.0	128.1	114.8	97.0	128.1	116.0	92.5	128.1	114.2	85.0	127.6	111.0	94.0	128.1	114.8	84.2	127.6	110.7
05	METALS	92.7	108.5	97.6	97.6	111.0	101.8	92.7	111.0	98.5	92.7	108.3	97.6	92.6	111.0	98.4	92.7	106.3	97.6
06	WOOD, PLASTICS & COMPOSITES	100.5	126.6	115.4	95.1	126.6	113.1	98.1	126.6	114.4	94.2	121.7	109.9	99.2	126.6	114.9	93.6	121.7	109.0
07	THERMAL & MOISTURE PROTECTION	97.2	125.3	108.5	102.9	126.2	112.3	97.4	125.1	108.6	97.2	124.6	108.2	97.7	126.2	109.2	101.1	124.2	110.4
08	OPENINGS	95.8	124.4	102.8	110.0	124.4	113.5	110.0	124.4	113.5	97.8	122.6	103.8	112.2	124.4	115.2	103.9	120.2	106.9
0920	Plaster & Gypsum Board	100.1	126.8	118.8	95.4	126.8	117.4	99.2	126.8	118.5	96.0	121.8	114.0	98.0	126.8	118.2	95.9	121.8	114.0
0950, 0980	Ceilings & Acoustic Treatment	88.3	126.8	114.0	98.6	126.8	117.4	97.7	126.8	117.1	88.3	121.8	110.6	88.3	126.8	114.0	100.4	121.8	114.6
0960	Flooring	99.5	169.0	120.2	98.3	169.0	119.3	98.3	169.0	119.3	97.4	146.6	112.1	98.6	169.0	119.6	98.5	169.0	119.5
0970, 0990	Wall Finishes & Painting/Coating	96.1	122.0	111.6	96.0	122.0	111.6	96.0	122.0	111.6	96.1	120.0	110.4	96.0	122.0	111.6	96.1	120.0	110.4
09	FINISHES	100.2	133.5	118.9	99.6	133.6	118.6	100.2	133.6	118.9	99.0	127.5	115.0	98.6	133.6	118.2	99.6	131.3	117.6
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	114.6	103.0	100.0	114.7	103.0	100.0	114.7	103.0	100.0	105.9	101.2	100.0	114.7	103.0	100.0	110.2	102.1
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	99.5	122.8	109.0	100.0	126.6	110.9	100.0	127.2	111.1	99.5	122.4	108.9	99.6	126.6	110.6	100.0	122.5	109.1
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	97.4	135.4	117.4	107.7	134.3	121.7	103.5	134.4	119.8	95.6	130.1	114.3	98.8	134.4	117.6	106.1	134.5	120.3
MF2010	WEIGHTED AVERAGE	99.4	123.9	110.2	102.7	124.8	112.4	100.9	124.9	111.5	98.9	121.6	108.9	99.2	124.8	110.5	99.5	122.5	109.8

DIVISION		NEW JERSEY			NEW MEXICO												
		VINELAND			ALBUQUERQUE			CARRIZOZO			CLOVIS			FARMINGTON			GALLUP	
		080,083			870 - 872			883			881			874			873	
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		98.7	98.7		109.2	109.2		109.2	109.2		109.2	109.2		109.2	109.2		109.2	109.2
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	106.2	104.0	105.2	81.3	104.1	97.3	102.3	104.1	103.5	90.2	104.1	99.9	87.6	104.1	99.1	95.4	104.1	101.3
0310	Concrete Forming & Accessories	91.6	126.3	121.6	99.3	65.6	70.1	99.3	65.6	70.1	99.3	65.4	70.0	99.3	65.6	70.1	99.3	65.6	70.1
0320	Concrete Reinforcing	84.4	120.4	102.3	104.7	71.5	88.2	112.3	71.5	92.0	113.5	71.5	92.6	114.4	71.5	93.0	109.5	71.5	90.5
0330	Cast-in-Place Concrete	90.9	131.3	107.5	103.9	72.4	90.9	96.7	72.4	86.7	96.6	72.3	86.6	104.8	72.4	91.5	98.7	72.4	87.5
03	CONCRETE	98.5	125.8	112.0	104.5	70.1	87.5	118.9	70.1	94.8	107.9	70.0	89.2	108.4	70.1	89.5	114.1	70.1	92.3
04	MASONRY	85.1	127.6	111.1	107.6	62.0	79.8	103.5	62.0	78.2	103.5	62.0	78.2	114.9	62.0	82.6	103.6	62.0	78.3
05	METALS	92.6	106.6	97.0	101.3	88.0	97.1	98.1	88.0	94.9	97.7	87.9	94.6	99.0	88.0	95.6	98.1	88.0	94.9
06	WOOD, PLASTICS & COMPOSITES	91.4	126.6	111.5	89.4	66.0	76.1	89.5	66.0	76.1	89.5	66.0	76.1	89.5	66.0	76.1	89.5	66.0	76.1
07	THERMAL & MOISTURE PROTECTION	96.8	124.9	108.1	98.7	73.1	88.5	100.2	73.1	89.3	99.0	73.1	88.6	98.9	73.1	88.5	99.9	73.1	89.1
08	OPENINGS	97.3	124.1	103.8	98.1	69.2	91.1	96.8	69.2	90.1	96.9	69.2	90.2	100.7	69.2	93.1	100.8	69.2	93.2
0920	Plaster & Gypsum Board	94.3	126.8	117.1	83.6	64.7	70.4	76.4	64.7	68.2	76.4	64.7	68.2	76.4	64.7	68.2	76.4	64.7	68.2
0950, 0980	Ceilings & Acoustic Treatment	88.3	126.8	114.0	130.0	64.7	79.8	106.7	64.7	78.7	106.7	64.7	78.7	106.7	64.7	78.7	106.7	64.7	78.7
0960	Flooring	96.6	146.6	111.5	98.8	68.4	89.8	100.6	68.4	91.0	100.6	68.4	91.0	100.6	68.4	91.0	100.6	68.4	91.0
0970, 0990	Wall Finishes & Painting/Coating	96.1	120.0	110.4	104.1	51.2	72.4	98.4	51.2	70.1	98.4	51.2	70.1	98.4	51.2	70.1	98.4	51.2	70.1
09	FINISHES	97.6	130.5	116.0	99.2	64.3	79.7	99.9	64.3	80.0	98.4	64.3	79.3	97.9	64.3	79.1	99.2	64.3	80.7
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	110.9	102.2	100.0	77.3	95.4	100.0	77.3	95.4	100.0	77.3	95.4	100.0	77.3	95.4	100.0	77.3	95.4
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	99.5	123.5	109.3	100.1	69.1	87.4	96.5	69.1	85.3	96.5	68.7	85.1	99.9	69.1	87.3	98.3	69.1	86.4
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	96.6	136.9	117.8	89.4	72.9	80.7	89.4	72.9	80.7	86.9	72.9	79.5	87.6	72.9	79.8	86.7	72.9	79.4
MF2010	WEIGHTED AVERAGE	97.1	123.4	108.7	99.1	73.5	87.0	99.7	73.5	88.2	97.7	73.4	87.0	99.7	73.5	88.2	99.0	73.5	87.8

DIVISION		NEW MEXICO															
		LAS CRUCES			LAS VEGAS			ROSWELL			SANTA FE			SOCORRO			TRUTH/CONSEQUENCES	
		880			877			882			875			878			872	
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		85.5	85.5		109.2	109.2		109.2	109.2		109.2	109.2		109.2	109.2		85.5	85.5
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	91.4	83.6	85.9	87.0	104.1	99.0	92.3	104.1	100.6	85.6	104.1	98.5	85.4	104.1	97.9	102.2	83.6	88.9
0310	Concrete Forming & Accessories	96.5	64.4	68.7	99.3	65.6	70.1	99.3	65.6	70.1	97.8	65.6	69.9	99.3	65.6	70.1	95.5	64.4	68.6
0320	Concrete Reinforcing	108.1	71.4	89.8	111.3	71.5	91.5	113.5	71.5	92.6	112.3	71.5	92.0	113.5	71.5	92.6	106.8	71.4	89.2
0330	Cast-in-Place Concrete	91.2	64.8	80.3	102.0	72.4	89.8	96.6	72.4	86.6	106.1	72.4	92.3	99.9	72.4	88.6	109.5	64.8	90.1
03	CONCRETE	86.8	66.6	76.9	105.6	70.1	88.1	108.6	70.1	89.6	106.7	70.1	88.7	104.5	70.1	87.5	98.5	66.7	82.8
04	MASONRY	99.5	61.7	76.4	103.9	62.0	78.3	114.6	62.0	82.5	107.9	62.0	79.9	103.8	62.0	78.3	104.1	61.7	78.4
05	METALS	98.9	81.4	93.4	97.8	88.0	94.8	99.0	88.0	95.5	99.0	88.0	95.5	98.1	88.0	94.9	92.7	81.4	89.5
06	WOOD, PLASTICS & COMPOSITES	80.9	64.9	71.8	89.5	66.0	76.1	89.5	66.0	76.1	89.0	66.0	75.9	89.5	66.0	76.1	80.9	64.9	71.8
07	THERMAL & MOISTURE PROTECTION	85.8	68.5	78.8	98.5	73.1	88.3	99.1	73.1	88.7	98.7	73.1	88.4	98.5	73.1	88.3	95.3	68.5	84.1
08	OPENINGS	90.7	68.6	85.3	96.9	69.2	90.2	96.7	69.2	90.0	96.9	69.2	90.2	96.8	69.2	90.1	100.6	68.6	93.8
0920	Plaster & Gypsum Board	78.4	64.7	68.8	76.4	64.7	68.2	76.4	64.7	68.2	87.5	64.7	71.5	76.4	64.7	68.2	78.4	64.7	68.9
0950, 0980	Ceilings & Acoustic Treatment	94.6	64.7	74.7	106.7	64.7	78.7	106.7	64.7	78.7	111.3	64.7	80.2	106.7	64.7	78.7	93.6	64.7	74.6
0960	Flooring	132.0	68.4	113.0	100.6	68.4	91.0	100.6	68.4	91.0	101.0	68.4	91.3	100.6	68.4	91.0	119.0	68.4	104.1
0970, 0990	Wall Finishes & Painting/Coating	89.3	51.2	66.5	98.4	51.2	70.1	98.4	51.2	70.1	98.4	51.2	70.1	98.4	51.2	70.1	89.3	51.2	66.5
09	FINISHES	110.3	63.5	84.0	97.8	64.3	79.0	98.5	64.3	79.4	100.6	64.3	80.3	97.7	64.3	79.0	111.0	63.5	85.3
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	74.6	94.8	100.0	77.3	95.4	100.0	77.3	95.4	100.0	77.3	95.4	100.0	77.3	95.4	100.0	74.6	94.8
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	100.3	68.8	87.4	96.3	69.1	85.1	99.9	69.1	87.3	99.9	69.1	87.3	96.3	69.1	85.1	98.1	68.8	86.1
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	88.1	66.6	76.8	89.4	72.9	80.7	88.3	72.9	80.2	102.3	72.9	86.8	87.3	72.9	79.7	91.3	66.6	78.3
MF2010	WEIGHTED AVERAGE	96.2	69.4	84.4	97.6	73.5	87.0	99.6	73.5	88.1	100.4	73.5	88.5	97.1	73.5	86.7	97.1	69.4	85.1

Vinyl-coated gates for security fence

Using a 24,500 lb. 2-axle truck with a 8’ x 16’ flat bed and small tools.

3' wide, 7' high, 3' trans, single gate	s3@2.35	Ea	788.00	64.60	17.80	870.40
4' wide, 7' high, 3' trans, single gate	s3@3.05	Ea	848.00	83.80	23.10	954.90
3' wide, 10' high, single gate	s3@2.40	Ea	788.00	66.00	18.20	872.20
4' wide, 10' high, single gate	s3@2.40	Ea	848.00	66.00	18.20	932.20
10' wide, 7' high, 3' trans, double gate	s3@4.32	Ea	409.00	119.00	32.80	560.80

Vinyl-coated gates for security fence

Using an 8-ton hydraulic crane with 85’ boom, a 46,000 lb. 3-axle 6x4 truck with a 8’ x 16’ flat bed and small tools.

12' wide, 7' high, 3' trans, double gate	s5@6.75	Ea	490.00	186.00	107.00	783.00
14' wide, 7' high, 3' trans, double gate	s5@8.00	Ea	572.00	220.00	126.00	918.00
10' wide, 10' high, double gate	s5@4.32	Ea	584.00	119.00	68.20	771.20
12' wide, 12' high, double gate	s5@4.76	Ea	753.00	131.00	75.10	959.10
14' wide, 14' high, double gate	s5@5.22	Ea	1020.00	144.00	82.40	1246.40
Add for gates on 16 foot (4.9m) high fence	---@---	%	18.00	33.00	--	--

Barbed wire fence, complete

Based on post at 10', using a 24,500 lb. 2-axle truck with a 8’ x 16’ flat bed and small tools.

3-strand barbed wire fence, galvanized	s3@.080	LF	2.18	2.20	.61	4.99

Barbed wire (per strand)

No posts included, using a 24,500 lb. 2-axle truck with a 8’ x 16’ flat bed and small tools.

Galvanized	s3@.008	LF	.08	.22	.06	.36
Vinyl coated	s3@.008	LF	.08	.22	.06	.36

Miscellaneous wire and screen

No framing or posts included, using miscellaneous power tools and small tools.

48" wide rolls	ap@.023	SF	.29	.78	.03	1.10

Hog wire

Including driven posts, using miscellaneous power tools and small tools.

4" x 4" mesh hog wire fence	ap@.010	SF	.11	.34	.01	.46
6" x 6" mesh hog wire fence	ap@.010	SF	.11	.34	.01	.46

Snow fence

Including driven steel posts set at 10', using small tools.

4' high snow fence	wg@.053	LF	1.43	.81	.03	2.27

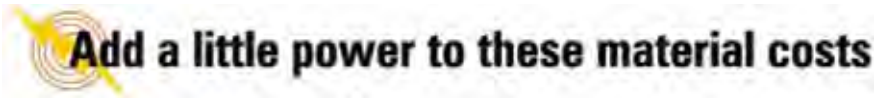
CSI 02-713, Wood fencing

CSI 02-713	Craft@Hrs	Unit	Material	Labor	Equip	Total
3/8" x 4" boards, 6' high, 4" x 4" posts set at 8', using small tools.						
#1 cedar basket weave fence	wg@.107	LF	15.00	1.63	.06	16.69
Treated pine basket weave fence	wg@.117	LF	6.69	1.78	.07	8.54

Board fence

1" x 4" boards, 2" x 4" rails, 4" x 4" posts set at 8', using small tools.

3' high treated board fence, 2 rails	wg@.124	LF	4.18	1.89	.07	6.14
4' high treated board fence, 2 rails	wg@.138	LF	4.88	2.10	.08	7.06
5' high treated board fence, 3 rails	wg@.146	LF	5.96	2.22	.09	8.27
6' high treated board fence, 3 rails	wg@.156	LF	6.55	2.38	.09	9.02
3' high #2 western red cedar fence, 2 rails	wg@.124	LF	4.66	1.89	.07	6.62
4' high #2 western red cedar fence, 2 rails	wg@.138	LF	4.66	2.10	.08	6.84



The figures above are from a time and money saving construction cost manuals from Craftsman Book Company. Over 50 cost estimating databases are available and all come with the popular National Estimator program.

National Estimator helps you compile estimates and bids for any construction project

National Estimator lets you use these costs to create estimates for new construction, repair and remodeling, commercial and industrial projects. Copy and paste and anything you see here into your estimate. Then add overhead and profit and print the bid – or turn your bid into an invoice that goes out in a window envelope. It's quick, easy and flexible.

Find out more about using these cost estimates with the National Estimator program:

Click here for more information on getting these cost estimates in book form and CD-ROM

Click here for more information on getting these costs as a download on the Web.

National Estimator Includes the following features:

Prints estimates and saves estimates to disk.

Add any percent for overhead, profit and sales tax. Plus, show or hide markup and unit costs.

Change, copy, revise or delete an estimate at any time.

Use your own labor rates and man-hour estimates.

Export to Excel, Word, QuickBooks Pro and others

Organize estimates by division with subtotals.

Turn estimates into invoices

No need to be connected to the Web when estimating.

Includes an extensive help system and free phone support.

CD-ROM includes the Watch Me video on disk.

APPENDIX C
ENGINEERING QUANTITIES

Table 1 Takeoff Quantities

Item	Detail	Quantity	Units	Source	Comments
Disturbed Areas	Haul Road	3.8	acres	Figure 5[1]	Rip 18" depth and revegetate
	Open Pit Flat Areas	104.1	acres	Figure 5[1]	Rip 18" depth and revegetate; 50 foot offset from highwall
	Western Haul Road	14.8	acres	Figure 5[1]	Rip 18" depth and revegetate
	North Stockpile	4.3	acres	Figure 5[1]	Rip 18" depth and revegetate; Area is naturally vegetated, remains in estimate until financial assurance is released.
	Safety Berm around Open Pit Perimeter	30	acres	Figure 5[1]	Revegetate; Assume a 100 foot swath is disturbed to construct the safety berms and a 25 foot swath is disturbed to construct Chain link fence, it is assumed the livestock fence will not disturb the ground significantly enough to warrant re-seeding. Area only includes places that are not already being revegetated.
	West Canyon Stockpile	1.5	acres	Figure 5[1]	Rip 18" depth and revegetate; Area is naturally vegetated, remains in estimate until financial assurance is released.
	Ancillary Facilities	5.3	acres	Figure 5[1]	Rip 18" depth and revegetate
	Reclaimed Leach Stockpile and P-Plant	30.1	acres	Disturbed Area Limits from CDQAP[2] trimmed to conceptual open pit outline	Rip 18" depth and revegetate; Area was revegetated August, 2010. Remains in estimate for a 12-year revegetation establishment period.
	Allowance for Other Disturbed Areas	10.0	acres	-	Rip to 18" depth and revegetate; Substation, ancillary equipment areas
In-pit Stockpile	In-pit Stockpile West Slope Grading	55,946	cy	Figure 5[1]	-29% grade; 128-ft push
	In-pit Stockpile East Slope Grading	508,508	cy	Figure 5[1]	-29% fill grade, 415 ft push
	In-pit Stockpile	48.5	acres	Figure 5[1]	Rip 18" depth and revegetate
	Benches	3970	ft	Figure 5[1]	31.6 foot wide benches, 2% inslope, 2% longitudinal slope, 200 foot interbench slope length, 3:1 interbench slope, 3.5:1 overall slope.
Fencing and Berms	Construct Safety Berm Around Open Pit Perimeter	12,560	ft	Figure 5[1]	Berm: 1.5:1 side slope, 10 foot top width, 5 feet high, 2.8 cy/ft; 40 ft offset from conceptual open pit outline
	Chain Link Fence Open Pit Perimeter	5820	ft	Figure 5[1]	Six foot chain link fence
	Livestock Fence Around Western Haul Road & North Stockpile	2520	ft	Figure 5[1]	4 strand NMDOT-spec barbed wire fence with t posts, demolished 13 years after reclamation when vegetation has been established. Outer side of western haul road is fenced also prevent livestock access at the North Stockpile.
	Livestock Fence Around West Canyon Stockpile	1080	ft	Figure 5[1]	4 strand NMDOT-spec barbed wire fence with t posts, demolished 13 years after reclamation when vegetation has been established.
	Livestock Fence Other Disturbed Areas	1070	ft	Figure 5[1]	4 strand NMDOT-spec barbed wire fence with t posts, demolished 13 years after reclamation when vegetation has been established.
	Livestock Fence Around Primary Haul Road	2850	ft	Figure 5[1]	4 strand NMDOT-spec barbed wire fence with t posts, demolished 13 years after reclamation when vegetation has been established.
Ancillary Facility Demolition	Power Lines	2590	ft	Figure 1[1]	Measured to Permit boundary; Length of wire over expanded open pit that will be mined out is excluded; Assume poles are left for wildlife habitat. Assume takes 2 days to take down and dispose of wiring.
	Dewatering Pipeline Alignment #1	2460	ft	Figure 1[1]	Measured from conceptual open pit outline to permit boundary
	Dewatering Pipeline Alignment #2	1900	ft	Figure 1[1]	Measured from conceptual open pit outline to permit boundary
	Substation	4	days	-	Assumed takes 4 days for demolition.
Spanning Arch Culvert Demolition	Earth Fill Removal (dozer excavate, haul, spread)	3430	cy	As-builts[3]	The estimate assumes a new crossing will be constructed that is similar in design and material quantities to the existing structure. Earth fill is hauled an average of 300 feet and spread over the primary haul road.
	Concrete Foundation Removal (excavate, load, haul, grade)	730	cy	As-builts[3]	Concrete and metal debris is hauled about 1 mile to the in-pit stockpile and buried. A 60% swell factor was used for the concrete foundations loose cut volume.
	Metal arch Removal (excavate, load, haul, grade)	790	cy	As-builts[3]	Concrete and metal debris is hauled about 1 mile to the in-pit stockpile and buried. The 'loose cut' metal arch volume was reduced by 50%, assuming it is partially crushed during reclamation operations.
Other	Safety Signage	38	ea	-	Signs posted around the open pit highwall every 500 feet, 40-foot offset open pit outline 19,116-feet
	Abandon Monitoring 4-inch Well after 30-years	1705	ft.	-	LRW 1-3, 6, and 7 will be mined out or closed prior to 2017, LRW 4, 5, and 1236-2012-01 remain. Installing total of four new monitoring wells prior to 2017 for a total of 7 post closure monitoring wells. Assume the new wells are 4-inch 250 feet deep; LRW 4 is 175 feet deep with a 4-inch casing; LRW 5 is 118 feet deep with a 4-inch casing; assume 1236-2012-01 is a 4-inch well 250 feet deep.
	Erosion Control and Monitoring	-	-	-	Monthly for the first year, quarterly for 11 years for a total of 12 years.
	Erosion Control and Monitoring Reclaimed Copper Leach Stockpile and P-Plant	-	-	-	Once a year for 5 years. Area initially vegetated in August 2010, costs include remaining 5 years 2018 through 2022.
	Monitoring and Reporting	11	samples per quarter	DP-1236	7 Monitoring wells, 2 open pit samples, 1 North and South Seep Collections, and 1 California Gulch. Two of three sampling locations on California Gulch are mined out and one is replaced. Based on sampling in 2008, the estimate assumes water for sampling the two locations in California Gulch is present once a year. Little Rock Pit, and California Gulch are sampled for total and dissolved constituents (DP-1236), effectively doubling the number of samples each quarter. Seep Collections are dry two quarters a year. Sampling Frequency Years 1-2 Quarterly, Years 3-12 Semi-Annually, Years 13-30 Annually.
	Road Maintenance	-	-	-	Assume 20-foot wide roads, total length approximately 8,770 feet (well access roads and powerline access roads); Motor grader engaged for 12 hours prior to each sampling event (beginning in year 13 conducted annually until year 30)
	Water Truck and Motor Grader During Reclamation	-	-	-	Equivalent to loader time.

[1] Freeport-McMoRan Tyrone Inc., Telesto Solutions Inc., and Gilder Associates Inc. Updated Closure/Closeout Plan for the Little Rock Mine, June, 2014.

[2] Little Rock Mine Leach Pad and Precipitation Plant Reclamation Construction Design and Quality Assurance Plan By Telesto Solution Inc., May 2009.

[3] Deadman's Crossing as-builts, completed September 15, 2011, Freeport-McMoRan Tyrone Inc.

APPENDIX D
COST ESTIMATE (ELECTRONIC)

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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