Appendix I-2

Mine Backfill Work Plan

Mine Backfill Work Plan
Communications Hill
San Jose, California

Report Prepared for

McCloskey Consultants, Inc.

Report Prepared by

SRK Consulting (U.S.), Inc.
SRK Project Number 399400.010
April 28, 2014

Mine Backfill Work Plan
Communications Hill
San Jose, California

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Executive Summary

The Communications Hill Project (Project) is located approximately four miles southeast of downtown San Jose, California and consists of approximately 300 acres of relatively undeveloped land. The Project will consist of constructing residential housing and industrial parks, along with supporting access roads and infrastructure on the property. There is a historic mine situated beneath a small portion of the Project area that will be remediated to reduce the potential risk to public safety. Workings will be either (a) removed through cut, (b) excavated and backfilled with a compacted fill or (c) backfilled with a flowable backfill and remain in place. The project proponent requested that SRK develop a flowable backfill program to minimize the potential collapse of the remaining workings from propagating to the surface.

SRK has analyzed the probability of a potential collapse reaching the surface. The analysis is based on estimates of the potential failure area in a given drift, using estimated rock mass properties and height a potential collapse can propagate before it has been arrested due to bulking of the caved material. The results suggest that if some of the largest workings are disturbed, there is a potential that a collapse might reach the surface. However, if the workings are backfilled, the total probability of a collapse reaching the surface is reduced by at least two orders of magnitude and the surface subsidence is estimated to be less than 0.1 inch. This is considered negligible.

SRK has developed a backfill program that considers using surface access to backfill the workings by drilling a borehole and placing the flowable backfill remotely from the surface using a series of vertical borings. The placement of flowable backfill will be completed before surface regrading activities commence so as to minimize disturbance of the underground workings prior to backfilling. Reverse Circulation (RC) drilling will be used to drill boreholes on a regular spacing to intercept the known workings. The boreholes that intercept the workings will be used to tremi the flowable backfill, and to observe conditions and monitor the placement of flowable backfill via downhole video. In the event that remote access via boreholes does not prove feasible, access can be from the existing underground workings after stable ground conditions are assessed by a qualified mining geotechnical engineer as an alternative.

Directional drilling will be used to confirm the extent of the workings that have not been physically surveyed, such as the Main Tunnel identified in McNeil's map, South Portal or other workings that are encountered in the field during construction, prior to initiation of the flowable backfilling. In general, after backfilling is complete the material above each of the workings will then be removed by over-excavating material until a stable opening is reached (approximately 1.5 times the drift height). The limit of excavation would be assessed by a qualified geotechnical engineer in the field such that there is sufficient competent rock above the working to provide for stability. All workings that would remain after regrading would have been backfilled with either a Flowable Sand Fill (FSF) material in workings located beneath hill-side areas or self-consolidating concrete (SCC) fill in workings located beneath planned housing area.

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List of Abbreviations

The US System for weights and units has been used throughout this report. Tons are reported in short tons of 2,000 lbs. All currency is in U.S. dollars (US$) unless otherwise stated.

Abbreviation	Unit or Term
°	degree (degrees)
%	percent
amsl	above mean sea level
Col	Colluvium
CQA	Construction Quality Assurance
ft	foot or feet
HR	hydraulic radius
KJfs	Franciscan Sandstone
KJfs(c)	Franciscan Claystone
LMG	Low mobility grouting
N’	stability number
PPE	Personal Protection Equipment
Q	Rock Quality Index
Qal	Alluvium
QC	Quality Control
RC	Reverse Circulation
sf	square feet
RMR	Rock Mass Rating
sc/sp	Silica Carbonate with Serpentinite
sp	Serpentinite
US$	United States Dollar
yd^3	cubic yard

1 Introduction

The Communications Hill project is located approximately four miles southeast of downtown San Jose, California and consists of approximately 300 acres of relatively undeveloped land. The Project is to construct residential housing and industrial park uses, along with supporting access roads and infrastructure on the property.

There is a historic mine situated beneath a small portion of the Project area that needs to be remediated. The area above the underground workings will be used to generate excess cut and provide for access.

1.1 Purpose of the Report

In developing the site geologic and geotechnical hazards investigation report (Cornerstone, 2014), Cornerstone referred to the underground working remediation plan and recommendations made by Vector (Vector, 2009). Cornerstone's Mine Mitigation Summary indicates that workings will be:

- Removed by regrading. Based on the current regrading plan, a majority of the workings will be removed during the site regrading process as a cut borrow source; and
- Where the backfill material intersects the cut slope surface, the removal would include excavation of the working and placement of engineering fill.

To significantly reduce the risk of collapse or subsidence at the surface over in-place workings, McCloskey Consultants Inc. (McCloskey) requested that SRK Consulting, (U.S), Inc. (SRK) develop a program to backfill all known underground workings below the final planned grade. The purpose of this report is to provide the design and specifications for underground working flowable backfill. A description of the implementation sequence, a plan for monitoring construction quality and on-site health and safety requirements for on-site personnel was also developed. SRK's scope was completed as a desktop study, relying on the information provided by others.

2 Site Conditions

The property is situated on a topographic high known as Communications Hill. The proposed project site is within the Specific Plan Area near the top of the hill adjacent to the existing KB Home Tuscany Hills development, as shown in Figure 2.1. Communications Hill property is a northwest-southeast trending hill with moderately steep topography. The natural slopes angles range from 25° to 30° to the northeast. Elevation ranges from lows of approximately 150 feet (ft) above mean sea level (amsl) near the railroad to the northeast and 400 ft amsl at the crest of the hill along the southwest margin of the Project area (Cornerstone, 2014).

A historic underground mercury mine, known as the Hillsdale Mercury Mine, is located in the north-central portion of the site. The mine encompasses approximately six acres and includes a network of drifts, stopes, raises, shafts and portals. Mining began approximately 160 years ago and operations continued intermittently through the 1940's. Numerous investigations have been performed and have been reviewed by SRK. The documents include the following:

- HMH Engineering, unpublished interior survey of the underground portal workings to the east of the site as provided by McCloskey Consulting, 2014;
- McCloskey Consultants Inc., unpublished site report on the over-excavation of underground portal workings to the east of the site, 2014.
- Cornerstone Earth Group, Geologic and Geotechnical Hazards Investigation, Communications Hill – Phase 2, Communications Hill Boulevard, San Jose, California, April 21, 2014;
- Vector Engineering Inc., Preliminary Subsidence Analysis for the Communications Hill Project in San Jose California, June 2009;Norcal Geophysical Consultants, Electrical Resistivity Survey, Hillsdale Mercury Mine, San Jose, California, February 11, 2009;
- HMH Engineering, unpublished interior survey of the underground workings as provided by McCloskey Consulting, 2009;
- Norcal Geophysical Consultants, Geophysical Investigation, Hillsdale Mercury Mine, San Jose, California, August 16, 2007; and
- McNeil, "Hillsdale Mercury Mine, unpublished map of the underground workings locations, survey by Rolf Thoms, May, 1943.

The workings as currently delineated in reference to the currently planned subdivision and regrading plan are shown in Figure 2.2.

2.1 Geology and Geotechnical Conditions

2.1.1 Geology

Complete descriptions of the regional and local geology, as well as geologic hazards are presented by Cornerstone (2014) and are summarized below.

Local geology at the Project includes three main lithologies; alluvium, sand/claystone and serpentinite (sp). Quaternary alluvium fills the Santa Clara Valley and can be found at the base of Communications Hill on the northeastern margins of the Project. Late Jurassic to Cretaceous aged sandstone and claystone rocks of the Franciscan Assemblage are present at the Project in the topographically lower areas. Sp is the prevailing lithology at the Project and is present at the topographically higher areas making up the bulk of Communications Hill. The sp locally contains silica carbonate, the host rock for mercury mineralization at the historic Hillsdale Mercury Mine.

The major geologic units are summarized below:

- Colluvium (Col). Colluvium material is present on the slopes and at the base of the slopes on the north side of Communications Hill. The colluvium is composed of silty-clay with minor sand, gravel and cobbles derived from the adjacent hills;
- Alluvium (Qal). Holocene and Pleistocene age alluvium is present in the relatively flat areas of the Project on the north side of Communications Hill. The alluvium is composed of unconsolidated silty- and sandy-clay with gravel; and
- Franciscan Complex. The subunits of the Franciscan Complex are as follows:
    - Franciscan Sandstone (KJfs). The sandstone is medium-grained and is light olive-brown in color. Moderately hard siltstone and generally weak claystone interbeds are present throughout. At the Project the sandstone is generally found at the lower elevations and in the western areas;
    - Franciscan Claystone (KJfs(c)). The claystone is a sandy-claystone with a distinct black color. It is more laterally extensive than the KJfs but is generally present in the same lower elevations and western areas of the Project as the sandstone;
    - Sp and Silica Carbonate with Serpentinite (sc/sp). The sp contains local accumulations of ultramafic rocks as well as irregular-shaped bodies of sandstone, shale and silica carbonate. It varies in hardness and competency with harder sp making up the bedrock of Communications Hill and weathered, friable sp found away from the ridge-line; and
    - The silica carbonate is light gray to light orange in color and locally contains streaks of limonite, quartz, chalcedony and carbonate veins. It is the host rock for mercury mineralization at the historic mine and is interspersed throughout the mine.

2.1.2 Rock Mass Quality

Rock mass properties for the historic Hillsdale Mercury Mine were estimated by Vector in June of 2009 (Vector, 2009). Vector used the near-surface materials and engineered fill properties from Cornerstone (2009) to estimate properties for the stability of the rock crown above openings. No distinction was made between the rock mass quality of surface materials as characterized by Cornerstone (2009) and the deeper rocks because the Cornerstone (2009) materials are of lower quality than the deeper rocks, and the object of the estimation was to provide a conservative, worst case estimation. Because no laboratory testing results were available, empirical methods were used to estimate the intact and in-situ rock mass properties, specifically Rock Mass Rating (RMR) (Bieniawski, 1989) and the Hoek-Brown strength parameters (Hoek, et. al., 2002). Table 2.1.2.1 summarizes the rock mass classification use for the Project.

Table 2.1.2.1: Rock Mass Classification Used

Parameter	Units	Silica-Carbonate	Claystone/ Serpentinite	Weathered Rock	Clayey Soil
Density of in situ rock mass	pcf	168	159	145	110
UCS (intact)	psi	30,000	4,500	1500	100
RMR		80	45	25	5
Rock Class		Good/V.G.	Poor/V.P.	Ext. Poor	Exc. Poor
Elastic Modulus (intact OB)	M psi	24.0	10.0	0.73	0.12
Poisson's ratio (intact OB)		0.15	0.15	0.20	0.40
Elastic Modulus (RM OB)	M psi	18.1	1.4	0.73	0.12
UCS (RM OB)	psi	3,432.3	256.5		
P-wave Velocity (RM OB)	ft/sec	4,049	1,148	895	581
S-wave Velocity (RM OB)	ft/sec	2,598	737	550	239

Complete descriptions of the rock mass quality are presented in the Vector report (2009).

2.1.3 Groundwater Conditions

According to Vector (2009), the phreatic water level is below the mine with only one small (eight to ten foot deep) pool of water in the lowest, southern portion of the mine that is present year round. This pool of water is thought to seep out the old haulage drive to an abandoned portal location. The pool level is thought to fluctuate only slightly during major precipitation events when inflow to the workings is increased.

2.2 Underground Workings and Existing Conditions

2.2.1 Survey of Workings

The underground workings encompass approximately six acres of area in the north central portion of the Project. The mine workings are believed to date back to the 1850’s when mercury was in high demand during the California gold rush, becoming intermittent after that. The then current workings were mapped in 1943 (McNeil, 1943), and a copy of this map is included in Appendix A. NORCAL Geophysical, Inc. of Cotati, CA (Norcal) completed two geophysical investigations of the mine workings in 2007 and 2009. The purpose of the 2009 study was to establish a boundary defining the extents of the workings. Norcal concluded that mine workings exist on two different levels and that three portals are located on the northern slope of Communications Hill (Appendix B). Although this investigation provided a useful tool for locating areas of potential voids, the geophysical techniques were not capable of mapping the workings in detail.

In 2009, HMH completed underground mapping and surveying of the historic workings. The underground mapping completed by HMH was limited to open, safe-to-enter workings areas and areas which were not flooded. The 2009 underground surveying was completed using traditional surveying methods (e.g., measured points on walls, roof and floor). Any mined-out area or volume data which is based upon this mapping should be given a certain degree of uncertainty due to the possible lack of accessibility and nature of the survey. There is at least one known flooded area that was not accessible for surveying, but neither the historic mine map nor the geophysical work indicate that the workings extend significantly beyond the visible extents of this flooded area at the bottom of the mine.

A recent survey by McCloskey (2014) has confirmed the presence of historic workings in the southeastern area (referred to as the south portal and discussed in Section 2.2.2) that were noted in the 1943 McNeil map.

The 2009 HMH survey and 2014 McCloskey survey was compiled by HMH (2014) and is shown in the plan view in Figure 2.2.1.1 and in cross section in Figure 2.2.1.2.

An overlay of the 1943 mine map, 2009 HMH survey and 2014 McCloskey survey was prepared by HMH (2014) that incorporates the remediation methods proposed and SRK has included this as Figures 2.2.1.3 and 2.2.1.4. The survey shows good agreement with the 1943 mine map in areas that were accessible for the survey. SRK understands that neither end of the Main Tunnel identified in McNeil's map was accessible at the time of mapped in either the 2009 MHM survey or 2014 McCloskey survey. In addition, a short, isolated portal is shown south of the main workings on the 1943 map that was beyond the geophysical survey. Both workings will need to be evaluated prior to the backfilling of the workings, as described in Section 2.3.

2.2.2 Mine Portals

Three portals were identified and opened for the HMH survey in 2009 in addition to a fourth portal opened by McCloskey in 2014. The locations of the four portals are shown in Figure 2.2.1.1 and have the following approximate UTM coordinates:

- Portal #1: 1604987.1970' E 290034.2970' N;
- Portal #2: 1605033.7877' E 289983.0243' N;
- Portal #3: 1605200.5390' E 290024.6340' N; and
- Portal #4: 1605820.2244' E 289778.1931' N.

The drift inside Portal #1 (referred to as the "Upper Main Tunnel Portal" by McNeil) is approximately 68 ft in length and terminates before intersecting any other workings. The entirety of this working will be remediated by regrading and no access will be necessary for placement of flowable backfill. Portal #2 (not explicitly labeled by McNeil) and Portal #3 (referred to as "Tunnel Portal" by McNeil) are located in areas planned to be remediated by cut and their associated drifts make up a network of workings in areas of both remediation by over-excavation and placement of flowable backfill prior to regrading.

The workings progress deeper to southwest from the north side of the hill with approximately 360 ft of horizontal offset between the portals and the deepest workings. Elevation of the workings decreases from the portals southward, beginning at approximately 275 ft amsl at the portals to approximately 200 ft amsl in the furthest south advancements of the mine. The overall trend of the workings dips approximately 25° to southwest. The total length of the surveyed workings is approximately 1,950 lineal feet with drift widths ranging from narrow pinch-outs to larger mined out areas approximately 25 ft wide. The average width of the workings is estimated to be approximately seven feet. Heights of the workings range from less than four feet at the ends of some drifts to up to approximately 15 ft in some of the larger mined out areas. The average height of the workings is estimated to be approximately eight feet.

Survey results by McCloskey (2014) have confirmed the presence of a fourth portal (referred to as the south portal) to the east of the main workings and are presented in Appendix C. This drift is located beneath planned housing units and the portion to remain will require structural fill to mitigate the potential for surface subsidence.

2.2.3 Shafts

There are no known vertical ventilation raises or shafts that are currently open. Although, a historic, black-and-white aerial photograph from 1954 shows evidence of a circular depression that could be remnants of a backfilled or collapsed vertical shaft above the deepest part of the workings. In recent work by HMH to attempt to locate the potential vertical shaft, their work included both geophysical surveying and mechanical excavation (HMH, 2009). No evidence of an open shaft was found. It is likely that this was a vent raise or winze shaft excavated in a soft, sheared claystone. A connection with the underground workings was observed in the bottom of the mine at the time of the 2009 HMH survey work and a winze is noted on the historic workings map by McNeil. Because the claystone material is weak, the shaft has likely completely collapsed and/or been infilled as there is no evidence for it. A description for how such openings would be handled, should they be encountered during site grading is discussed in the project geotechnical report (Cornerstone, 2014).

2.2.4 Previous Analysis

In assessing the stability of the underground workings, Vector (2009) had concluded that the risk of subsidence could be separated into three risk levels in decreasing order of risk:

- Collapse-induced subsidence beneath residential structures;
- Collapse-induced subsidence beneath public roadways and utility easements; and
- Collapse-induced subsidence under sloped hillside.

Vector (2009) had performed 2-D numerical modeling using the Fast Lagrangian Analysis of Continua (FLAC) program that considered critical cross sections, mine geometry and material properties. Vector had recommended that in areas where the rock cover was less than 1.5 times the drift width and where the drift is located in the less competent serpentinite, the drift would not be expected to remain stable over the longer term, and these drifts should either be backfilled or manually collapsed prior to final regrading. Drifts deeper than this were predicted to be stable over the long-term which corroborates with these working having remained open as long as 160 years.

2.2.5 Probability of Collapse Reaching Surface Analysis

The current remediation plan calls for backfilling all the underground drifts that will not be removed by regrading or mechanically collapsed. However, there is a possibility that some small openings (i.e., not current collapsed but not accessible for surveying) might not be backfilled with the flowable backfill material as identifying all such small openings could be impractical and not cost effective compared to the collapse-induced subsidence risk they impose.

SRK has analyzed the probability of a potential collapse reaching the surface for unbackfilled and backfilled drifts from the workings presented in the 2009 HMH survey. The simplified analysis is based on (a) estimates of the potential failure area in a given drift given the estimated rock mass properties, and (b) estimates of the height a potential collapse can propagate before it has been arrested due to bulking of the caved material (Hanna et. al., 2013).

SRK has sub-divided the underground working areas to be backfilled into a series of zones, as shown on Figure 2.2.5.1. Only workings south of the dotted line in this figure will be backfilled and were analyzed. Table 2.2.5.1 provides a summary of the average geometry of each zone analyzed.

The potential for failure of the drift was estimated using an empirical stability method (Mathews, 1981) that uses the hydraulic radius (HR) of the roof area (i.e., HR = area ÷ perimeter) where the assumed failure length would be three times the drift width. The method is based on case histories that indicate the better the rock mass quality is the larger the hydraulic radius can be before roof failure occurs. Given the uncertainty in predicting the rock mass quality there is a range of HR over which failure is initiated. The empirical method relies on an estimate of the stability number (N') that is based on the rock mass quality (RMR or Q) and the manner in which fracturing intersects the drift, as shown on Figure 2.2.5.2. It was assumed that the minimum and maximum HR shown in this figure represents two standard deviations (95%) of the possible collapse range.

Hanna (2013) has used data from shallow coal mining-induced collapse events to develop a predictive tool for estimating the probability of caved zone reaching surface. The method predicts probabilities as a function of overburden thickness, as shown on Figure 2.2.5.3. This chart is based on a typical weak overburden rock mass and assumes constant mined opening size. SRK has adopted the same analysis procedure, but has made modifications to Hanna's probability chart to account for variable drift dimensions and variable caved material density (e.g., stronger overburden rock will have a higher void ratio than weak rock due to the fragment size distribution).

For each zone identified in (Table 2.2.5.1 and Figure 2.2.5.1) the probability of failure and probability of a cave propagating to surface was estimated in Table 2.2.5.2. The total probability of collapse reaching the surface is given by the product of three independent probabilities: probability of failure; probability of the cave reaching the surface; and probability of the cave material compacting to its ultimate density. The results shown on Table 2.2.5.2 suggest the probability of failure of any zone is extremely small. This is corroborated with these openings having remained open for as long as 160 years.

The analysis was repeated assuming a range of rock mass properties to see the effects on collapse-induced subsidence. The results for the conservative case that assumes completely weathered rock mass at depth are summarized on Table 2.2.5.3. These results suggest that the four largest zones (Z1-1, Z2-1, Z4-1, and Z4-4), if backfilled but then subsequently collapse, would have an estimated surface subsidence of less than 0.06 inch. This subsidence is considered negligible.

In summary, these analyses demonstrate that in the event that backfilling does not 100% fill all the voids, there is an extremely low probability that a collapse would occur, a subsidence feature would reach the surface, and the magnitude of associated surface subsidence would be essentially undetectable.

Table 2.2.5.1: Summary of the Average Geometry of Zones Analyzed

Zone	Ave Cover Depth (ft)	Width (ft)	Length (ft)	Drift Height (ft)	Assumed collapse length (ft)	Fill Volume (yd^3)	Comment
Z1-1	105	24	32	20	32	569	Chamber, water to south
Z1-2	87	11	94	13	69.12	498	Strike haulage
Z1-3	75	4.8	43	10	7.2	76	Footwall drive, may extend 67 ft
Z1-4	101	4.8	73	6	7.2	78	No survey data
Z2-1	55	17	27	20	25.5	340	Chamber, strike haulage, plug 1A
Z2-2	48	8	38	6	12	68	Connects Z5-1 chamber, plug 1B
Z2-3	67	5.5	46	6	8.25	56	Strike haulage
Z3-1	83	7	28	8	10.5	58	Connects Z1-1 chamber
Z3-2	43	4.8	25	6	7.2	27	May connect intersection to Z5-1
Z3-3	63	4.8	27	6	7.2	29	May connect Z5-1
Z4-1	43	9.8	34	16	14.7	197	2nd level
Z4-2	35	4.8	14	6	7.2	15	2nd level, plug 2B
Z4-3	43	7	16	8	10.5	33	2nd level, plug 2A
Z4-4	25	6	20	6	9	27	Inclined orepass/vent raise, fill at will
Z5-1	105	4.8	44	6	7.2	47	New, drift filled with water
Z5-2	60	4.8	65	6	7.2	69	New, 3rd level footwall drive to bottom of orepass
Z5-3	40	4.8	60	6	7.2	64	New, 2nd level west strike drift
Z5-4	Man. Cave						New, connection between 1st and 2nd levels on east at orepass
Z5-5	Excavate						New, 2nd level east strike drift
Z5-6	Excavate						New, 1st level to 3rd level hangingwall vent raise
Z5-7	Excavate						New, 3rd level haulage drive to collapse portal
	Ave/Total	**7.9**	**686**	**9.1**		**2,251**	

Table 2.2.5.2: Estimated Probability of Failure and Cave to Surface by Zone for Estimated Rock Mass Properties

Zone	Potential Collapse Height (ft)	OB Above Cave (ft)	Total Probability Cave Reaches Surface (Filled)
Z1-1	79.7	25.3	<0.01%
Z1-2	44.1	42.9	<0.01%
Z1-3	20.5	54.5	<0.01%
Z1-4	19.6	81.4	<0.01%
Z2-1	68.0	-	<0.01%
Z2-2	24.5	23.5	<0.01%
Z2-3	21.3	45.7	<0.01%
Z3-1	27.7	55.3	<0.01%
Z3-2	19.6	23.4	<0.01%
Z3-2	19.6	23.4	<0.01%
Z4-1	42.3	0.7	<0.01%
Z4-2	19.6	15.4	<0.01%
Z4-3	27.7	15.3	<0.01%
Z4-4	22.3	2.7	<0.01%
Z5-1	19.6	85.4	<0.01%
Z5-2	19.6	40.4	<0.01%
Z5-3	19.6	20.4	<0.01%

Table 2.2.5.3: Estimated Probability of Failure and Cave to Surface by Zone for Highly Weathered Rock Mass Properties

Zone	Potential Collapse Height (ft)	OB Above Cave (ft)	Total Probability Cave Reaches Surface (Filled)	Calc Subsidence Filled (in)
Z1-1	104.9	0.1	0.32%	0.051
Z1-2	58.4	28.6	0.01%	
Z1-3	30.6	44.4	<0.01%	
Z1-4	26.1	74.9	<0.01%	
Z2-1	90.1	-	1.07%	0.059
Z2-2	32.6	15.4	0.01%	
Z2-3	28.1	38.9	<0.01%	
Z3-1	36.6	46.4	<0.01%	
Z3-2	26.1	16.9	<0.01%	
Z3-3	26.1	36.9	<0.01%	
Z4-1	58.8	-	0.08%	0.059
Z4-2	26.1	8.9	<0.01%	
Z4-3	36.6	6.4	0.01%	
Z4-4	29.3	-	0.01%	0.059
Z5-1	26.1	78.9	<0.01%	
Z5-2	26.1	33.9	<0.01%	
Z5-3	26.1	13.9	<0.01%	

2.2.6 Remediation Plan

Vector (2009) had identified that workings with a rock cover 1.5 times the drift width in typical good quality rock would remain stable. However, to reduce the risk of subsidence on surface, the project proponent has requested that SRK develop a program to backfill all currently delineated underground workings that are below the final planned grade.

SRK has developed a remediation plan for the workings that would include backfilling of the remaining drift areas which are not remediated by either regrading or over-excavation. The purpose of this backfill is to fill the mine workings and to minimize the volume of the voids left in place. Even though SRK's analysis did not include the Upper Main Tunnel Portal and South Eastern Portal shown in the 1943 McNeil map, the remediation recommendations and approach are considered valid for all workings.

The flowable backfill material will be either a Flowable Sand Fill (FSF) or self-consolidating concrete (SCC) fill depending on the drift's proximity to planned housing units.

- The FSF material in hill-side slope areas will be a competent sand fill material with low viscosity characteristics so that the backfill can be pumped long distances and flow in the voids (i.e., up to 200 ft in horizontal drifts and more in inclined drifts) and does not require to be a cement slurry with significant strength properties; and
- The SCC fill will be used in drifts located beneath planned housing area and has structural characteristics comparable to concrete.

The Earthworks Contractor will submit a copy of the FSF and SCC mix designs for review and approval by SRK.

It should be noted that the Main Tunnel identified in McNeil's map, (currently not accessible) will be evaluated using directional drilling to determine whether portions of this tunnel remain open. If there is evidence that portions remain open and are located in hill-side slope areas not planned for houses, and they will not be removed from cut activities, then FSF backfill will be placed. Open drifts located beneath planned housing will be backfilled with a SCC structural fill.

2.2.7 FSF Backfill

SRK has selected a sand / foam reagent (Arx Transport™) as the FSF, to make the material more flowable and act similar to more conventional sand-and-water slurry. The foam technology generally involves the introduction of engineered bubbles that replace water as the main transport medium for underground working backfilling applications. The foam entrains the sand, allowing it to flow into the mine voids, behaving as a self-leveling, viscous fluid (Figure 2.2.6.1). Given that the proposed FSF is a foam-sand slurry, the in situ properties of the relatively uniform sand after the bubbles dissipate is anticipated to be similar to hydraulic sand fill. The strength would likely be characterized as have an internal friction angle of 34° to 36° and zero cohesion. Assuming minimal slurry pressures during placement, the material is anticipated to have an initial in situ void ratio of about 0.40 to 0.60 and a relative density of about 30% to 40% depending on confining pressures. The best soil mixture to use for FSF material is silty sand with a maximum of about 30% fines.

The foam is 100% biodegradable and dissipates after short time leaving the void filled with sand. The low viscosity, FSF fill can be easily pumped long distances to fill voids (i.e., up to about 200 ft in horizontal drifts and more in inclined drifts). The 25° dip of the mined openings will allow the mix to flow for relatively long distances (less than 200 ft). The foam is 100% biodegradable, and dissipates after short time leaving the void filled with sand. Details of the foam agent are presented in Appendix D.

SRK would expect that FSF will be generated on site using a foam generator, water and wetting agents. The foam is mixed with sand in a concrete mixer truck where the foam takes the place of water, making the sand act similar to hydraulic sand-and-water slurry. The sand can be delivered to the site in transit mixers in 6 cubic yard (yd^3) loads, whereupon approximately 3 yd^3 of foam is mixed for approximately five minutes. The FSF (foamed sand slurry) is then dropped via gravity in a 4-inch PVC casing installed in the borehole. The progress of the FSF will then be monitored by a video camera installed in an observation borehole approximately 50 ft away (Figure 2.2.6.2).

2.2.8 SCC Backfill

SCC fill does not require vibration for placing and compaction. It is able to flow under its own weight, filling voids and achieving full compaction. The hardened concrete is dense, homogeneous and has the same engineering properties and durability as traditional vibrated concrete. The fluidity and segregation resistance of SCC ensures a high level of homogeneity, minimal voids and uniform strength.

Mixture proportions for SCC differ from those of ordinary concrete in that they have more powder content and less coarse aggregate. SCC incorporates high range water reducers (HRWR, super plasticisers) in larger amounts and frequently a viscosity modifying agent (VMA) in small doses. The selection of aggregate materials for SCC consider: (a) limits on the amount of marginally unsuitable aggregates, especially those deviating from ideal shapes and sizes, (b) choice of HRWR, (c) choice of VMA, and (d) interaction and compatibility between cement, HRWR, and VMA.

The SCC fill does not require a high cured strength because the fill is not exposed to elevated shear stresses. The modulus of elasticity should be about 1,450 Kips/sqin (10 GPa), which corresponds to a compressive strength of about 1100 psi (8 MPa). The SCC mix should comply with applicable ASTM standards.

The handling and monitoring of the SCC fill will be same as used for FSF.

2.3 Backfill Remediation Program

SRK has developed the program assuming that the workings will be backfilled prior to re-contouring activities to reduce the risk of collapsing sections during heavy equipment regrading over the workings. The flowable backfill (either FSF or SCC backfill) that is exposed during regrading will be over excavated and backfilled. This sequence may be adjusted somewhat, depending on conditions encountered in the field. The primary plan is to remotely access the workings via boreholes drilled from the surface, as discussed in Section 2.3.1. In the event that remote access via boreholes does not prove feasible, access can be from the existing underground workings as presented in Section 2.3.2, but this will require improvements to the existing workings.

Because the workings in the main area dip to the southwest and areas to be mitigated in-place are the deepest and furthest in the south workings, the flowable backfill program will be sequenced to place flowable backfill in the lowest southern workings first continuing up-dip northward to the future cut slope areas.

In the area around the south portal, Cornerstone (2014) has recommended that a buttress needs to be installed to maintain overall slope stability in this area. SRK understands that the construction of this buttress will result in the removal of a portion of the portal. In the event that the entire south portal is not removed, the remaining part will require backfill. Based on the McCloskey survey (2014), the working floor of the eastern workings was noted as being almost flat. The backfill program should progress in a similar manner to the main area, starting at the furthest most point and filling towards the entrance, but will require a bulkhead sized sufficiently to hold the SCC fill. The backfill will consist of either a flowable backfill in hillside slope areas or a SCC structural fill in areas located within the limits of the planned housing. Directional drilling will be used to confirm the extent of the workings prior to initiation of the flowable backfill.

SRK recommends that the sequence of the remediation be as follows:

- Step 1: Establish underground working boundary limits – Based on the characterization results (i.e., the underground mapping, additional excavation work to identify portal locations, the proposed directional drilling into the Main Tunnel, and the geophysical results), the limits of the underground workings would be identified along the existing ground surface. The limits would include offsets to account for depth below final grade surface. Regular cut and fill activities could be performed outside of these limits, with steps 2 through 5 performed for workings within these limits;
- Step 2: Initial portal excavations – The material above each of the portals will be removed by over-excavating to access the open workings. This includes removing collapsed material until a stable opening is reached. The limit of excavation would be assessed by a qualified geotechnical engineer in the field such that there is sufficient competent rock above the drift to provide for stability (i.e., approximately 1.5 times the drift width);
- Step 3: Mitigated in-place – All workings would be backfilled with flowable backfill. This step includes drilling access boreholes, remote scoping of drifts and placing the flowable backfill. This step is described in more detail in Section 2.3;
- Step 4: Remediation by regrading – In areas where the underground workings will be above the final planned grade, the backfill and native material adjacent to the underground workings will be removed by regrading; and
- Step 5: Remediation by over-excavation – Backfill in Portal areas that are located within the area of geotechnical over-excavation will be removed, the material above each of the portals removed until a stable opening is reached and filled to final grade with compacted fill material.

The greatest uncertainty in the backfilling of the underground workings is the condition of the Main Tunnel identified by McNeil but not entirely surveyed by HMH. Review of historic air photos by McCloskey (2014) suggest that extensive cuts were performed in this area in the 1980's as part of the historic quarrying operations, so the extent of remaining tunnel is not known. It is likely that the remaining tunnel might still be open, but is known to be caved at both ends (McCloskey, 2014). It can be assumed that a portion of this tunnel will not be very deep after the grading is made in the area. Additional investigation will be conducted during grading. It is assumed for planning purposes that this drift could remain partially open. The portion of the tunnel remaining after grading would be abandoned in place as long as the rock cover is adequate and harder bedrocks are competent. The tunnel will be mitigated with the flowable backfill in hillside slope areas not planned for houses and with a SCC structural fill in areas located beneath planned housing. Directional drilling will be used to confirm the extent of the workings prior to initiation of the flowable backfilling.

2.3.1 Remote Access from Surface

The preferred option for accessing the underground workings and placing the flowable backfill is remotely from the surface using a series of vertical borings. The placement of flowable backfill will be completed before surface regrading activities commence so as to minimize disturbance of the underground workings prior to backfilling. Reverse Circulation (RC) drilling will be used to drill boreholes on a regular spacing to intercept the known workings. The boreholes that intercept the workings will be used to tremi the flowable backfill, and to observe conditions and monitor the placement of flowable backfill via downhole video.

Advantages to placing the flowable backfill remote via boreholes includes not having to stabilize the workings and using the head differential (difference in elevation from the surface to the working which will be a minimum of 50 ft) to force the flowable backfill into the underground workings. Borehole lights and cameras will be used in observation boreholes to verify the effectiveness of placing the flowable backfill.

According to Vector (2009), there is pooled water in the deepest drifts towards the southwest end of the mine that was clear and estimated to be eight to ten feet deep. Because pooled water is restricted to the lowest, southern portion of the mine, it is not expected to affect the actual placement of flowable backfill. The flowable backfill will flow when deposited underwater, but experience suggests flow distances are approximately 50 ft from the borehole (Hanna 2013).

SRK has laid out the boreholes on approximate 50 ft spacing as shown on Figure 2.3.1.1 with focus being the larger chambers that were known to be open at the time the underground survey was conducted.

Underground Backfilling Plan

The flowable backfill program will take place in the following order:

- Perform steps 1 and 2 as noted in Section 2.3;
- Access to the drill pads and lay-down areas will be done using surface excavation equipment to clear access to the drill locations and appropriately level the drilling pad for the drill rig;
- Drilling of reverse circulation (RC) in PQ size boreholes (approximately 5-inch diameter) to target specific working areas and provide for access and monitoring of flowable backfill placement. A 4-inch PVC casing will be inserted in the boreholes;
- The borehole camera will be lowered into the workings and the extents of the void verified. The camera should have lights to enhance the visibility;
- Placement of flowable Backfill will commence from boreholes with access to the deepest portion of the workings (i.e., the most southern workings). Based on borehole scoping, it may be necessary to pump water from the workings prior to backfilling. If it is determined that pumping is necessary, then a downhole pump will be lowered into the borehole and pumping commenced until no additional water is available. Pumping water will be discharged into a Baker tank and transported offsite for disposal as necessary;
- The flowable backfill will then be dropped by gravity-flow down the 4-inch PVC casing in the borehole (tremied). The progress of the foamed slurry flow will be monitored by the video camera installed in a nearby observation borehole approximately 50 ft away;
- The flowable backfill will advance to boreholes at progressively shallower across the mine. The following borehole backfill sequencing is recommended, as shown on Figure 2.3.2.1:
    - Series A boreholes are filled first using the Series B boreholes to observe and monitor the backfilling;
    - Series B boreholes are filled next using the Series C boreholes to observe and monitor the backfilling; and
    - D series of boreholes are filled next using the open portals or observation boreholes for monitoring completion of the backfilling.

After waiting a one to two weeks to monitor settlement of the sand, a borehole will be drilled about 10 ft from one of the slurry boreholes and scoped to check for settlement voids. If a significant void is observed, additional foam sand slurry or low mobility grouting (LMG) can be pumped into the sand-filled void through the borehole to fill the void.

Once backfilling is complete, remediation by over-excavation and remediation by regrading of the remaining underground workings would then be performed. The work plans for these activities are described elsewhere for the project.

2.3.2 Alternative Underground Access

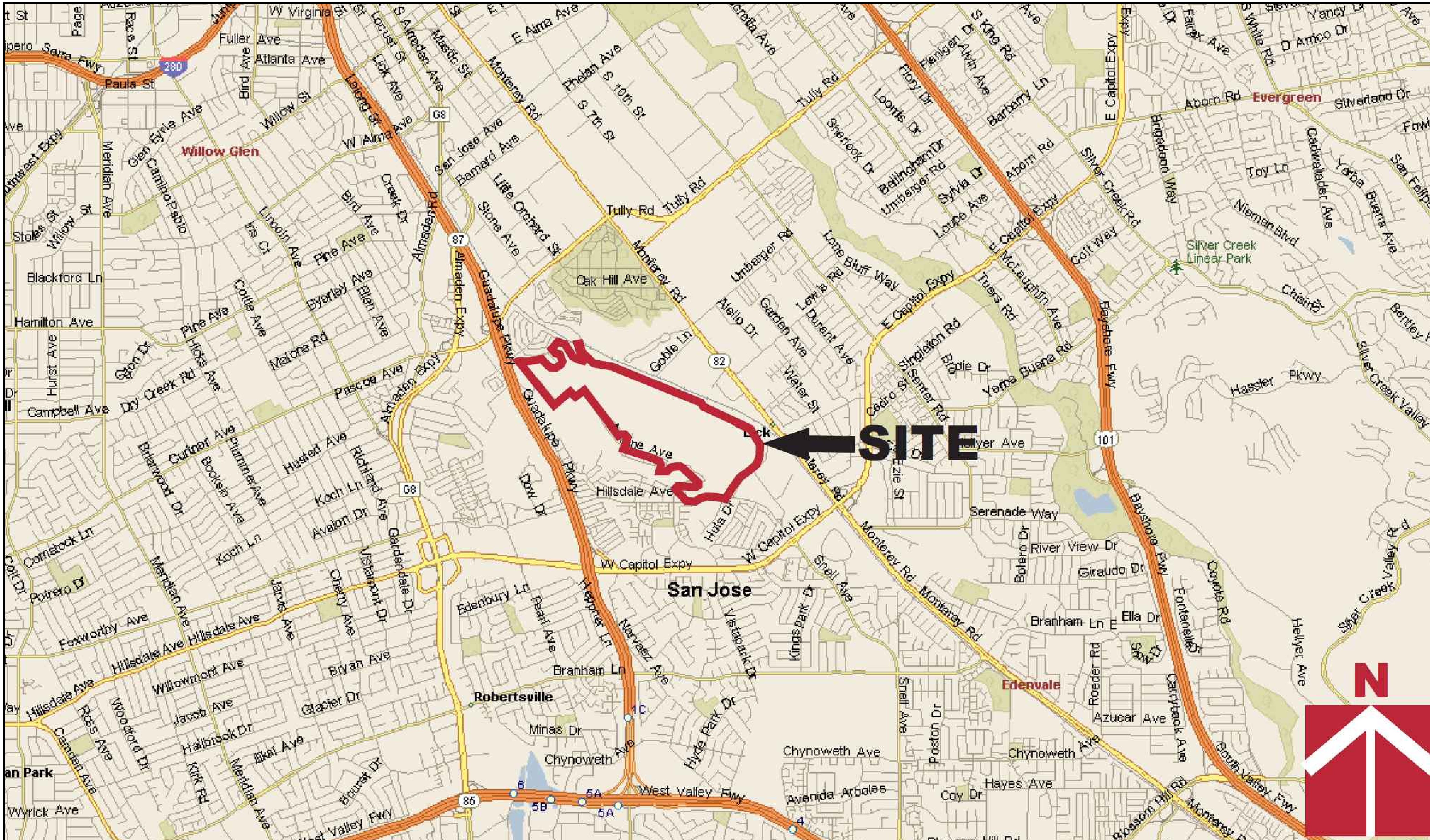
In the event that remote access via boreholes does not prove feasible, access can be from the existing underground workings after stable ground conditions are assessed by a qualified mining geotechnical engineer. The advantage of using the existing underground access is that backfilling of the workings can be visually monitored and the sequence is in a retreating manner (from the furthest, lowest point retreating to the portal access). The disadvantage is the uncertainty in ground stability and the need to take extra safety precautions.

Backfill Plan

The backfill program will take place in the following order:

- Clearing, regrading and recontouring of access roads and portal lay-down areas;
- Stabilize necessary portals and drifts. Necessary steps will need to be taken to ensure that personnel can safely access the mine. This will require scaling of any potentially unstable ground. Ventilation installation, if required, should be completed simultaneously with advancement of portal and drift stabilization;
- Install ventilation if required (to be completed simultaneously with stabilization). In order to safely access and work in the bulkhead locations, personnel will need to check and monitor air quality. If air quality is deemed to be hazardous then ventilation to the bulkhead locations will be required;
- Dewater underground workings as required. The wet area will be pumped the extent reasonably possible using a submersible pump, and the back of the pool inspected for the presence of additional open workings;
- The flowable backfill would be placed using a 3 or 4-inch flexible tremie hose line;
- Backfill will progress beginning in the deepest and furthest parts of the mine working toward the portals. Flowable backfill will be pumped from surface at the portals into the mine. Pumping hoses will be withdrawn or shortened as flowable backfill progresses;
- The following backfill sequencing is recommended for the main workings (Figures 2.3.2.1 through 2.3.2.3):
    - o Portal #2 provides the shortest access routes, access and layout would be developed to this area. Approximately 250 ft of drift stabilization would be performed for access route 2-A. Dewatering would be performed at the low point;
    - o Approximately 350 ft of drift stabilization would be performed for access route 2-B (including 2-B1, 2-B2 and 2-B3 and 2-B4). In the event that 2-B2 (Main tunnel identified by McNeil) is inaccessible, directional drilling will be used to confirm the extent of the workings the working will need to be mitigated with FSF or SCC fill using remote access from the surface;

- Flowable backfill would be placed alternately using access route 2-A and 2-B (including 2-B1 and 2-B2), starting at the lowest point and progressing upward;
- Approximately 100 ft of drift stabilization would be performed for access route 2-C; and
- Flowable backfill would be placed using access route 2-C, starting at the lowest point and progressing upward.



REFERENCE:
COMMUNICATION HILL PHASE II, REPORT BY
CORNERSTONE EARTH GROUP, 12/17/13

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SRK JOB NO.: 399400.010

FILE NAME: 399400.010.Rev.A.Fig.2.1.Vicinity.Map.2014-04-25.dwg

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MINE BACKFILL WORK PLAN

VICINITY MAP

DATE:	APPROVED:	FIGURE:	REVISION NO.
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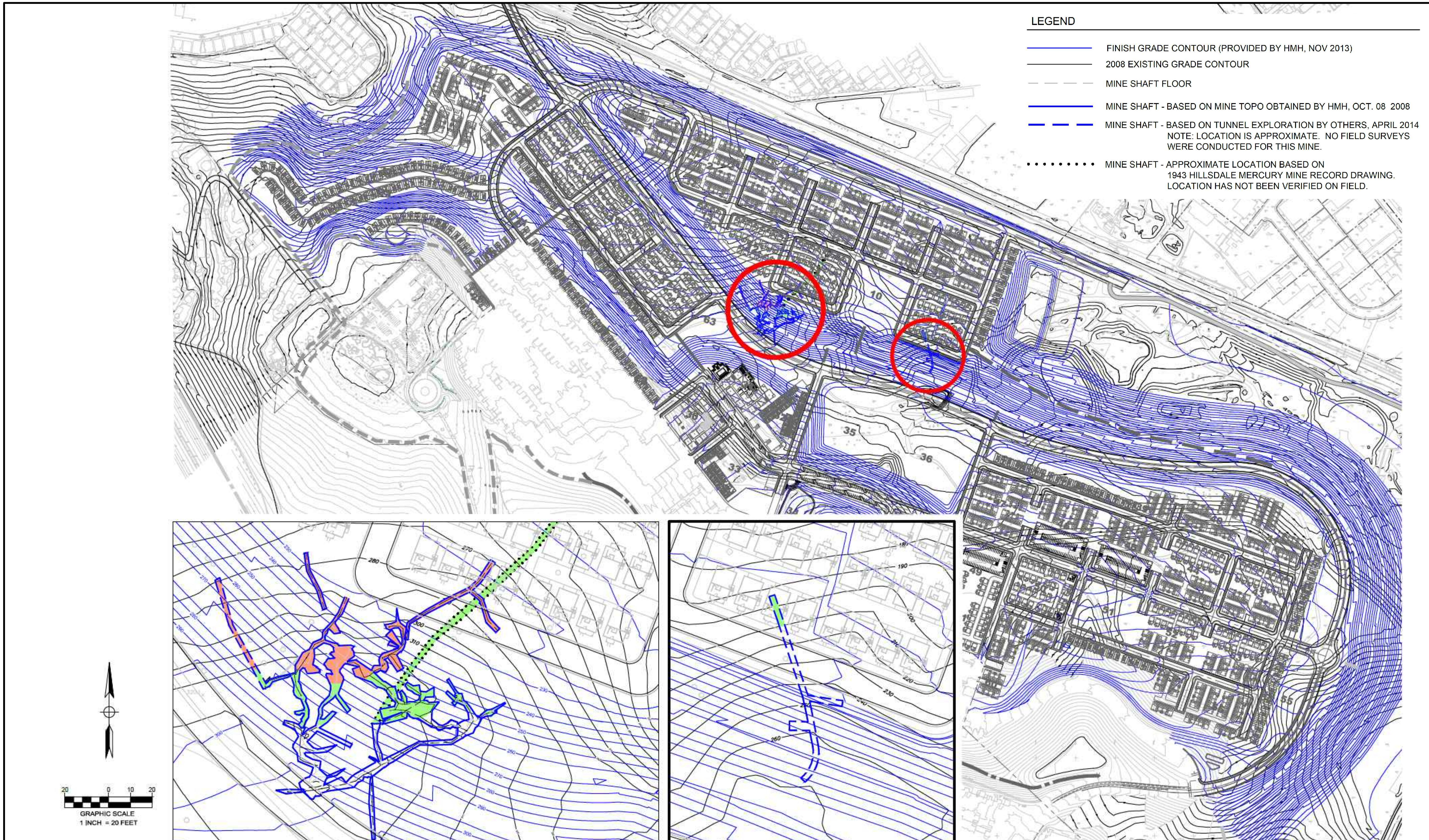

REFERENCE:
TOPOGRAPHIC MINE SURVEY EXHIBIT, PROVIDED TO SRK BY McCLOSKEY. MINE MAPPING WAS PERFORMED BY HMH ENGINEERS IN 2009 AND McCLOSKEY IN 2014.

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MINE BACKFILL WORK PLAN

UNDERGROUND WORKINGS (HMH, 2014)

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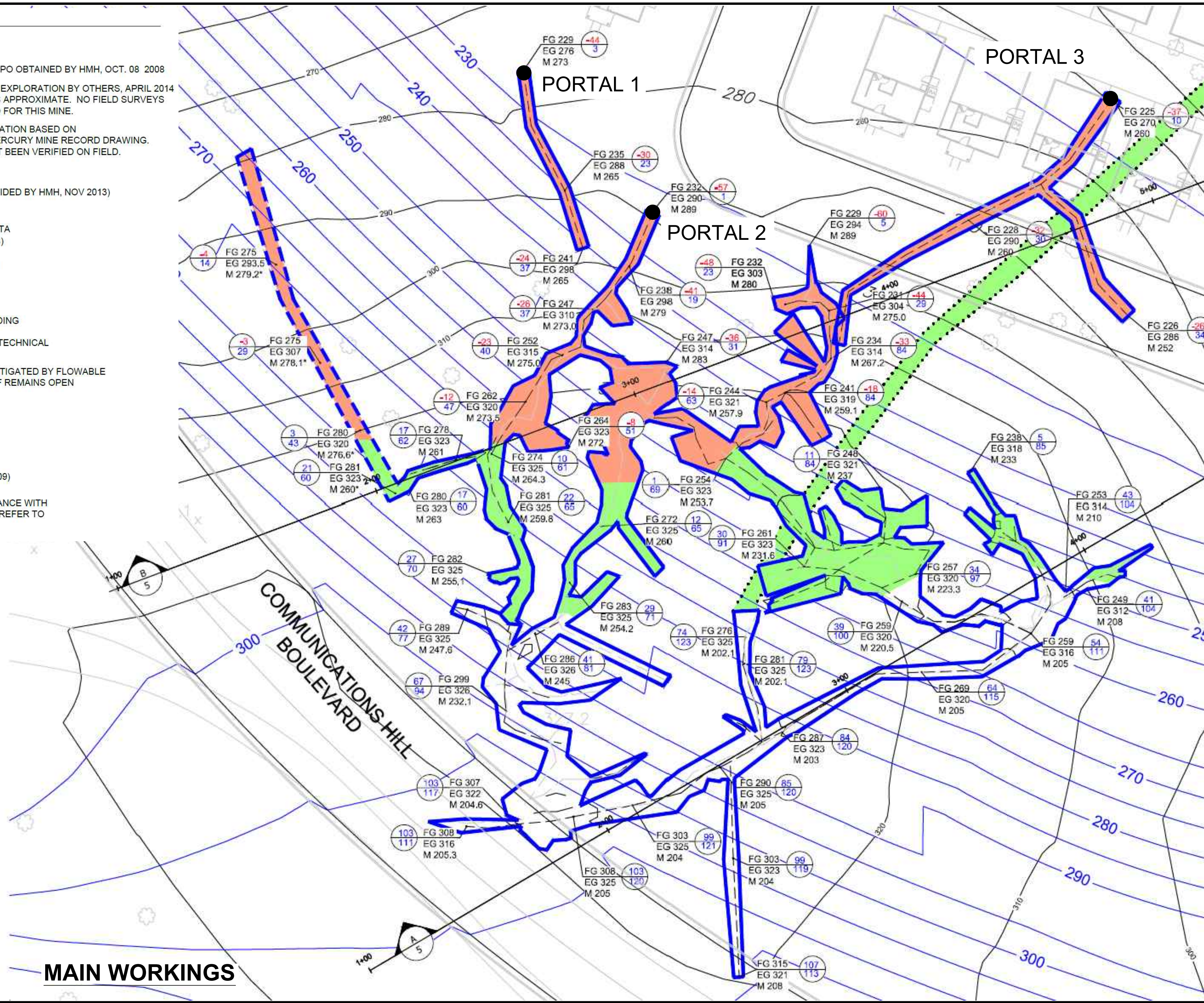
LEGEND

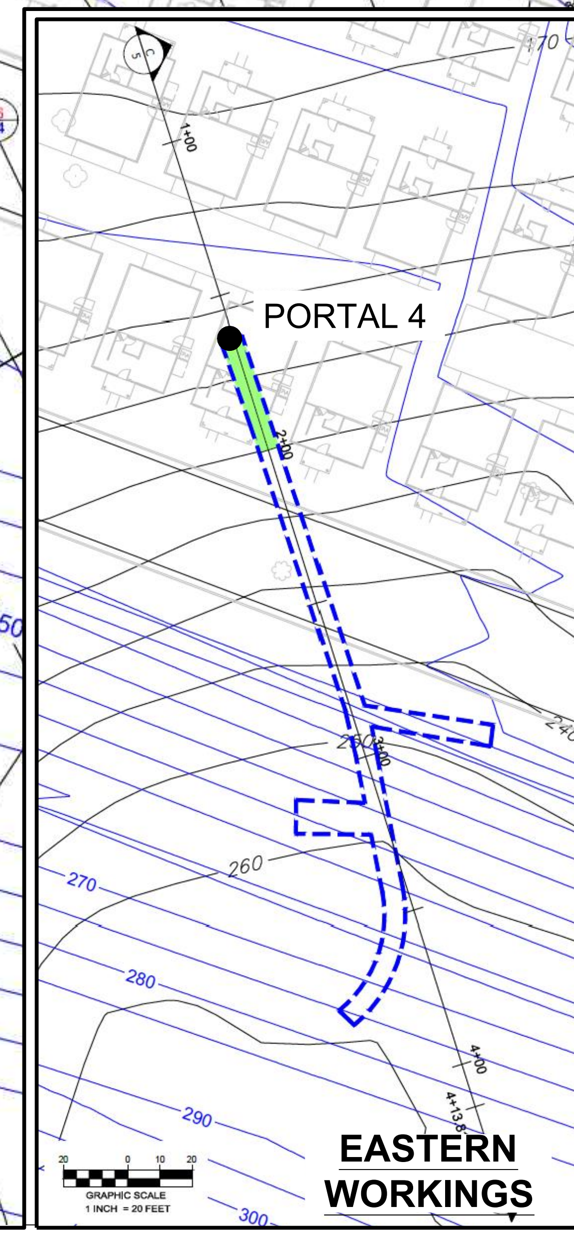
- — — — MINE SHAFT FLOOR
- MINE SHAFT - BASED ON MINE TOPO OBTAINED BY HMH, OCT. 08 2008
- MINE SHAFT - BASED ON TUNNEL EXPLORATION BY OTHERS, APRIL 2014 NOTE: LOCATION IS APPROXIMATE. NO FIELD SURVEYS WERE CONDUCTED FOR THIS MINE.
- MINE SHAFT - APPROXIMATE LOCATION BASED ON 1943 HILLSDALE MERCURY MINE RECORD DRAWING. LOCATION HAS NOT BEEN VERIFIED ON FIELD.
- 2008 EXISTING CONTOUR
- FG XXX — FINISH GRADE ELEVATION (PROVIDED BY HMH, NOV 2013)
- EG XXX — EXISTING GRADE ELEVATION
- M XXX — MINE ELEVATION (MINE TOPO DATA PROVIDED BY HMH, OCT. 08, 2008)
- # / # — DEPTH QUANTITY FROM FINISH GRADE TO MINE FLOOR / DEPTH FROM EXISTING GRADE TO MINE FLOOR
- MINE SHAFT REMOVED BY GRADING
- MINE SHAFT REMOVED BY GEOTECHNICAL OVER-EXCAVATION
- MINE SHAFT TO REMAIN AND MITIGATED BY FLOWABLE SAND OR CEMENT GROUTING IF REMAINS OPEN (± 3300 CY OF FILL)

NOTES

M XXX.X* ELEVATION PROVIDED BY STRATEGIC ENGINEERING AND SCIENCE, INC. (JAN. 28, 2009)

ALL MINE MITIGATION SHALL BE IN CONFORMANCE WITH SRK CONSULTING, INC. RECOMMENDATIONS (REFER TO MINE BACKFILL WORK PLAN, APRIL 2014)





REFERENCE:
TOPOGRAPHIC MINE SURVEY EXHIBIT, PROVIDED TO SRK BY McCLOSKEY. MINE MAPPING WAS PERFORMED BY HMH ENGINEERS IN 2009 AND McCLOSKEY 2014..

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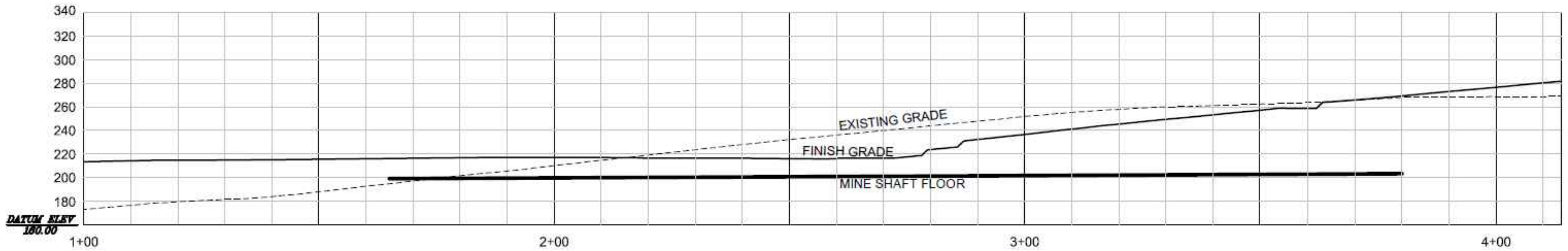
srk consulting	McCloskey Consultants ENVIRONMENTAL & GEOLOGIC ASSESSMENTS	MINE BACKFILL WORK PLAN
SRK JOB NO.: 399400.010	COMMUNICATIONS HILL SAN JOSE, CALIFORNIA	PLAN VIEW OF HISTORICAL WORKINGS (HMH, 2014)
FILE NAME: 399400.010.Rev.A.Fig.2.2.1.1.2014-04-25.dwg		DATE: APR. 2014 · APPROVED: JT · FIGURE: 2.2.1.1 · REVISION NO.: A

LEGEND

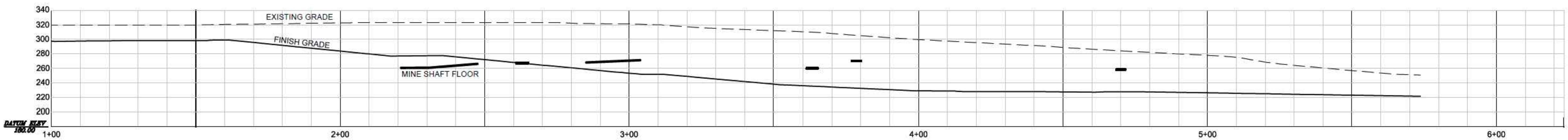
- MINE SHAFT FLOOR
- EXISTING GRADE (2008)
- FINISHED GRADE

NOTE

ALL MINE MITIGATION SHALL BE IN CONFORMANCE WITH SRK CONSULTING, INC. RECOMMENDATIONS (REFER TO MINE BACKFILL WORK PLAN, APRIL 2014)



C SECTION
NTS



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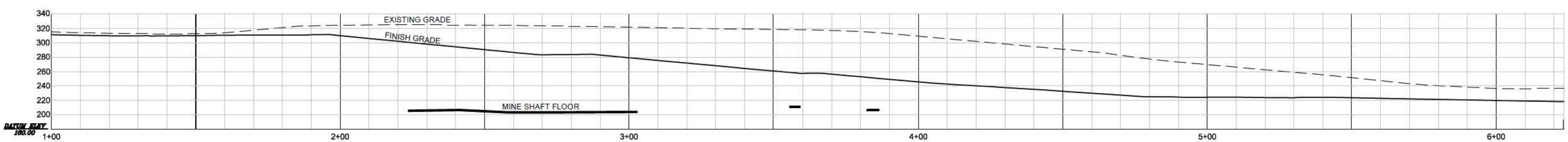

A SECTION
NTS

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REFERENCE:
TOPOGRAPHIC MINE SURVEY EXHIBIT, PROVIDED TO SRK BY McCLOSKEY. MINE MAPPING WAS PERFORMED BY HMH ENGINEERS IN 2009 AND McCLOSKEY 2014..

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SRK JOB NO.:	399400.010
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COMMUNICATIONS HILL
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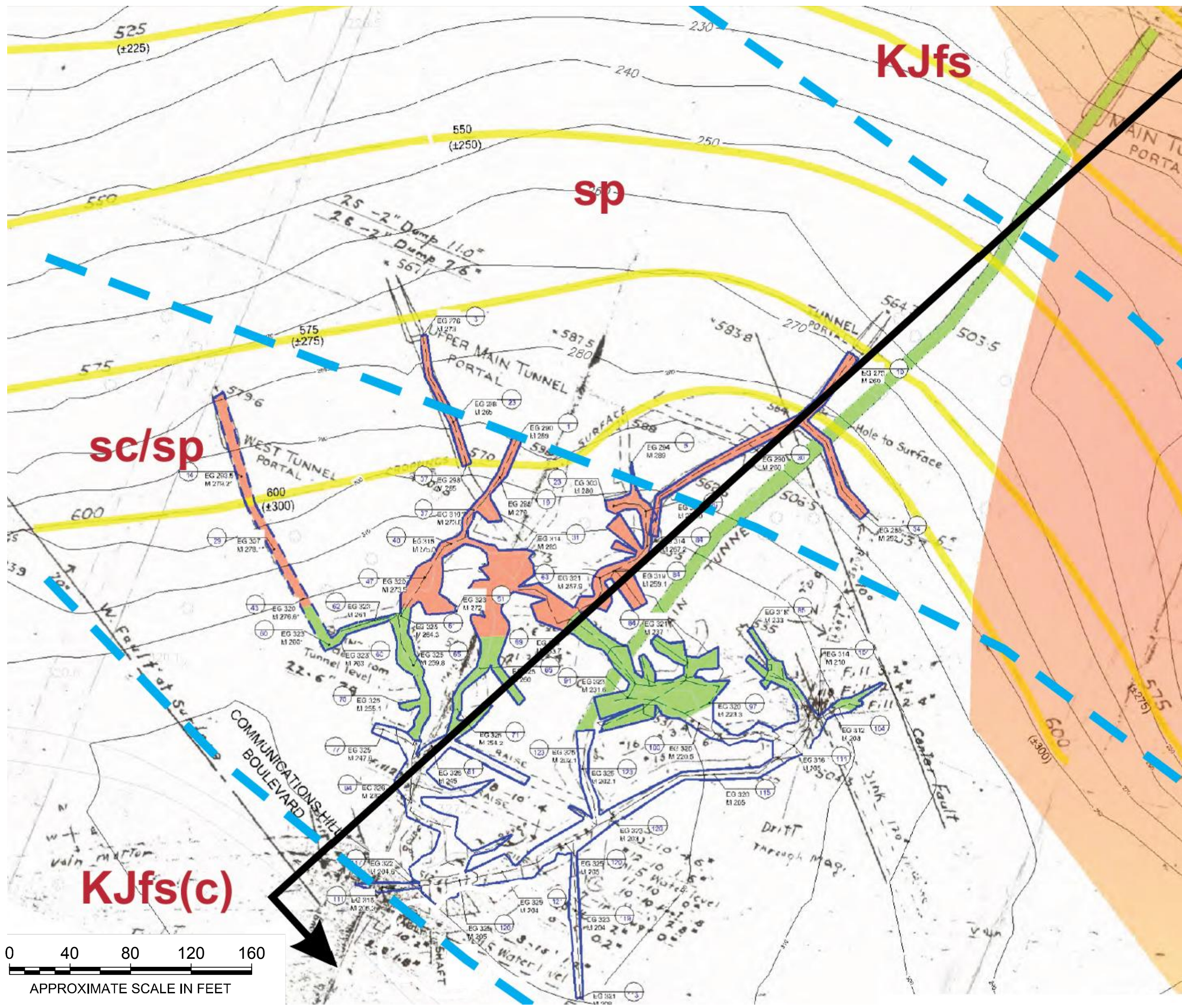
MINE BACKFILL WORK PLAN

CROSS SECTION OF HISTORICAL WORKINGS (HMH, 2014)

DATE:	APPROVED:	FIGURE:	REVISION NO.
APR. 2014	JT	2.2.1.2	A



Explanation

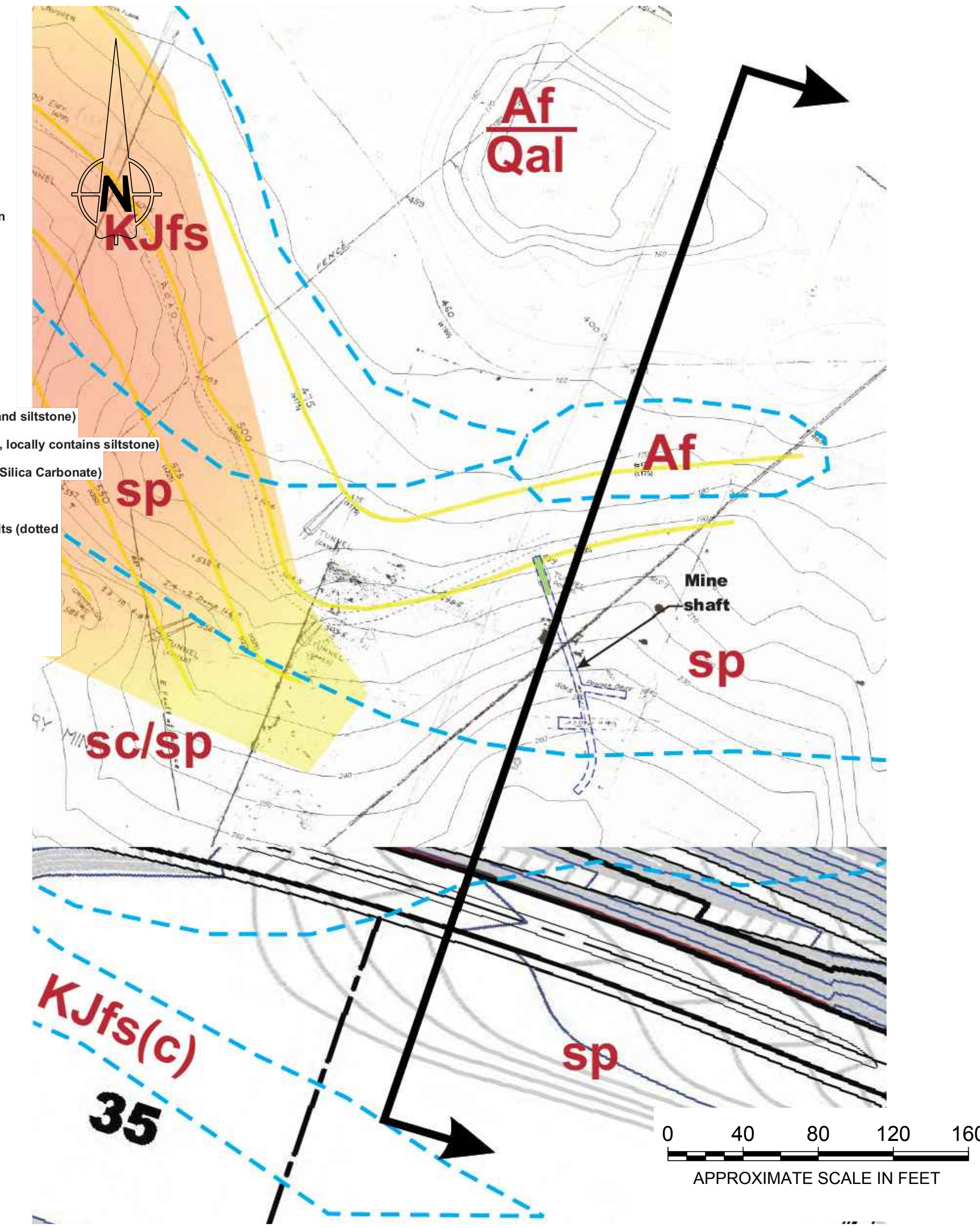
Symbols

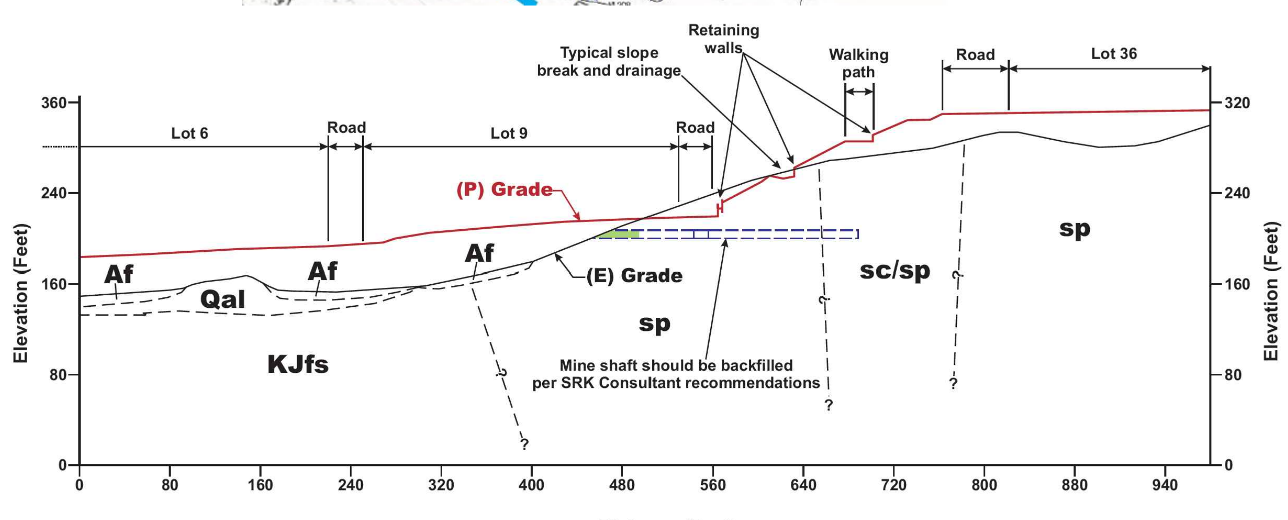
- Mine shaft wall
- Mine shaft floor
- Mine shaft ceiling
- Mine shaft removed by grading
- Mine shaft removed by geotechnical over-excavation
- Mine shaft to remain, but backfilled
- Cut (From 2008 EG to 1943 EG)
- Approximate location of geologic cross section

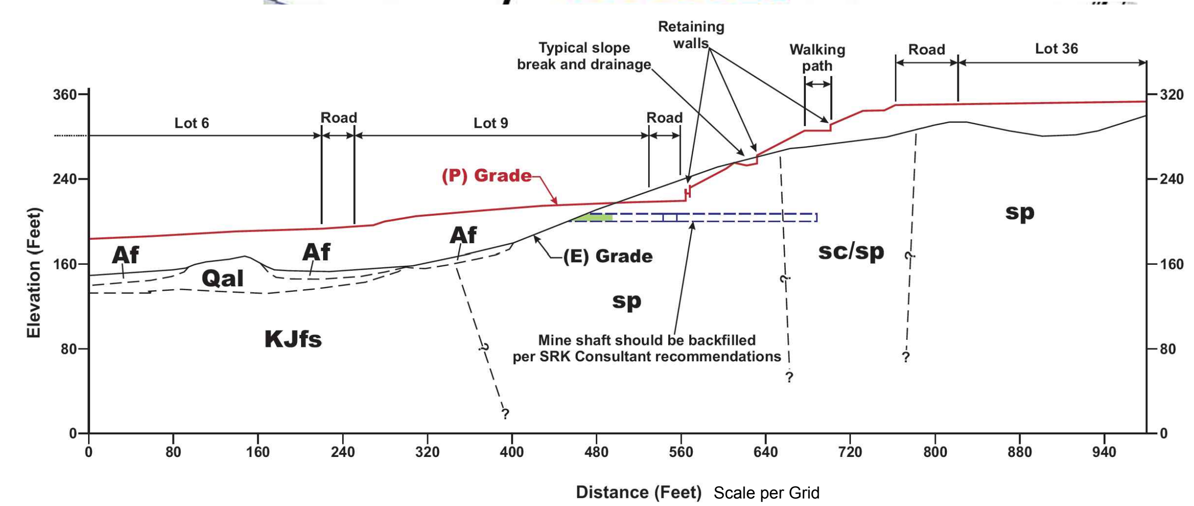
Geologic Units

- KJfs — Franciscan Sandstone (locally contains claystone and siltstone)
- KJfs(c) — Franciscan Claystone (associated with serpentinite, locally contains siltstone)
- sp — Serpentinite and Ultramafic rocks (locally contains Silica Carbonate)
- sc/sp — Silica Carbonate intermixed with Serpentinite
- Approximate Fault Contact between Franciscan Units (dotted where concealed)

Note: See recommendations by SRK addressing backfilling of all mine tunnels prior to performing grading activities including but not limited to cutting, filling, excavating, over-excavating, etc. in the area of the mine tunnels.







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FILE NAME: 399400.010.Rev.A.Fig.2.2.1.3.2014-04-24.dwg

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MINE BACKFILL WORK PLAN

PLAN VIEW OF HISTORICAL WORKINGS (CORNERSTONE 2014)

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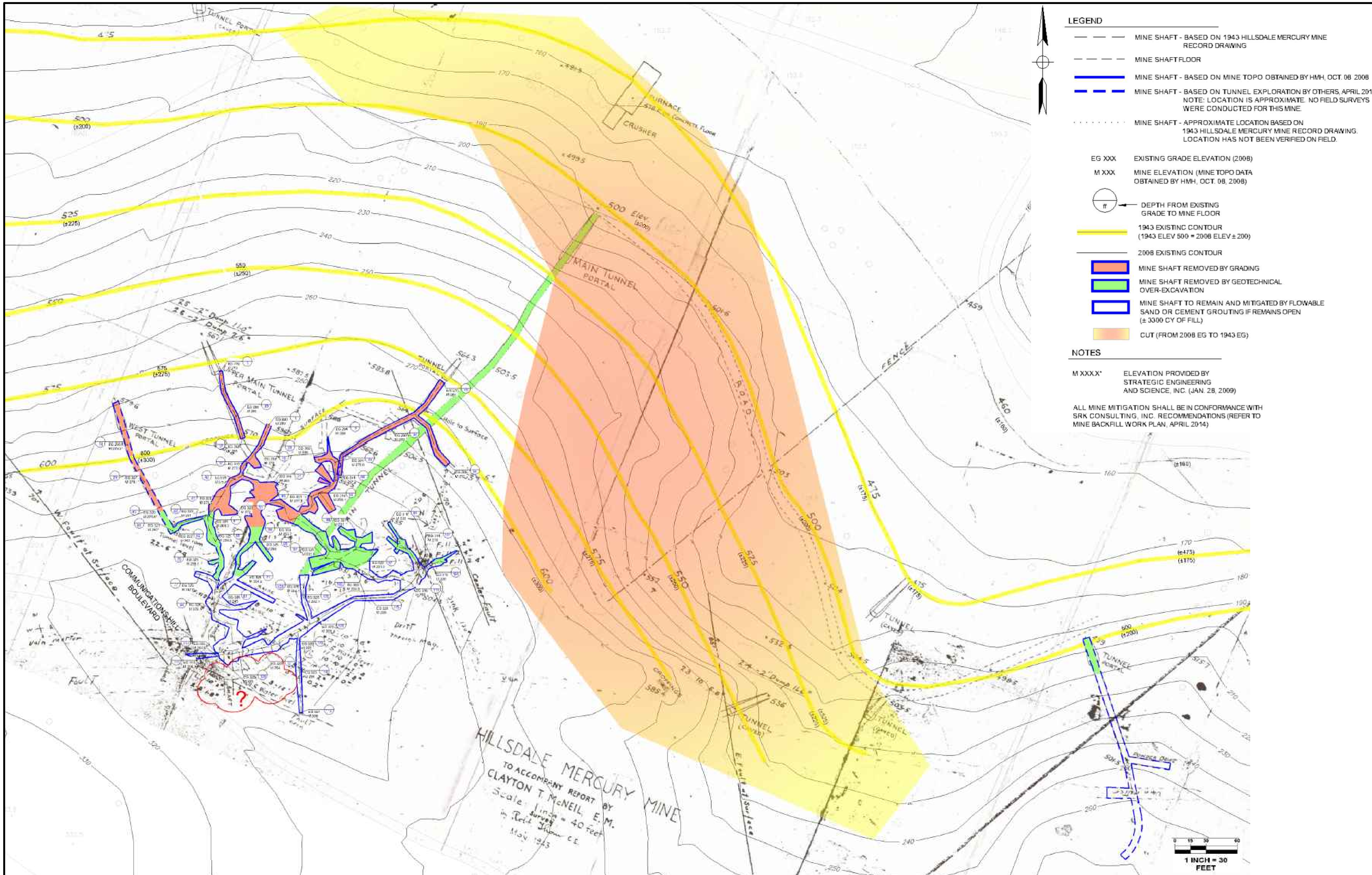

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MINE BACKFILL WORK PLAN

PLAN VIEW OF HISTORICAL WORKINGS (HMH, 2014)

DATE:	APPROVED:	FIGURE:	REVISION NO.
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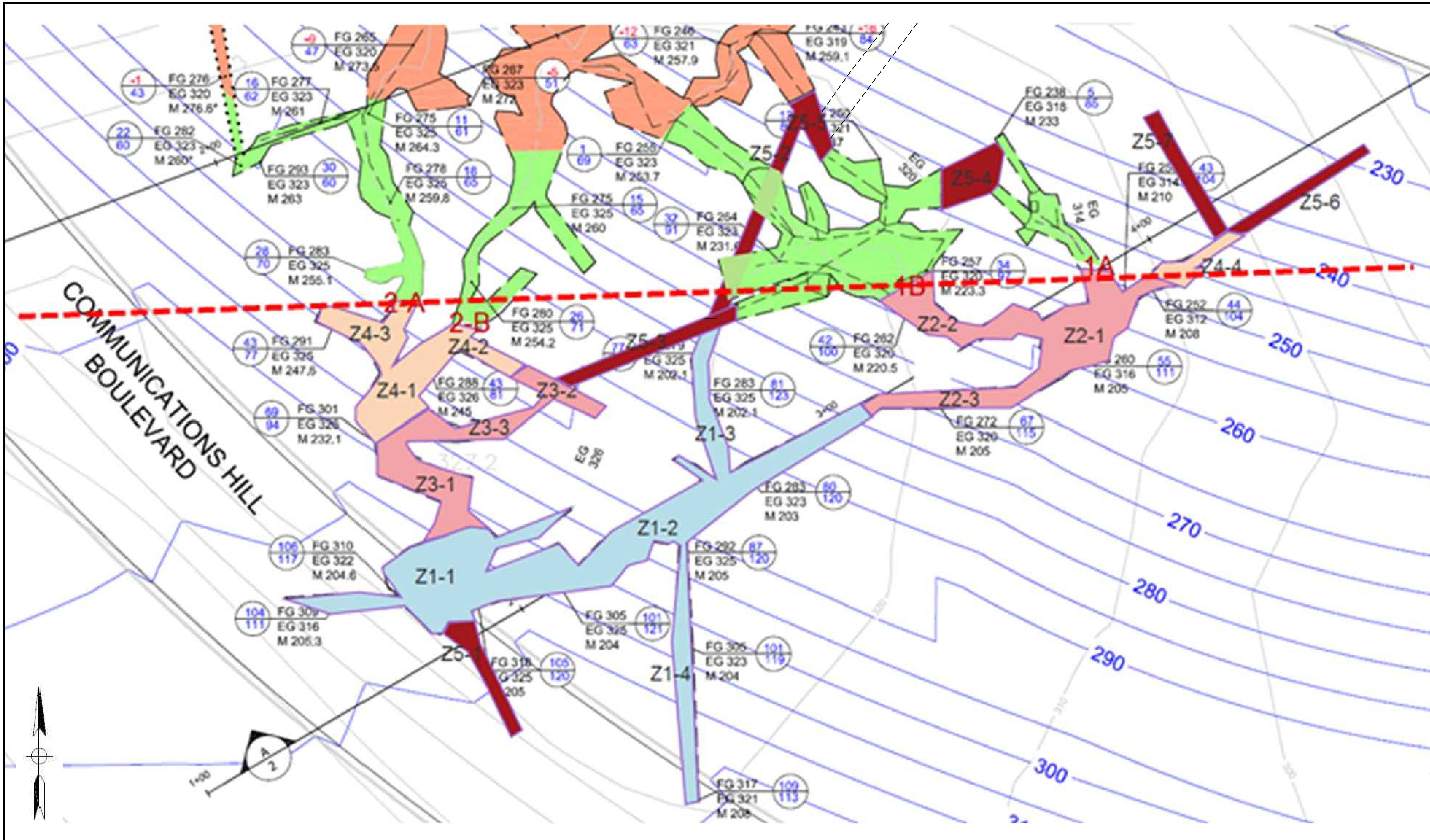

REFERENCE:
TOPOGRAPHIC MINE SURVEY EXHIBIT, PROVIDED TO SRK BY McCLOSKEY. MINE MAPPING WAS PERFORMED BY HMH ENGINEERS IN 2009 AND McCLOSKEY 2014.

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FILE NAME: 399400.010.Rev.A.Fig.2.2.5.1.2014-04-01.dwg

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MINE BACKFILL WORK PLAN

UNDERGROUND WORKINGS TO BE BACKFILLED IDENTIFIED BY ZONES ASSESSED FOR POTENTIAL OF COLLAPSE REACHING SURFACE

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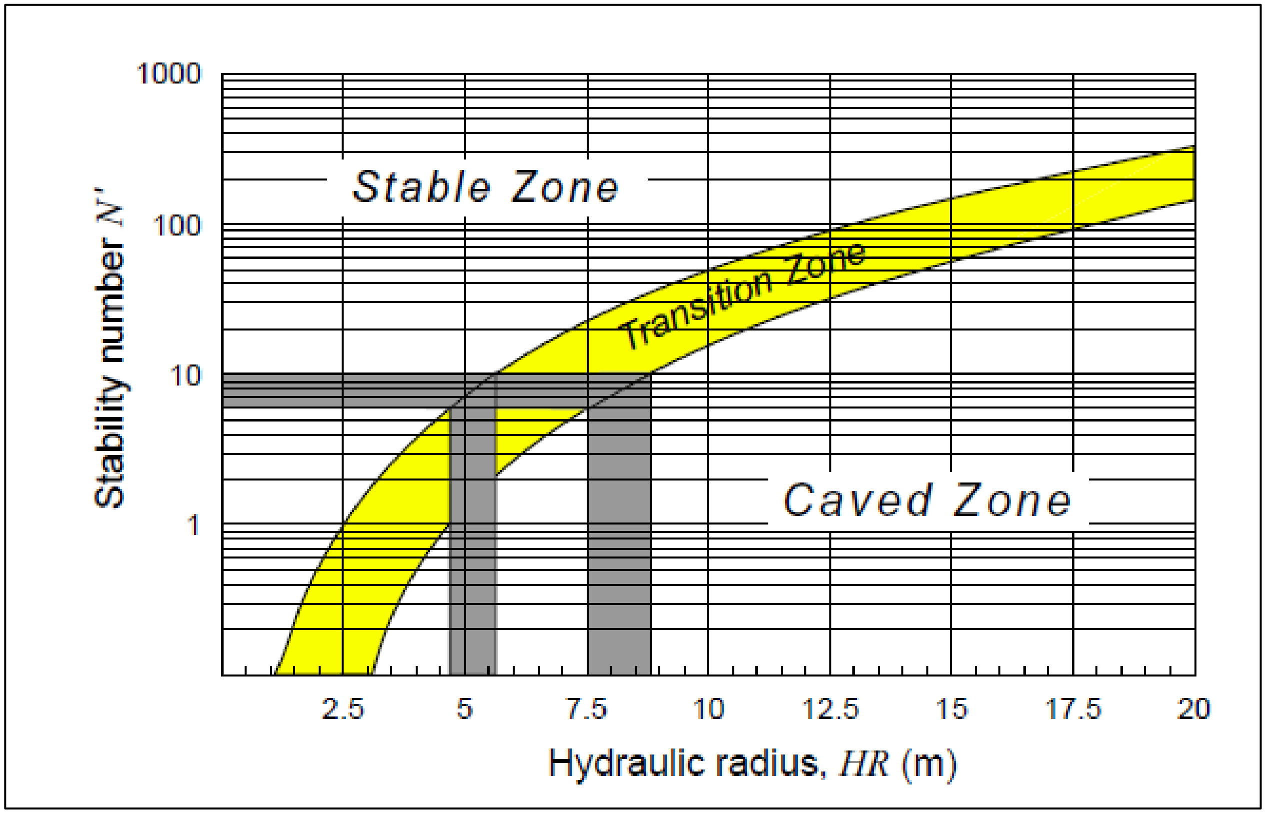
APR. 2014	JT	2.2.5.1	A



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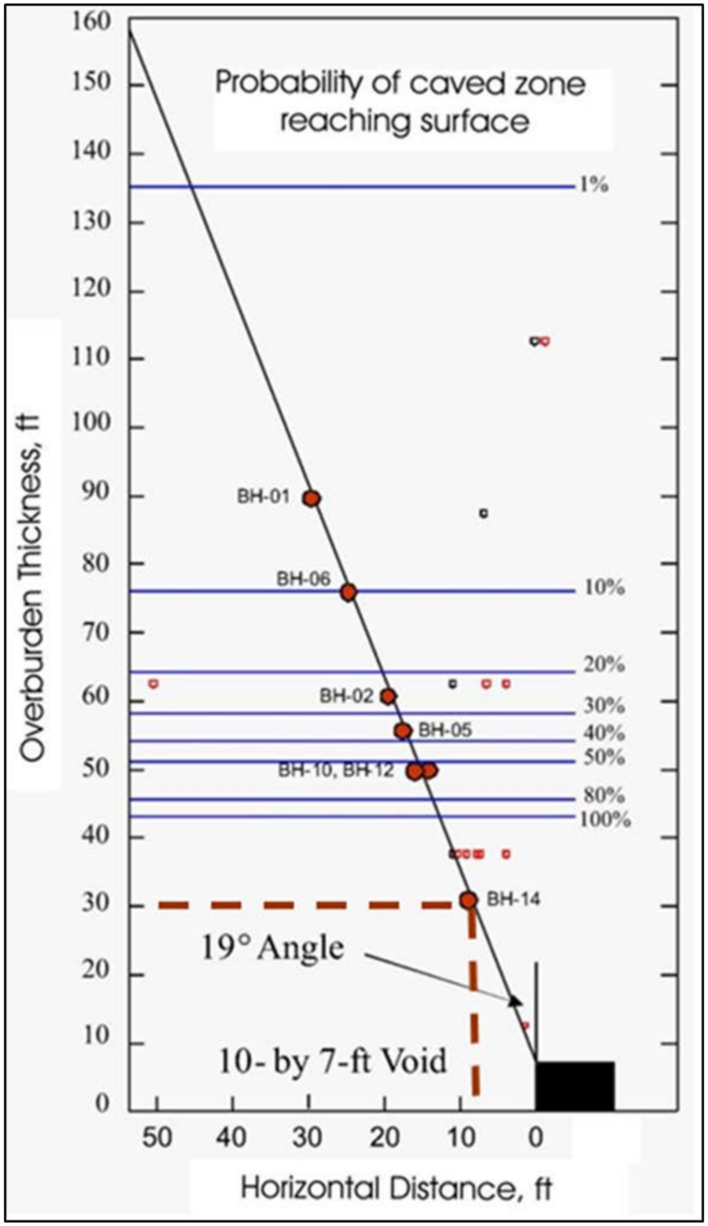
Source: Mathews, 1981

Figure 2.2.5.2

Stability Graph Showing the Zones of Stable Ground And Caving Ground



srk consulting	COMMUNICATIONS HILL, SAN JOSE, CALIFORNIA Source: Hanna, 2013	**Figure 2.2.5.3** **Probability of Caved Zone Development Reaching Surface as a Function of Overburden Thickness**

(a) (b)

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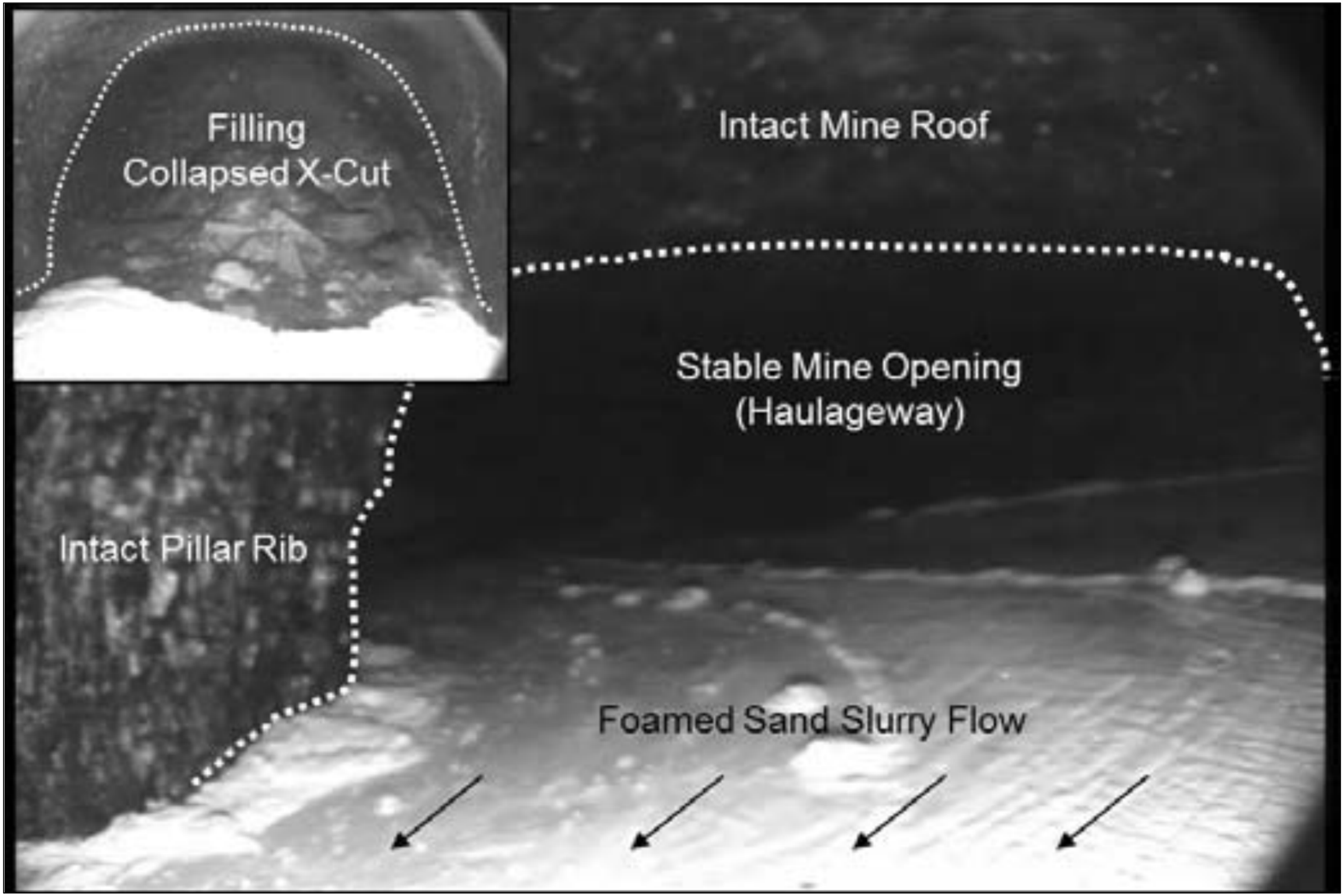
Source: Hanna, 2013

Figure 2.2.6.1

Example Photo of (a) Foam and (b) Flowable Sand Fill



srk consulting	**COMMUNICATIONS HILL, SAN JOSE, CALIFORNIA** **Source: Hanna, 2013**	**Figure 2.2.6.2** **Example Photo Of Borehole Video Image During Foamed Sand Backfilling**

LEGEND

- MINE SHAFT FLOOR
- MINE SHAFT - BASED ON MINE TOPO OBTAINED BY HMH, OCT. 08 2008
- MINE SHAFT - BASED ON TUNNEL EXPLORATION BY OTHERS, APRIL 2014 NOTE: LOCATION IS APPROXIMATE. NO FIELD SURVEYS WERE CONDUCTED FOR THIS MINE.
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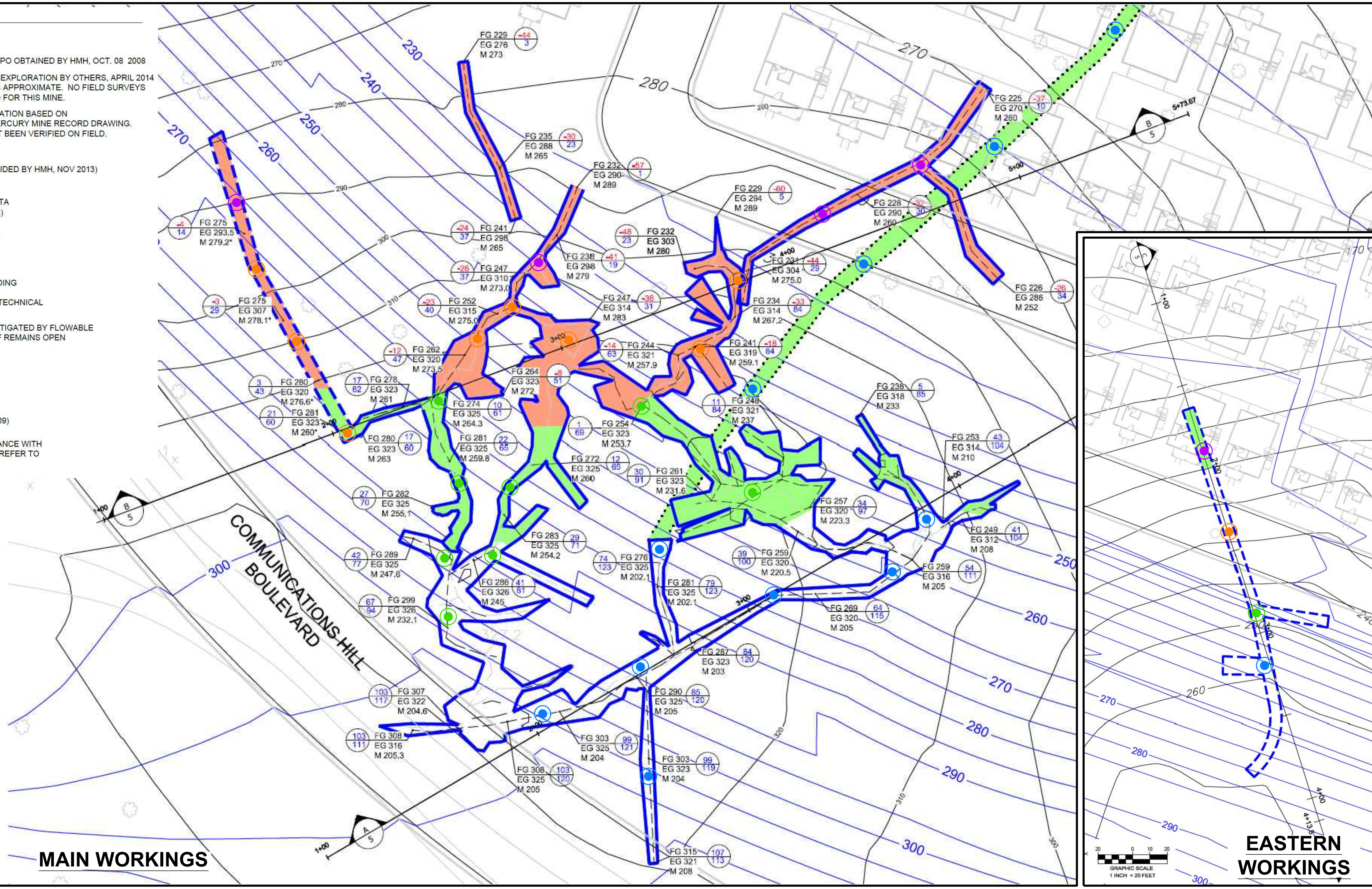
- FG XXX — FINISH GRADE ELEVATION (PROVIDED BY HMH, NOV 2013)
- EG XXX — EXISTING GRADE ELEVATION
- M XXX — MINE ELEVATION (MINE TOPO DATA PROVIDED BY HMH, OCT. 08, 2008)
- # / # — DEPTH QUANTITY FROM FINISH GRADE TO MINE FLOOR; DEPTH FROM EXISTING GRADE TO MINE FLOOR
- MINE SHAFT REMOVED BY GRADING
- MINE SHAFT REMOVED BY GEOTECHNICAL OVER-EXCAVATION
- MINE SHAFT TO REMAIN AND MITIGATED BY FLOWABLE SAND OR CEMENT GROUTING IF REMAINS OPEN (± 3300 CY OF FILL)

NOTES

M XXX.X* — ELEVATION PROVIDED BY STRATEGIC ENGINEERING AND SCIENCE, INC. (JAN. 28, 2009)

ALL MINE MITIGATION SHALL BE IN CONFORMANCE WITH SRK CONSULTING, INC. RECOMMENDATIONS (REFER TO MINE BACKFILL WORK PLAN, APRIL 2014)

- A SERIES DRILLHOLES
- B SERIES DRILLHOLES
- C SERIES DRILLHOLES
- D SERIES DRILLHOLES



REFERENCE:
TOPOGRAPHIC MINE SURVEY EXHIBIT, PROVIDED TO SRK BY McCLOSKEY. MINE MAPPING WAS PERFORMED BY HMH ENGINEERS IN 2009 AND McCLOSKEY 2014..

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McCloskey Consultants — ENVIRONMENTAL & GEOLOGIC ASSESSMENTS

SRK JOB NO.: 399400.010	COMMUNICATIONS HILL SAN JOSE, CALIFORNIA	MINE BACKFILL WORK PLAN
FILE NAME: 399400.010.Rev.A.Fig.2.3.1.1.2014-04-25.dwg		SURFACE BACKFILL

DATE:	APPROVED:	FIGURE:	REVISION NO.
APR. 2014	JT	2.3.1.1	A

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LEGEND

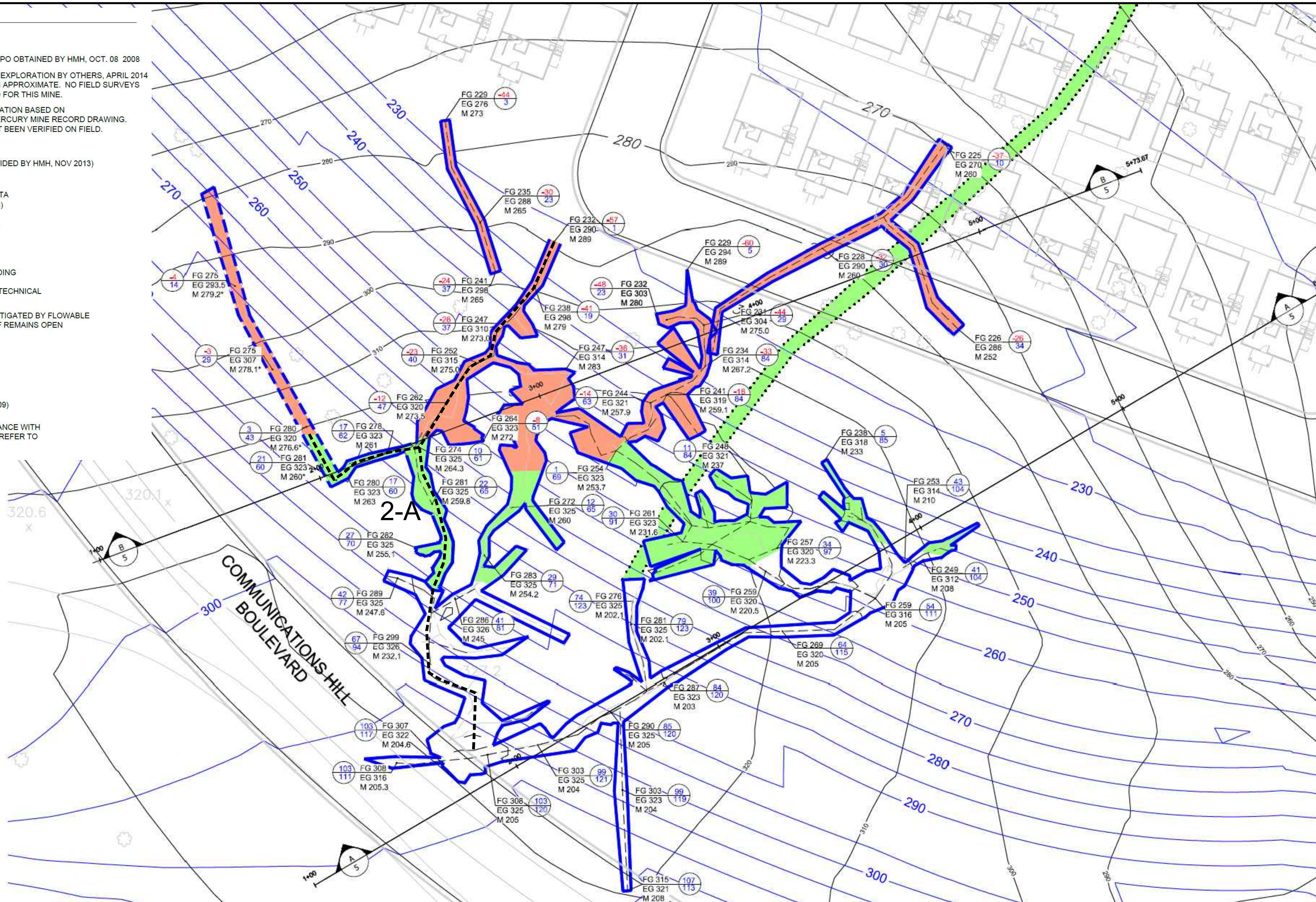
- — — — MINE SHAFT FLOOR
- MINE SHAFT - BASED ON MINE TOPO OBTAINED BY HMH, OCT. 08 2008
- MINE SHAFT - BASED ON TUNNEL EXPLORATION BY OTHERS, APRIL 2014 NOTE: LOCATION IS APPROXIMATE. NO FIELD SURVEYS WERE CONDUCTED FOR THIS MINE.
- MINE SHAFT - APPROXIMATE LOCATION BASED ON 1943 HILLSDALE MERCURY MINE RECORD DRAWING. LOCATION HAS NOT BEEN VERIFIED ON FIELD.
- 2008 EXISTING CONTOUR
- FG XXX — FINISH GRADE ELEVATION (PROVIDED BY HMH, NOV 2013)
- EG XXX — EXISTING GRADE ELEVATION
- M XXX — MINE ELEVATION (MINE TOPO DATA PROVIDED BY HMH, OCT. 08, 2008)
- # (top) — DEPTH QUANTITY FROM FINISH GRADE TO MINE FLOOR
- # (bottom) — DEPTH FROM EXISTING GRADE TO MINE FLOOR
- MINE SHAFT REMOVED BY GRADING
- MINE SHAFT REMOVED BY GEOTECHNICAL OVER-EXCAVATION
- MINE SHAFT TO REMAIN AND MITIGATED BY FLOWABLE SAND OR CEMENT GROUTING IF REMAINS OPEN (± 3300 CY OF FILL)

NOTES

M XXX.X* — ELEVATION PROVIDED BY STRATEGIC ENGINEERING AND SCIENCE, INC. (JAN. 28, 2009)

ALL MINE MITIGATION SHALL BE IN CONFORMANCE WITH SRK CONSULTING, INC. RECOMMENDATIONS (REFER TO MINE BACKFILL WORK PLAN, APRIL 2014)

- ACCESS ROUTE
- 2-A — ACCESS I.D.



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SRK JOB NO.: 399400.010

FILE NAME: 399400.010.Rev.A.Fig.2.3.2.1.2014-04-25.dwg

COMMUNICATIONS HILL
SAN JOSE, CALIFORNIA

MINE BACKFILL WORK PLAN

UNDERGROUND BACKFILL SEQUENCE (1 OF 3)

DATE:	APPROVED:	FIGURE:	REVISION NO.
APR. 2014	JT	2.3.2.1	A

LEGEND

- – – – MINE SHAFT FLOOR
- MINE SHAFT - BASED ON MINE TOPO OBTAINED BY HMH, OCT. 08 2008
- MINE SHAFT - BASED ON TUNNEL EXPLORATION BY OTHERS, APRIL 2014 NOTE: LOCATION IS APPROXIMATE. NO FIELD SURVEYS WERE CONDUCTED FOR THIS MINE.
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NOTES

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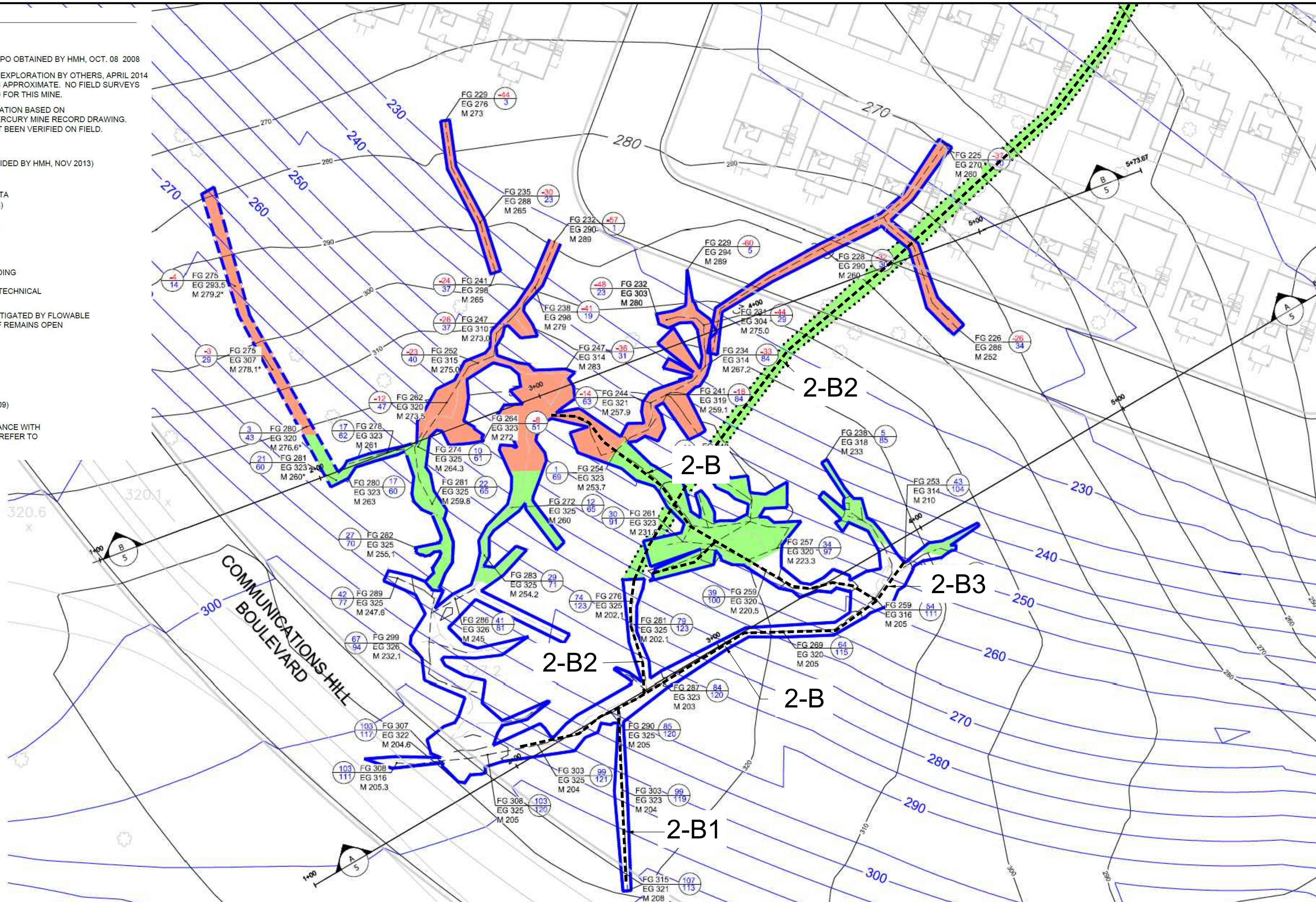
ALL MINE MITIGATION SHALL BE IN CONFORMANCE WITH SRK CONSULTING, INC. RECOMMENDATIONS (REFER TO MINE BACKFILL WORK PLAN, APRIL 2014)

- ACCESS ROUTE
- 2-B — ACCESS I.D.



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SRK JOB NO.: 399400.010

FILE NAME: 399400.010.Rev.A.Fig.2.3.2.2.2014-04-25.dwg

COMMUNICATIONS HILL
SAN JOSE, CALIFORNIA

MINE BACKFILL WORK PLAN

UNDERGROUND BACKFILL SEQUENCE (2 OF 3)

DATE:	APPROVED:	FIGURE:	REVISION NO.
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LEGEND

— — — MINE SHAFT FLOOR

MINE SHAFT - BASED ON MINE TOPO OBTAINED BY HMH, OCT. 08 2008

MINE SHAFT - BASED ON TUNNEL EXPLORATION BY OTHERS, APRIL 2014 NOTE: LOCATION IS APPROXIMATE. NO FIELD SURVEYS WERE CONDUCTED FOR THIS MINE.

MINE SHAFT - APPROXIMATE LOCATION BASED ON 1943 HILLSDALE MERCURY MINE RECORD DRAWING. LOCATION HAS NOT BEEN VERIFIED ON FIELD.

2008 EXISTING CONTOUR

FG XXX — FINISH GRADE ELEVATION (PROVIDED BY HMH, NOV 2013)

EG XXX — EXISTING GRADE ELEVATION

M XXX — MINE ELEVATION (MINE TOPO DATA PROVIDED BY HMH, OCT. 08, 2008)

DEPTH QUANTITY FROM FINISH GRADE TO MINE FLOOR

DEPTH FROM EXISTING GRADE TO MINE FLOOR

MINE SHAFT REMOVED BY GRADING

MINE SHAFT REMOVED BY GEOTECHNICAL OVER-EXCAVATION

MINE SHAFT TO REMAIN AND MITIGATED BY FLOWABLE SAND OR CEMENT GROUTING IF REMAINS OPEN (± 3300 CY OF FILL)

NOTES

M XXX.X* — ELEVATION PROVIDED BY STRATEGIC ENGINEERING AND SCIENCE, INC. (JAN. 28, 2009)

ALL MINE MITIGATION SHALL BE IN CONFORMANCE WITH SRK CONSULTING, INC. RECOMMENDATIONS (REFER TO MINE BACKFILL WORK PLAN, APRIL 2014)

ACCESS ROUTE

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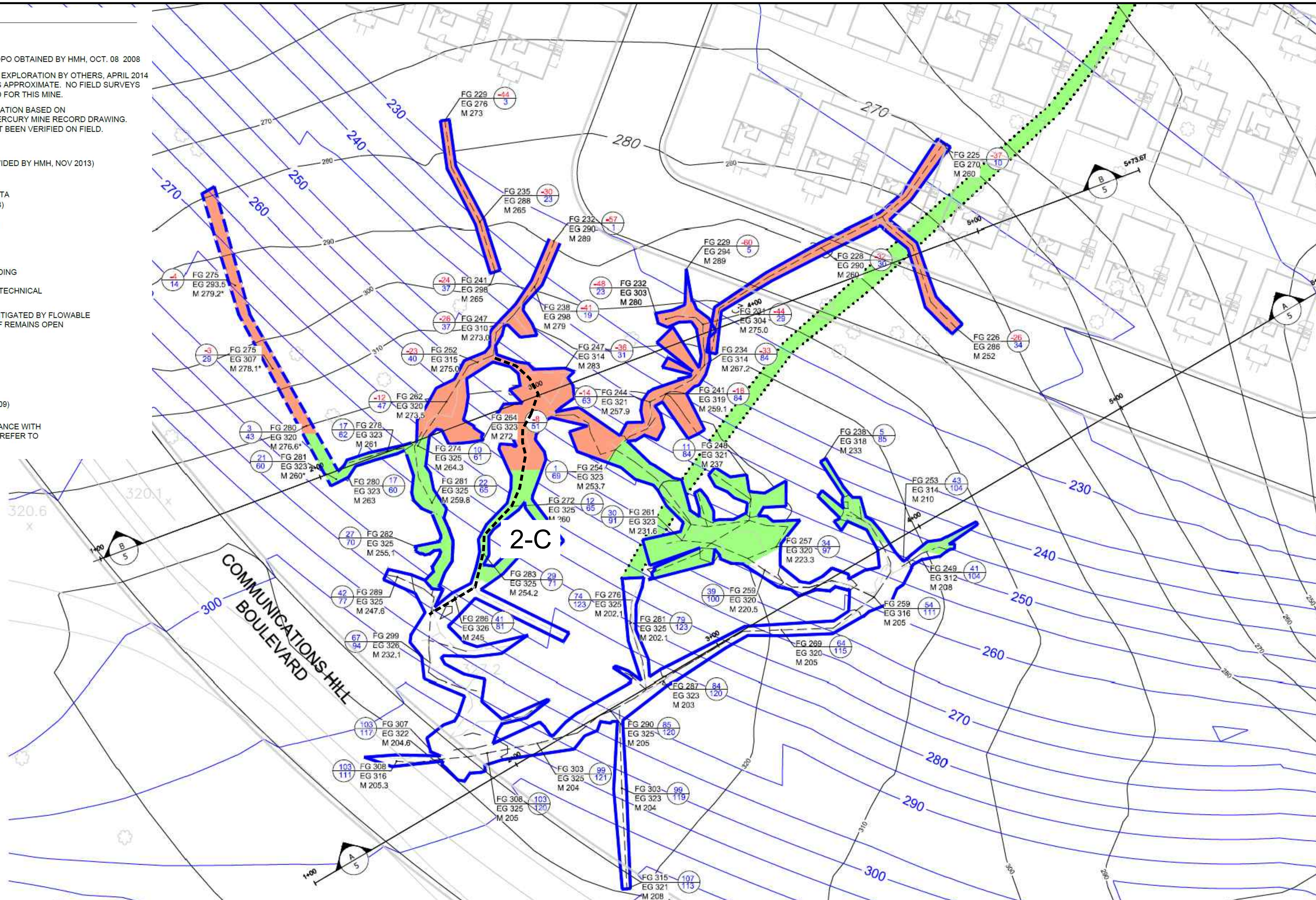

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TOPOGRAPHIC MINE SURVEY EXHIBIT, PROVIDED TO SRK BY McCLOSKEY. MINE MAPPING WAS PERFORMED BY HMH ENGINEERS IN 2009 AND McCLOSKEY 2014..

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srk consulting

McCloskey Consultants — ENVIRONMENTAL & GEOLOGIC ASSESSMENTS

SRK JOB NO.: 399400.010

FILE NAME: 399400.010.Rev.A.Fig.2.3.2.3.2014-04-25.dwg

COMMUNICATIONS HILL
SAN JOSE, CALIFORNIA

MINE BACKFILL WORK PLAN

UNDERGROUND BACKFILL SEQUENCE (3 OF 3)

DATE:	APPROVED:	FIGURE:	REVISION NO.
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3 Quality Assurance

Construction Quality Control (QC) is provided by the Contractor and refers to those actions taken by the Contractor to ensure that materials and workmanship meet the requirements of the Drawings and Specifications. The Construction Quality Assurance (CQA) Plan is independent of the QC programs conducted by the Contractor. The intent of the CQA Plan is to provide independent third party verification and testing, to demonstrate that the Contractor has met its obligations in the supply and installation of flowable backfill materials according to the design and project Specifications. The CQA is verification by the Owner that the Contractor is providing materials that meet specifications and, therefore, the design.

Quality assurance in construction can be defined as making sure the quality of construction is what it should be. Quality assurance provides confidence that the facility will perform satisfactorily in service, and addresses the overall problem of obtaining the quality of the facility to be built in the most efficient, economical, and satisfactory manner possible. In its broadest form quality assurance includes quality control as one of its elements, in which the Quality control is the responsibility of the contractor. Quality assurance in construction requires that the procedures for incorporating design changes into the construction plans be well developed and fully utilized. The earlier that design changes are recognized and implemented the lower the downstream cost impact. Quality assurance efforts in construction must closely monitor how well management of the design, and change of design processes are functioning. These represent the quality issues that need to be monitored during the quality assurance effort and acceptance testing. Another area of activity for quality assurance in construction that must be continuously monitored is the development of plans and specifications. Engineering plans and specifications often change during the construction phase of a complex project. It is important that the procedures for incorporating these changes into the construction plans be well developed and consistently followed.

CQA requirements will need to be developed as part of the Project specifications. However, SRK would anticipate that the CQA Program would generally consist of the following:

- Assessment of the underground working stability;
- Assessing the quality and competence of the rock material encountered during the over-excavation remediation versus properties assumed in the analysis to confirm the actual over-excavation depth required;
- Addressing onsite queries and making recommendations as to any revisions to the original remediation plan;
- Working with onsite surveyors to develop initial estimate of backfill quantities;
- Issuing daily reports;
- Documentation of remediation quantities; and
- Issuing as-built report.

4 Backfill Quantity Estimate

4.1 Quantity Estimate

Based on the underground working survey provided by HMH, an estimate of the volume of historic underground workings that would be remediated in place was developed by HMH as follows:

- A height of eight feet was assumed for drifts, multiplied by the two dimensional planar area of 3,000 square feet (sf), for a total volume of approximately 900 yd^3; and
- A height of 20 ft was assumed for major workings, multiplied by the two dimensional planar area of 1,850 sf, for a total volume of approximately 1,400 yd^3.

Considering the two typical sections, HMH estimated a total backfill volume of approximately 2,300 yd^3. However, considering that the mine survey did not document the underground working dimensions and the level of certainty in mapping the workings, SRK would recommend a contingency of 30% of this volume.

Provided that there is an accurate survey of the workings, it will be possible to determine whether the current fill volume is more or less than predicted by the survey as the filling progresses. Tracking the difference will help to identify whether unmapped openings have been filled or whether mapped but inaccessible areas have not been filled as anticipated.

5 Health and Safety

Many potential health and safety risks exist when working underground and above shallow voids. To avoid potential incidents all MSHA and OSHA regulations and guidelines should be followed. This section is not to be all encompassing or to address every possible risk and is only meant to outline and highlight some of the obvious risks that may be encountered.

Proper Personnel Protection Equipment (PPE) should be worn will working in and around the mine. PPE should include as a minimum:

- Steel-toe boots;
- Hard hat;
- Safety classes;
- Gloves;
- Battery lamp light; and
- Hearing protection when mechanical equipment is working underground.

Due to the abandoned nature of the workings, the following additional safety equipment should be provided to the crew working underground:

- Gas monitor;
- Fresh ventilation air as needed;
- Pry bars for loose ground; and
- Communication system.

Injury by ground fall is the single largest hazard underground, especially because ground conditions have not been verified for a long time. Before any area can be accessed a crew member trained in ground control measures should inspect tunnel conditions ahead and pry down any loose ground before other members of the crew have access to the area. It is important that crew members do not wonder off into uninspected/secured areas.

6 Conclusions, Recommendations and Requirements

6.1 Conclusions

SRK has developed a backfill program that considers using the existing mine to access and a surface program to backfill the workings based on the conditions documented in this report. In general, the material above each of the portals will be removed by over-excavating to access the open workings. This includes removing collapsed material until a stable opening is reached. The limit of excavation would be assessed by a qualified geotechnical engineer in the field such that there is sufficient competent rock above the drift to provide for stability. All workings that would remain after regrading would be backfilled with either a FSF material in workings located beneath hill-side areas or SCC fill in workings located beneath planned housing area. Drilling access boreholes, remote scoping of drifts and placing the flowable backfill are described in more detail in subsequent sections.

Directional drilling will be used to confirm the extent of the workings, such as the Main Tunnel identified in McNeil's map, South Portal or other workings that are encountered in the field during construction, prior to initiation of the flowable backfilling. If there is evidence that portions remain open and are located in hill-side slope areas not planned for houses, and they will not be removed from cut activities, flowable sand backfill will be placed. Open drifts located beneath planned housing will be backfilled with a SCC structural fill.

6.2 Recommendations

SRK has the following recommendations:

- Data Compilation. Prior to construction, the results of the previous geophysical and underground survey programs, as well as the historic McNeil map of the workings should be compiled into a single 3-D model. This model could be used to validate the understanding of the underground mining extents, confirm the extend of any workings within the residential area planned for houses and confirm the remediation quantities (backfill, over-excavation, etc.);
- Geophysical Program. In the event that several unmapped voids are encountered during the drilling program that cannot be verified by the surveyed map or the historic workings map by McNeil, then an additional geophysical surveys should be conducted;
- Underground Survey. In the event that portal excavation activities identify open underground workings that are accessible but have not been mapped, then an additional underground survey program should be undertaken for these drifts. The estimated volume of flowable backfill will be adjusted; and
- Construction document support. Scope of work, basis of payment, and specifications should be developed to ensure that the contractor will remediate the entire scope of the underground workings remediation (regrading, excavation and backfill) as designed.

6.3 Requirements

The following item would be required in order to document the successful implementation of the underground working remediation:

- Quality Assurance. A geotechnical engineer with the appropriate underground experience confirms the conditions documented in this report, oversee and document the remediation process.

Should McCloskey select the working remediation using the mine access, SRK would require the following addition items to minimize the risk to workers:

- Stabilization. Based on the Vector report, rock bolting is not anticipated to be required. However, worker safety will be paramount, requiring a scaling and monitoring program to be implemented;
- Safety Program. A program should be developed to address worker safety; and
- Safety Officer. Many potential health and safety risks exist when working underground and above shallow voids. A qualified Safety officer (dedicated or part time) should be consulted and oversee all aspects of the program.

7 References

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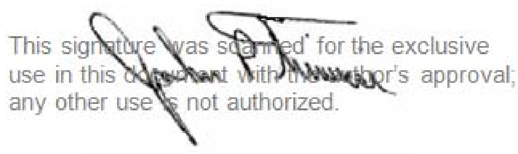
8 Date and Signature Page

Signed on this 28th Day of April, 2014.

Prepared by



John Tinucci, Principal Consultant, Geotechnical Engineer

Reviewed by

Terry Mandziak, Geotechnical Engineer

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted industry practices.

Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (U.S.), Inc. (SRK) by McCloskey Consultants Inc. (McCloskey). These opinions are provided in response to a specific request from McCloskey to do so, and are subject to the contractual terms between SRK and McCloskey. SRK has exercised all due care in reviewing the supplied information. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report.

Copyright

Appendices

Appendix A: Map of Historic Workings


S. P. RAILROAD RIGHT OF WAY
FENCE
FURNACE
478.2 ON CONCRETE FLOOR
CRUSHER
TUNNEL PORTAL (CAVED)
500 Elev.
MAIN TUNNEL PORTAL
ROAD
TUNNEL PORTAL
Hole to Surface
CATTLE DRINKING TROUGH
25 -2" Dump 11.0"
26 -2" Dump 7.6"
UPPER MAIN TUNNEL PORTAL
WEST TUNNEL PORTAL
CROPPINGS
MAIN TUNNEL
SHAFT 14' deep
W. Fault at Surface
Center Fault
E. Fault at Surface
24 -2" Dump 16.6"
TUNNEL (CAVED)
POWDER DRIFT
501.5 Water level
HILLSDALE MERCURY MINE
TO ACCOMPANY REPORT BY
CLAYTON T. McNEIL, E. M.
Scale: 1 inch = 40 feet
Survey by Robt. Thow C.E.
May 1943

Appendix B: NORCAL Geophysics

NORCAL GEOPHYSICAL CONSULTANTS, INC.

February 11, 2009

Strategic Engineering & Science, Inc.
110-11th Street, 2nd Floor
Oakland, California 94607

Subject: Electrical Resistivity Survey
Hillsdale Mercury Mine
San Jose, California

NORCAL Job No: 08-853.03

Attention: Mr. Tom McCloskey

Mr. McCloskey:

This letter presents the findings of an electrical resistivity (ER) survey performed by NORCAL Geophysical Consultants, Inc. at the historic Hillsdale Mercury Mine, in San Jose, California. The ER survey was conducted on January 6th and 7th and during the period January 14th through 16th, 2008 by the following NORCAL personnel:

- Donald J. Kirker PGp 997
- William Henrich PGp 893
- David T. Hagin PGp 1033
- Senior Geophysical Technician Travis Black

Site orientation, background information and logistical support were provided by Mr. Tom McCloskey of Strategic Engineering & Science, Inc. (SES). This study is the follow-up to a 3-method test survey performed by NORCAL in 2007.

SITE DESCRIPTION

The Hillsdale Mercury Mine is an abandoned mine located in the southern portion of San Jose, California (Plate 1). The mine is situated near the center of a roughly triangular 165-acre parcel that is bordered by railroad tracks on the east, Capitol Expressway on the south, and residential developments on the west and north. The area is generally undeveloped except for an existing quarry that occupies the south and southeastern portions of the site. The terrain is flat to moderately steep with a cover of grass and scattered brush which is relatively thick in low-lying areas. The topography is hilly and generally increases in elevation towards the southwest. The abandoned mercury mine underlies an area of approximately six-acres in the central portion of the site. The surface elevation in this area ranges from about 185 to 325 feet above mean sea level (msl).

Information provided by SES indicates that the area is underlain by a network of tunnels. The tunnel locations are reportedly based on a map that was developed in the 1940's; however, recent investigations seem to corroborate the maps accuracy. It is reported that the tunnels occur in two different levels. At least three of the tunnels daylight in the northern portion of the survey area. These tunnels are approximately five feet in diameter and trend in a south to southwest direction.

The geology in the area consists primarily of Great Valley Complex serpentinite of Jurassic age (Jsp); however, a narrow northwest trending strip of Franciscan complex mélange outcrops along the west side of the area. No faults are mapped through the site.

PURPOSE AND APPROACH

Before this site can be developed, it is necessary that potential collapse hazards presented by abandoned mine workings be remediated. This survey was performed to aid in establishing a boundary beyond which there is a high level of confidence that no mine workings exist. Geophysical lines have been placed around the known workings to determine whether the workings appear to extend beneath the lines. If the geophysical lines on this perimeter show no evidence of workings then it is interpreted that the workings are contained within the established perimeter.

Based on the results of NORCAL's 2007 test survey (ER Lines 1 and 2, Plate 1), electrical resistivity (ER) was selected as the geophysical method to be employed for detection of abandoned mine workings. To provide further assurance that this method would detect workings of this size at this depth in this geologic environment, two preliminary ER profiles were acquired over known workings (ER Lines 3 and 4) several days prior to the primary survey. After it was demonstrated that the mined areas were shown on the ER sections as high-resistivity anomalies, ER profiles were placed around the known workings to form a perimeter (ER Lines 5, 6 and 7).

METHODOLOGY

Electrical resistivity is the physical property of a material that resists the flow of electrical current. The electrical resistivity of earth materials is directly affected by the moisture content of the soil and/or rock material. The large air-filled void created by a tunnel is highly resistive to the flow of electricity, typically contrasting sharply with the surrounding soil. Accordingly, the electrical resistivity of subsurface materials can provide information regarding the depth and/or lateral extent of subsurface openings such as mine workings.

For this investigation, we used the ER method with a dipole-dipole electrode configuration. For each measurement, the dipole-dipole array uses four electrodes that are placed in the ground in a collinear array. One pair of adjacent electrodes is used to transmit electrical current into the earth. The second pair of electrodes is used to measure the resulting drop in voltage with increasing distance from the transmitting dipole. This electrode configuration is especially sensitive to lateral changes in subsurface electrical properties. Detailed descriptions of the ER method are provided in Appendix A.

DATA ACQUISITION AND ANALYSIS

On January 6th, 2008, preliminary ER lines 3 and 4 were positioned over known mine workings approximately 100 feet deep; line locations were surveyed in by SES prior to our arrival on site. Each ER line consisted of 56 electrodes distributed at 10-foot intervals in a collinear array, yielding a total length of 550 feet for each line.

Returning to the site on January 14th through 16th and 19th, three ER lines were positioned around the known mine workings to establish a perimeter. ER Lines 5, 6 and 7 used 70, 154, and 84 electrodes, yielding line lengths of 690 feet, 1,530 feet and 830 feet, respectively.

Continuous coverage over these distances was achieved using a "roll-along" data acquisition strategy. The initial 56-electrode data acquisition consisted of a total of 691 readings. Following completion of these readings the first 28 electrodes in the array were moved, or "rolled", to the end of the array adding (up to) an additional 280 feet of coverage. Once the "rolled" electrodes were connected the data acquisition was continued. Since a "roll" is an extension of the original array, only about one-half as many readings are necessary as are required for the initial data set. The "rolls" were continued until the end of the proposed profile was reached.

After electrode stations were installed they were tested to ensure adequate contact resistance had been achieved prior to data acquisition. The ER data were obtained using a minimum dipole length of 10 feet, with dipole separations up to six times that length. This configuration was used to provide high resolution data within approximately the upper 100 feet of the subsurface.

Upon completion of the electrical resistivity survey, we downloaded the data to a computer for archival and processing. We then reduced and interpreted the electrical resistivity data using *EarthImager*, software by AGI. This software uses an iterative inverse modeling routine to compute variations in electrical resistivity with depth and distance beneath each resistivity profile. Before beginning the inversion, the software checks the repeatability of the measurements (each reading was taken at least twice). Those that don't meet the pre-set repeatability accuracy (in this case 5%) are discarded. After filtering out bad data points, the software then begins the inversion process (see Appendix A).

The inversion process consisted of a series of iterations in which the software computed the apparent resistivities that would be observed above a starting 2D model, compared those values with the observed values, then adjusted the 2D model to improve the degree of fit. Following each iteration, the software displayed illustrations indicating the degree of fit of the computed model to the observed data. We used these illustrations as a guide to eliminate "noisy" data points; points which do not fit the model within an acceptable degree of accuracy. Typically, the eliminated points were those that resulted from electrodes placed near cultural objects and points deep in the section where the signal strength was low compared to background noise.

After completing the inversion process, we exported the modeled electrical resistivity vs. depth and distance data to *Surfer*, by Golden Software. This software was used to contour and color shade the data to produce 2D cross-sections illustrating the subsurface distribution of electrical resistivity versus depth and distance beneath each resistivity line.

RESULTS AND INTERPRETATIONS

The results of the electrical resistivity survey are represented by the 2D electrical resistivity cross-sections shown on Plates 2 through 5. The ER cross-sections (profiles) depict the distribution of electrical resistivity values versus depth and distance beneath each line. The left axis of each cross-section represents depth below the ground surface and the horizontal axis represents distance. The electrical resistivity values are presented in ohm-meters (Ω-m), and represented by color shaded contours according to the scale shown at the bottom of each figure. Low resistivity values are represented by blue colors, moderate values are represented by green shades, and higher resistivity values are represented by yellow, orange, and red.

Profiles for the preliminary ER Lines 3 and 4 are shown on Plate 2. High resistivity anomalies are apparent at the location and depth of the underlying mine workings, as surveyed. Measured values in the vicinity of the workings generally range from 500 to 1,000 Ω-m, with background values well under 100 Ω-m. These results corroborate the previous findings (NORCAL, 2007) that the mine workings are detectable as high resistivity zones on the ER profiles.

Profiles for ER Lines 5, 6 and 7 are displayed on Plates 3, 4 and 5, respectively. Analysis of these sections is fairly straight forward, as no high resistivity anomalies at depth are shown on any of the profiles. Small higher resistivity zones are noted on ER Lines 6 and 7. However, these areas are within 10 feet of the surface, and are not likely to represent mine workings since any workings at such a shallow depth would have collapsed long ago. Values measured at depth are generally less than 100 Ω-m, and often below 30 Ω-m. ER values at depth vary smoothly, as is typical of native materials free from of anthropogenic structures.

SUMMARY

ER lines 3 and 4 demonstrate the capability of the method to detect abandoned mine workings at depth in the given geologic environment. The presence of mine workings gives rise to high resistivity anomalies at depth on the ER profile.

ER Lines 5, 6 and 7 form a perimeter around the known mine workings. No high resistivity anomalies at depth are present on these profiles. Consequently, it is our interpretation that mine workings are not present beneath these lines. Since no mine workings are indicated beneath the lines, and because mine workings are necessarily continuous, it follows that the workings are likely contained within the perimeter established by these lines.

STANDARD CARE AND WARRANTY

The scope of NORCAL's services for this project consisted of using the electrical resistivity technique to measure variations in subsurface electrical resistivity. The accuracy of our findings is subject to specific site conditions and limitations inherent to the techniques used. We performed our services in a manner consistent with the level of skill ordinarily exercised by members of the profession currently employing similar methods. No warranty, with respect to the performance of services or products delivered under this agreement, expressed or implied, is made by NORCAL.

We appreciate having the opportunity to provide our service to SES for this project. If you have any questions, or require additional geophysical services, please do not hesitate to call.

Sincerely,

NORCAL Geophysical Consultants, Inc.

David T. Hagin III.

David T. Hagin
Professional Geophysicist PGp No. 1033

DTH/KGB/tt

Enclosures: Plates 1 - 7
Appendix A

Appendix A

GEOPHYSICAL METHODOLOGY

Appendix A

ELECTRICAL RESISTIVITY SURVEYS

Rational

Electrical resistivity is the physical property of a material that resists the flow of electrical current. The electrical resistivity of earth materials is directly affected by moisture content and permeability. Typically, electrical resistivity decreases as permeability and moisture content increases. The resistivity of earth materials is also greatly effected by the concentration of dissolved salts or free ions in the saturating fluid. Generally, fine-grained materials such as clays have a lower electrical resistivity than coarse grained materials such as sands and gravels. The presence of fluids that have a high concentration of dissolved salts or free ions can significantly decrease the electrical resistivity of both fine and coarse-grained materials.

Electrical properties of rock can vary greatly depending upon degree of weathering and fracturing, as well as composition. Rock formations that are deeply buried and not exposed to chemical weathering are generally impermeable, contain little water, and have a relatively high electrical resistivity. Conversely, highly weathered and fractured rock that contains moisture typically has lower resistivity.

Based on the above relationships, geophysical methods that measure the electrical resistivity of the subsurface can be used to determine the depth and/or lateral extent of possible water-bearing formations as well as the depth to bedrock.

Methodology

The electrical resistivity of the subsurface is measured using a galvanic resistivity method. This consists of transmitting electrical current into the earth through a pair of grounded metal electrodes, and measuring the resulting potential drop across the second pair of grounded metal electrodes. There are a variety of electrode arrangements (arrays) that can be used. The dipole-dipole electrode configuration is typically used because it provides information on both the depth and lateral extent of subsurface electrical properties.

The dipole-dipole array consists of four electrodes that are placed in the ground in a collinear arrangement. One pair of adjacent electrodes is used to transmit current into the earth and is referred to as the current dipole. The second pair of electrodes is used to measure the resulting potential drop, and is referred to as the potential dipole. Both dipoles have the same length.

To begin a profile, a reading is taken with the dipoles separated by their common length. Subsequent readings are taken as the potential dipole is moved along the profile while the current dipole remains stationary. The separation between dipoles is always be a multiple of the dipole length. As the separation between dipoles increases, so does the depth of investigation. Once the maximum separation is reached, the current dipole is moved along the profile one dipole length and the entire procedure is repeated.

For each reading, a value is calculated that represents the apparent resistivity of the volume of earth that the current flows through. The term, apparent, is used because the value represents the resistivity of a volume rather than an individual layer. The apparent resistivity values are then plotted in cross-section and contoured to form what is referred to as a "pseudo-section". The term "pseudo" is used because the vertical scale is not scalar but is proportional to the dipole separation. In addition, the resistivities are apparent rather than true. However, the pseudo-section can be inverted to generate a 2-D model showing the depth and true resistivity of subsurface layers.

Instrumentation

Apparent resistivity data is typically acquired using a SuperSting R1 Resistivity meter with the Swift automatic multi-electrode system. Both systems are manufactured by Advanced Geosciences Incorporated (AGI). The Sting is a self-contained unit that transmits current at outputs ranging from 1 to 500 milliAmps (mA). The unit also measures the potential drop and converts the data to values of apparent resistivity for a number of electrode arrays. The data are stored in internal memory and can be downloaded to a computer for processing. The Swift consists of an electrode interface console, four cables, and 56 stainless steel electrodes. Each cable has 14 individual take-outs that can be connected to electrodes at intervals up to 10 meters. Depending on the objective of the survey, the Swift can operate using 28 to 56 electrodes.

Data Acquisition

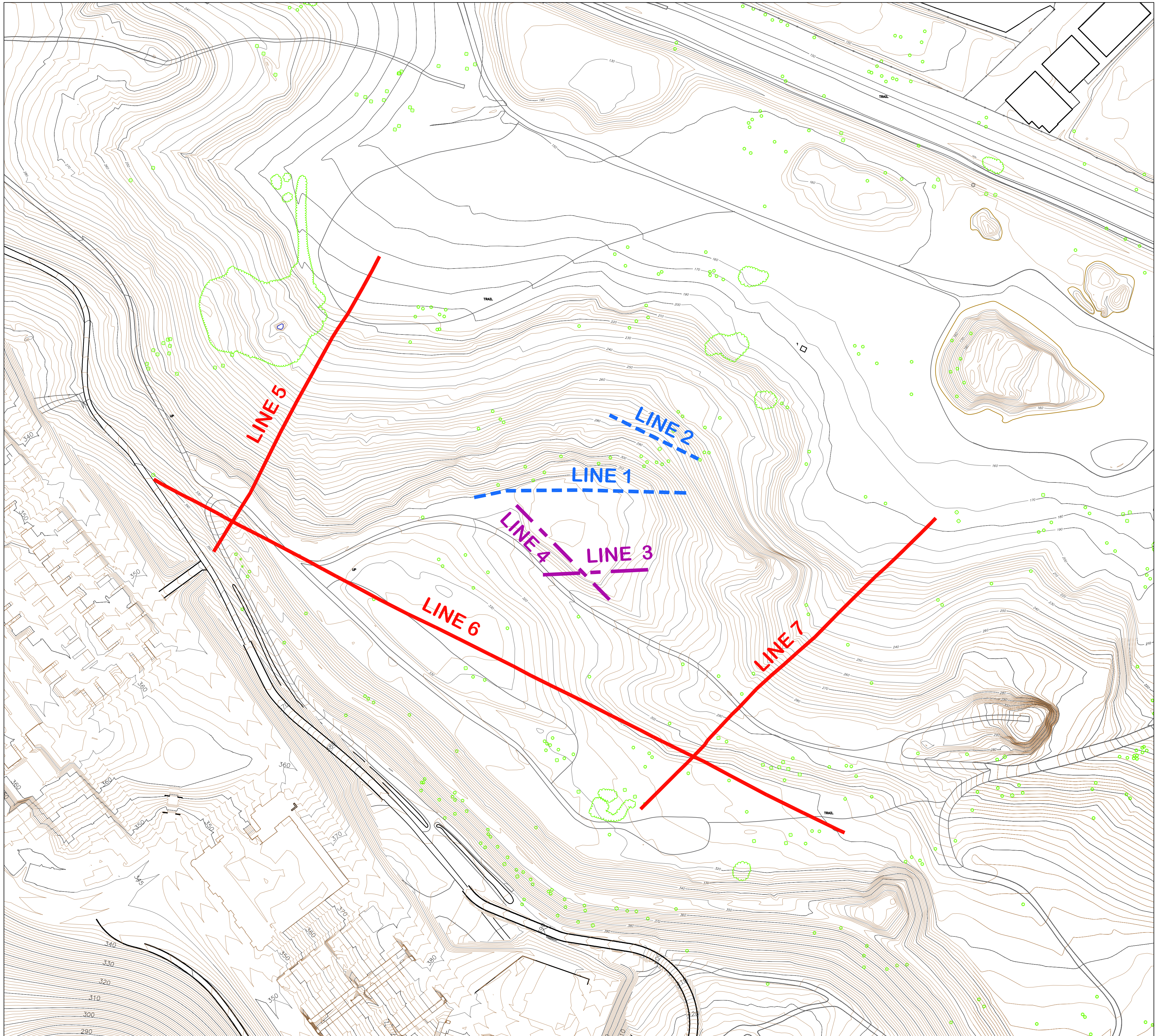
ER surveys using the Sting/Swift resistivity system are initiated by laying out the cables, end-to-end, along each profile. The Swift console is then connected between the two cables and to the Sting ER meter. At each take-out in the cable, stainless steel electrodes are driven into the ground and then fastened to the respective take-out. To begin the survey, the ER meter tests the contact resistance of each electrode. If any of the values are abnormally high, the electrode plant as well as the connection between the electrode and the switch is inspected, and if necessary, improved. The survey is begun once all of the electrode contacts tested satisfactory. To start out, readings are taken with the dipoles separated by their common length and moved along the length of the array. For example, if the length between two electrodes (referred to as a dipole) is 10 meters, then the distance between the current and potential dipoles (two electrodes each) will also be 10 meters. Since each of the switches are individually addressable by the Sting, the instrument is able to move this configuration down the array by turning the appropriate switches on and off, as necessary, to switch from one dipole to another. Subsequent readings are then taken by increasing the distance between dipoles, up to eight times the dipole separation, along the array. It then repeats the entire procedure using dipole lengths typically two to three times the length of the initial dipole. For example, if the initial dipole was 10 meters, then the Sting/Swift system repeats the process using dipole lengths of 20 and 30 meters.

Data Analysis

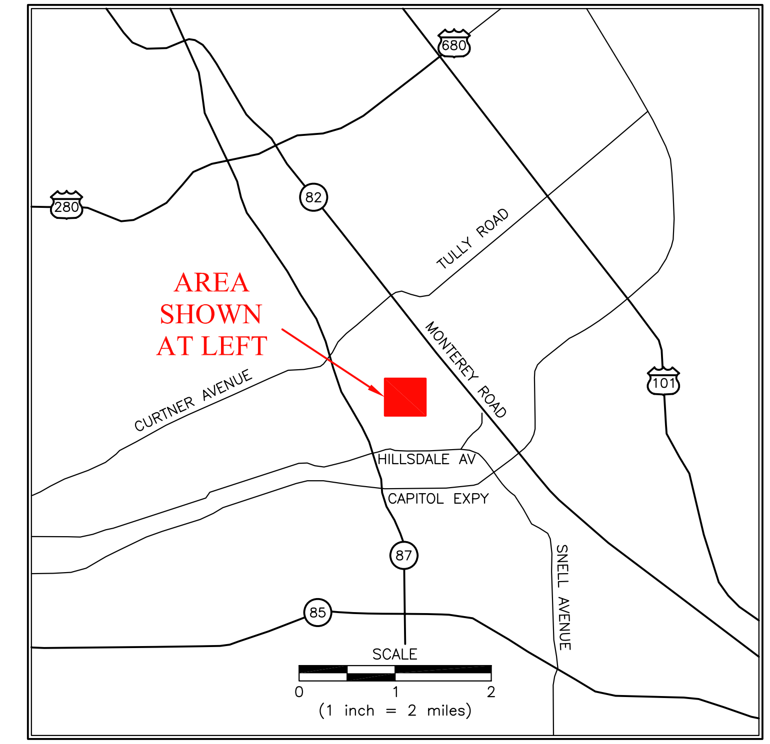
Upon completion of a dipole-dipole survey, apparent resistivity data are downloaded from the Sting to a lap-top computer using the program STINGDMP. The data are inverted to true resistivity versus depth and distance using the program EARTHIMAGER 2D. Both programs are written by AGI. The data generated by the EARTHIMAGER 2D program are then gridded and contoured using the computer program Surfer 8.0 by Golden Software to produce 2-D models.

Limitations

A common feature of all electrical methods is that the models derived from the electric profiling are not unique. That is, depending on the subsurface geo-electric structure, there may be many models that will produce essentially the same apparent resistivities. This is known as the *principal of equivalence*. To overcome this limitation, computer software programs include routines for evaluating the equivalence of a given model relative to the observed resistivity values, resulting in a model that provides the closest fit to the observed data.



VICINITY MAP



SCALE
0 100 200 400
(1 inch = 200 feet)

LEGEND

(solid red line)	ELECTRICAL RESISTIVITY PROFILE JANUARY 14–16 2009 SURVEY
(purple dashed line)	ELECTRICAL RESISTIVITY PROFILE JANUARY 6 2009 SURVEY
(blue dashed line)	ELECTRICAL RESISTIVITY PROFILE 2007 SURVEY

NORCAL

SITE LOCATION MAP
ELECTRICAL RESISTIVITY SURVEY
MERCURY HILL MINE

LOCATION: SAN JOSE, CALIFORNIA

CLIENT: STRATEGIC ENGINEERING & SCIENCE, INC.

NORCAL GEOPHYSICAL CONSULTANTS INC.

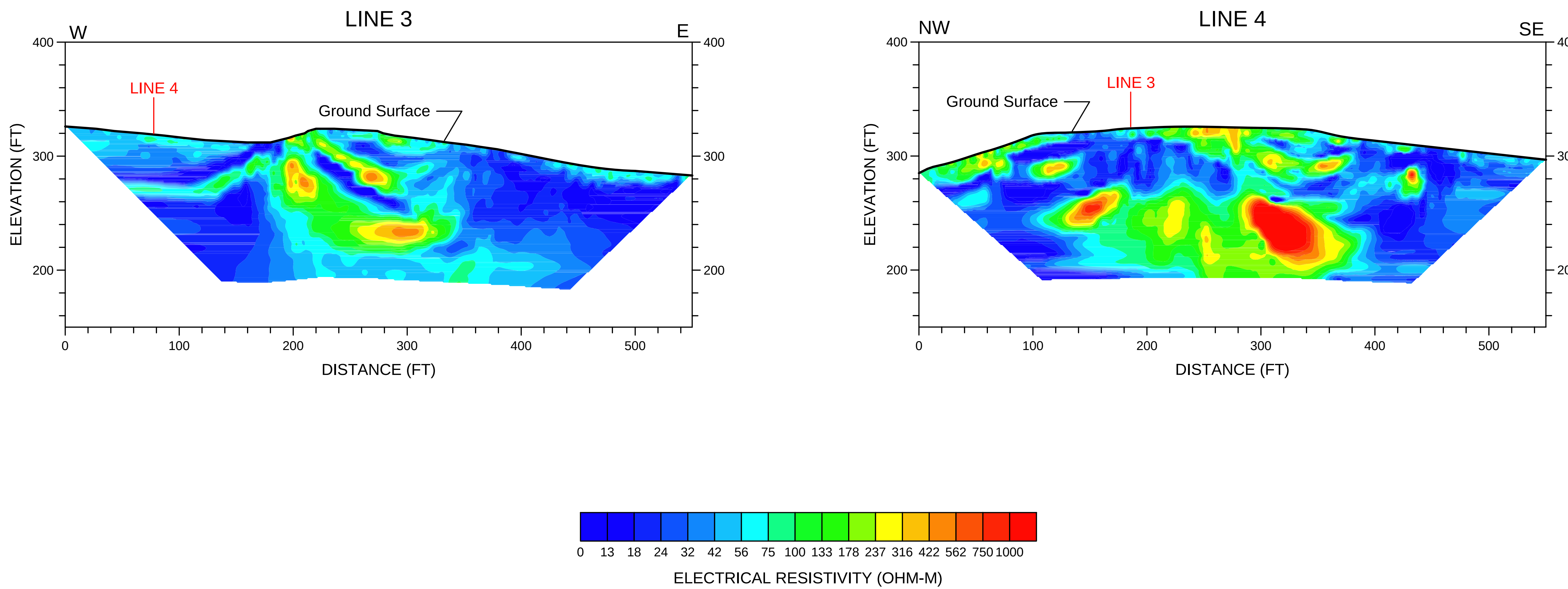
JOB #: 09–853.03

DATE: JAN. 2009

DRAWN BY: G.RANDALL

APPROVED BY: DJK

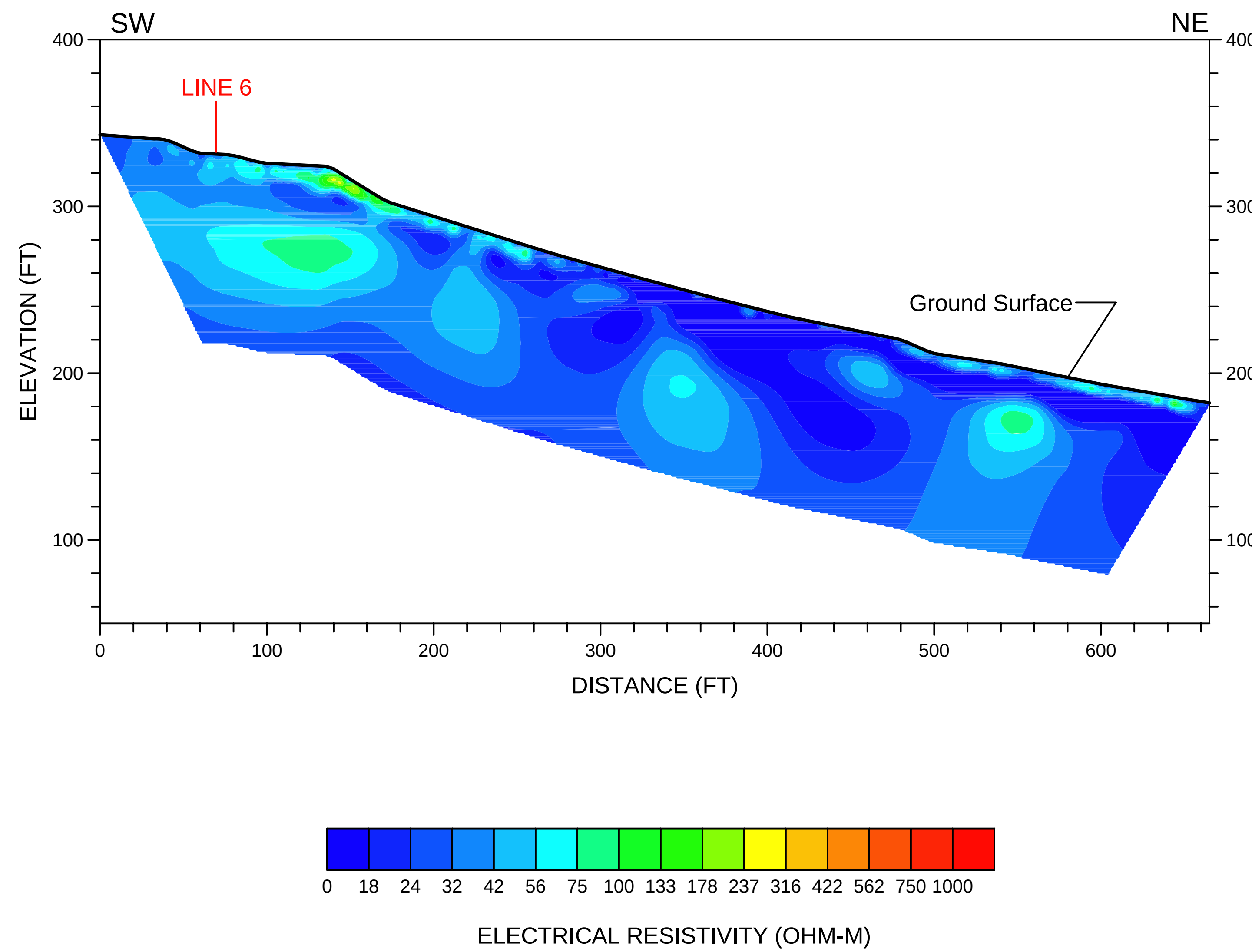
PLATE 1



NORCAL

ELECTRICAL RESISTIVITY LINES 3 & 4
JANUARY 6, 2009 SURVEY
MERCURY HILL MINE

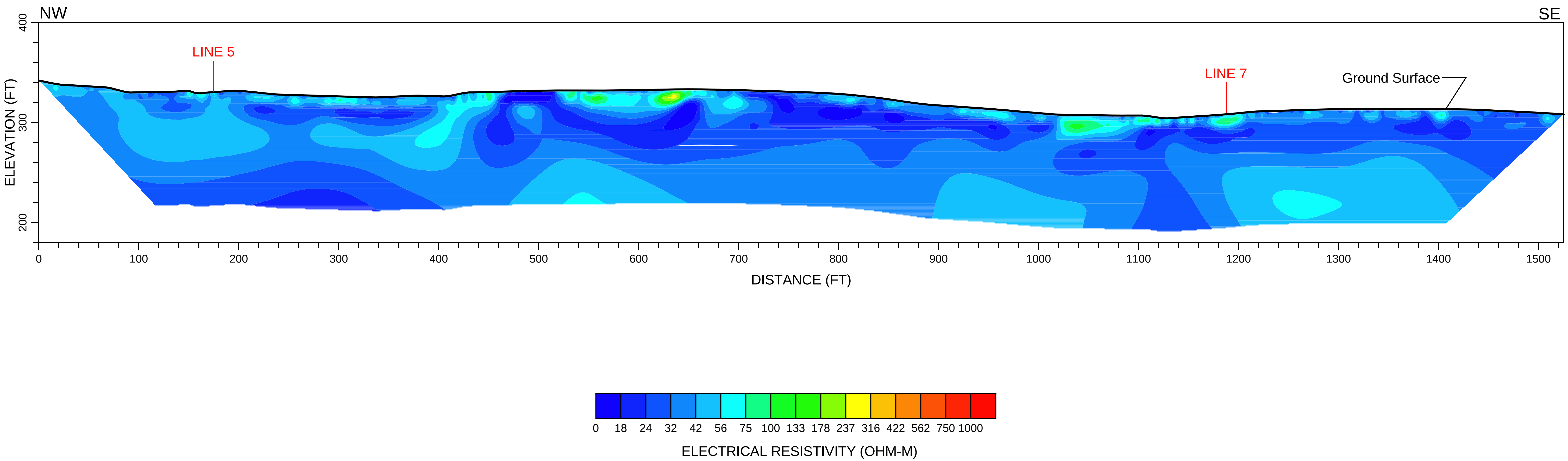
LOCATION: SAN JOSE, CALIFORNIA			
	CLIENT: STRATEGIC ENGINEERING AND SCIENCE, INC.		PLATE 2
JOB #: 09-853.03	NORCAL GEOPHYSICAL CONSULTANTS INC.		
DATE: JAN. 2009	DRAWN BY: G.RANDALL	APPROVED BY: DJK	



NORCAL

ELECTRICAL RESISTIVITY LINE 5
JANUARY 14-16, 2009 SURVEY
MERCURY HILL MINE

LOCATION: SAN JOSE, CALIFORNIA		
CLIENT: STRATEGIC ENGINEERING AND SCIENCE, INC.		PLATE 3
JOB #: 09-853.03	NORCAL GEOPHYSICAL CONSULTANTS INC.	
DATE: JAN. 2009	DRAWN BY: G.RANDALL	APPROVED BY: DJK



NORCAL

ELECTRICAL RESISTIVITY LINE 6
JANUARY 14-16, 2009 SURVEY
MERCURY HILL MINE

LOCATION: SAN JOSE, CALIFORNIA

CLIENT: STRATEGIC ENGINEERING AND SCIENCE, INC.

JOB #: 09-853.03

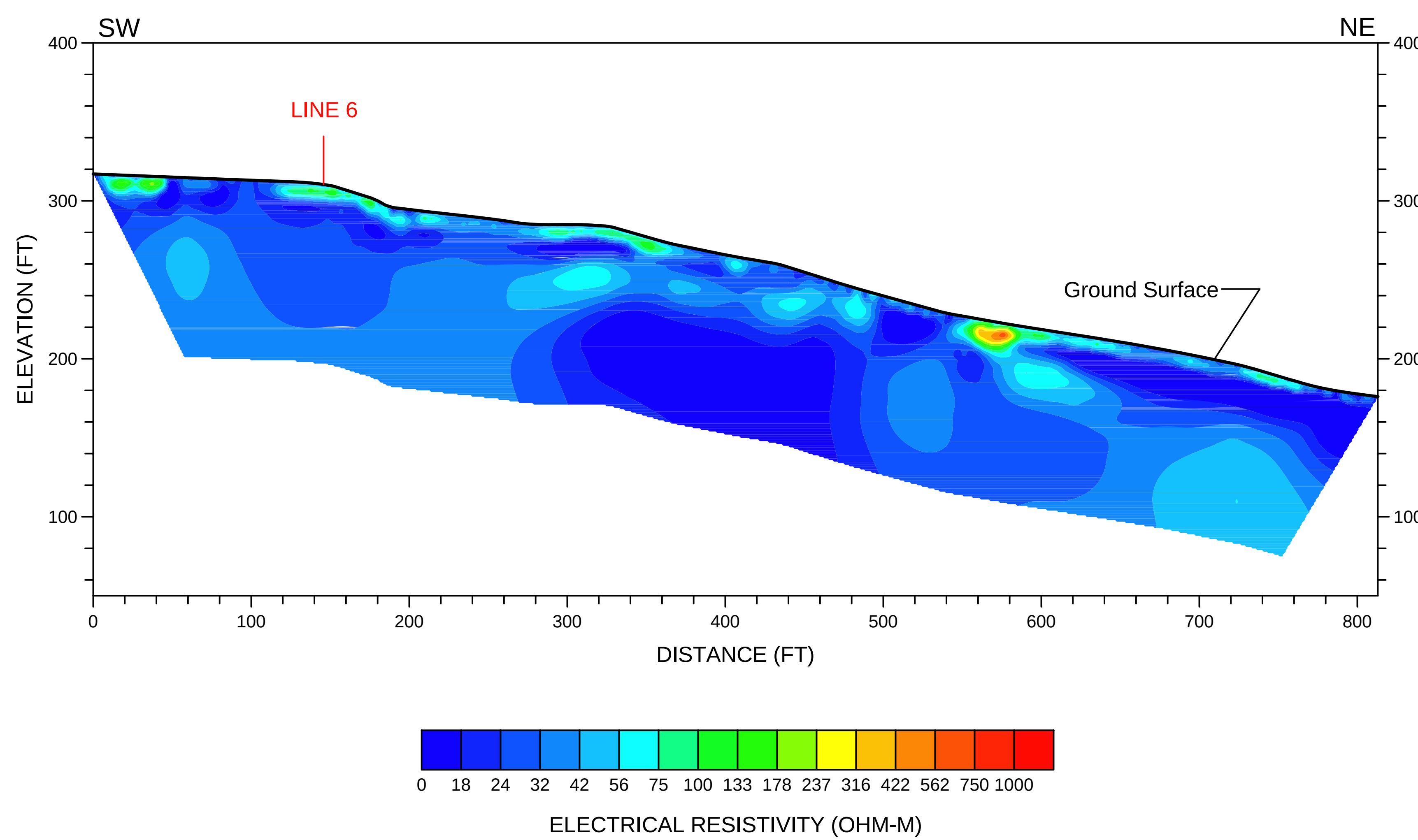
NORCAL GEOPHYSICAL CONSULTANTS INC.

DATE: JAN. 2009

DRAWN BY: G.RANDALL

APPROVED BY: DJK

PLATE 4



NORCAL	ELECTRICAL RESISTIVITY LINE 7 JANUARY 14-16, 2009 SURVEY MERCURY HILL MINE		
	LOCATION: SAN JOSE, CALIFORNIA		
	CLIENT: STRATEGIC ENGINEERING AND SCIENCE, INC.		PLATE 5
JOB #: 09-853.03	NORCAL GEOPHYSICAL CONSULTANTS INC.		
DATE: JAN. 2009	DRAWN BY: G.RANDALL	APPROVED BY: DJK	

Appendix C: McCloskey Memo on East Tunnel Investigation

McCloskey Consultants
ENVIRONMENTAL & GEOLOGIC ASSESSMENTS

April 23, 2014

Ms. Jodi Starbird
David J. Powers, Inc.
1871 The Alameda, Suite 200
San Jose, California 95126

Re: Additional Mine Tunnel Evaluations, Communication Hill, San Jose

Dear Ms. Starbird:

As you know the City of San Jose has reviewed the draft SRK Mine Mitigation Work Plan dated January 31, 2014, for the subject site and provided review comments dated February 27, 2014. There was a meeting with the City Geologist on March 5, 2014 where this review letter was also extensively discussed. One of the comments was in regards to possible additional open mine workings as shown on a mine map circa 1943 particularly a tunnel shown on this map to be southeast of the main mine workings. A number of short tunnels in that area were also noted as "caved" on this map. The main mine workings were extensively explored and surveyed in 2009 by HMH Engineers, but except for a geophysical survey, explorations for the southeastern tunnels were not because it was believed that extensive quarrying activities had taken place in that area and the tunnels removed.

To address this comment, HMH prepared an exhibit (attached) that overlays the 1943 mine map and topography over the current topographic map which also has the HMH surveyed locations of the main mine underground workings. This exhibit shows that there is good agreement between the two maps in regards to the topography as well as the underground mine workings in areas where extensive grading has not occurred. The topographic elevations of the 1943 map were assigned arbitrarily but appear to fairly accurately represent the shape and topography as it existed in 1943. The following is a discussion of additional explorations and planned mitigation for the additional workings.

Main Workings

In regards to the main mine workings, it is notable that the "main tunnel" noted on the 1943 map was the lowest, main haul route that formerly exited the mine. When the mine was explored and surveyed in 2009, there were rail lines and steel pipes in this tunnel, but the roof was collapsed a short distance from the mine bottom workings, which is why it could not be explored and surveyed. At the former exit point of this tunnel it is also collapsed but its location is visible as a linear depression in the hillside in that area. It is unknown if portions of the main tunnel are open or not, but cannot easily be explored because of the collapses at both ends. To address this issue, at the time mine mitigation, the project proponent would utilize a small directional drilling rig to advance a hole from the former entrance. With this equipment we anticipate being able to determine if the tunnel is filled in along its entirety, or if it remains open in some sections. Depending on the findings and the grading planned in that area, the project proponent has committed to mitigate the workings either by cut and fill, flowable sand, or slurry filled with concrete.

A second area of potential concern is a small area at the deepest portion of the main workings where the 1943 map shows workings, but that were flooded and were therefore not surveyed by HMH. This area is indicated by a red cloud and question mark on the attached exhibit. The extent of these workings might not have been fully mapped in 1943. To address this issue, at the time mine mitigation, the project proponent would dewater this area to allow for additional exploration. Depending on the findings and the grading planned in that area, the project proponent has committed to mitigate the workings either by cut and fill, flowable sand, or slurry filled with concrete.

Southeastern Tunnels

On the 1943 mine map there are shown a number of former tunnel entrances that were clustered in a valley area southeast of the main workings. All the tunnels are labeled to be "caved" at the time the map was prepared. Our review of historic air photos indicate that extensive cuts were performed in most of this area in the 1980's as part of the quarrying operations. The attached topographic overlay map prepared by HMH that compares the existing topography to the 1943 topography confirms that cuts of 35 feet were made. One tunnel is nearly outside the cut area and is also mapped as "caved." A geophysical survey line was also conducted through this area by Norcal in 2007 and a small, shallow high resistivity anomaly is present (see line 7, Plate 5) that could be related to either loose tunnel backfill or a tunnel that is buried but still open. Given the difficulty in exploring this area with small equipment at this time, if necessary this area can be explored prior to mine mitigation proceeding with heavy equipment.

Also on the 1943 map is a short tunnel further to the southeast that was apparently open at the time of that mapping. Once corrected for elevation, the map overlay by HMH indicates that the topographic shape of the hillside in this area is relatively unchanged since 1943, and therefore it was determined that it was possible this working remained open. It was decided that this tunnel should be evaluated because of the planned development encroaching on this area.

To evaluate the condition of the southern-most tunnel, HMH first staked the projected location of the tunnel, and an excavator was used by McCloskey Consultants to explore the location. There was no surface indication of tunnel or excavated material at the staked locations, and the historic aerial photos were reviewed again, but there was no clear evidence of the location of the tunnel.

The excavation was then performed to attempt to uncover the entrance of the tunnel, or to determine that the tunnel had been backfilled or was collapsed. After several hours of excavation, the open entrance to the tunnel was uncovered within a few feet laterally of the staked entrance, but was about 8 to 10 feet deeper than indicated by the topographic elevation. The excavator was used to remove unstable soils and rocks at the entrance, and the tunnel was left open overnight to allow ventilation. The following day, a six-gas meter and a three-man team was used to enter the tunnel to observe its' condition and extent. A tape measure was used and it was confirmed that the tunnel was approximately 80 feet longer than shown on the 1943 map, but the lateral tunnel labeled "powder drift" was accurately shown. The measured tunnel extent is shown on attached exhibit. The tunnel was uniformly about 5½ high and about 5 feet wide. The floor appeared to be nearly flat though was mapped as sloping gently towards the opening on the 1943 map. The floor was nearly clear of rockfall debris in most areas indicating good stability. There was some roof collapse and debris a short section of the tunnel where a lense of sheared claystone was present. The bedrock lithology was Franciscan Formation meta-sandstone at the tunnel entrance which transitioned to heavily altered silica carbonate vein material and ultramafics. There were indications that this tunnel was open within the last two decades as there was trash and debris scattered throughout including several aluminum beverage cans – one stamped with a date of 1991.

For safety reasons immediately after the tunnel was explored the entrance was blocked with a few large boulders and the area excavated around it was backfilled by the excavator. The material was placed by track walking only and will need to be removed and replaced if any structures or engineered fill are planned in this area.

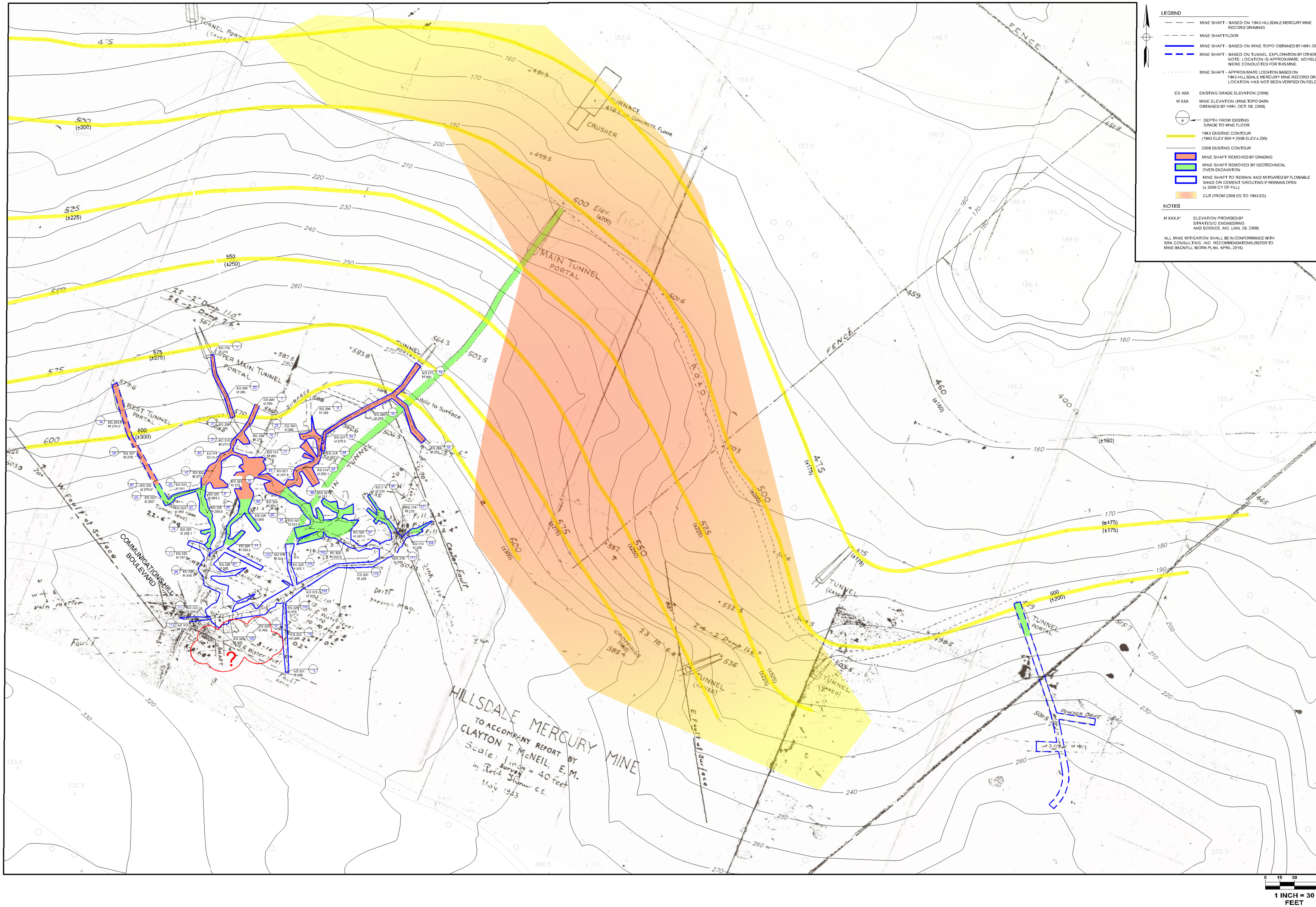
McCloskey Consultants, Inc appreciates the opportunity to be of service on this project. If you have any questions or comments relating about this letter, please contact me at (925) 786-2667 or tom@mccloskeyconsultants.com.

Sincerely,

Thomas F. McCloskey

Thomas F. McCloskey, P.G., C.E.G., C.HG.
President and Principal Geologist

Attachment: Map Exhibit



LEGEND

- MINE SHAFT - BASED ON 1943 HILLSDALE MERCURY MINE RECORD DRAWING
- MINE SHAFT FLOOR
- MINE SHAFT - BASED ON MINE TOPO OBTAINED BY HMH, OCT. 08 2008
- MINE SHAFT - BASED ON TUNNEL EXPLORATION BY OTHERS, APRIL 2014
  NOTE: LOCATION IS APPROXIMATE. NO FIELD SURVEYS WERE CONDUCTED FOR THIS MINE.
- MINE SHAFT - APPROXIMATE LOCATION BASED ON 1943 HILLSDALE MERCURY MINE RECORD DRAWING. LOCATION HAS NOT BEEN VERIFIED ON FIELD.

EG XXX — EXISTING GRADE ELEVATION (2008)

M XXX — MINE ELEVATION (MINE TOPO DATA OBTAINED BY HMH, OCT. 08, 2008)

ff — DEPTH FROM EXISTING GRADE TO MINE FLOOR

1943 EXISTING CONTOUR (1943 ELEV 500 = 2008 ELEV ± 200)

2008 EXISTING CONTOUR

MINE SHAFT REMOVED BY GRADING

MINE SHAFT REMOVED BY GEOTECHNICAL OVER-EXCAVATION

MINE SHAFT TO REMAIN AND MITIGATED BY FLOWABLE SAND OR CEMENT GROUTING IF REMAINS OPEN (± 3300 CY OF FILL)

CUT (FROM 2008 EG TO 1943 EG)

NOTES

M XXX.X* — ELEVATION PROVIDED BY STRATEGIC ENGINEERING AND SCIENCE, INC. (JAN. 28, 2009)

ALL MINE MITIGATION SHALL BE IN CONFORMANCE WITH SRK CONSULTING, INC. RECOMMENDATIONS (REFER TO MINE BACKFILL WORK PLAN, APRIL 2014)

KB HOME

TOPOGRAPHIC MINE
OVERLAY OF 1943 EXISTING GRADE VS 2008 EXISTING GRADE

PROJECT NO:	3636.60
CAD DWG:	2014 04 22 363600 MINE TOPO_OVERLAY
DESIGNED BY:	-
DRAWN BY:	EM
CHECKED BY:	ZEF
DATE:	04/15/14
SCALE:	1" = 20'

Appendix D: Arx Transport^{TM} MSDS Sheet

MATERIAL SAFETY DATA SHEET

Synthetic Concrete Foam

Date Prepared (April, 2013)

Section 1: CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

Product: ARX-Transport ™
Synonyms: Synthetic Detergent
CAS No: Mixture – No single CAS No. applicable

Company Identification

Aerix Industries™
7020 Snowdrift Road
Allentown, PA 18106

Telephone No.: 610.398.7833
Emergency Telephone No.: 888.235.5015

Section 2: COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS No.
Water	7732-18-5
Hexylene Glycol	107-41-5
Proprietary mixture of synthetic detergents	No single CAS# applicable

Section 3: HAZARDS IDENTIFICATION

Eye Contact
Product is an eye irritant
Carcinogenicity
No data available
Inhalation
No data available
Skin contact
Contact with liquid may cause moderate irritation or dermatitis due to removal of oils from the skins
Ingestion
Not a hazard in normal industrial use. Small amounts swallowed during normal handling operations are not likely to cause injury; swallowing large amounts may cause injury or irritation.

Section 4: FIRST AID MEASURES

Eye Contact
In case of eye contact, immediately flush eyes with water for 15 minutes. Retract eyelids often to ensure thorough rinsing. Contact a physician if irritation persists.
Ingestion
Do not induce vomiting unless directed to do so by a physician. Give milk or water. Never administer anything by mouth to an unconscious person. Seek medical attention

Inhalation
No specific treatment is necessary since this material is not likely to be hazardous by inhalation. If exposed to excessive levels of airborne aerosol mists, remove to fresh air. Seek medical attention if effects occur.
Skin contact
In case of skin contact, wash off in flowing water or shower. Launder clothing before reuse.

Section 5: FIRE FIGHTING MEASURES

Not flammable under normal conditions of use. Avoid Contact with reactive material, burning metals, and electrical energized equipment. Use extinguishing media appropriate for surrounding materials. This product will foam when mixed with water. Self contained breathing apparatus (SCBA) and full protective equipment recommended when fire fighting.

Section 6: ACCIDENTAL RELEASE MEASURES

Stop flow if possible. Use appropriate protective equipment during clean up. For any releases, collect spilled concentrate with absorbent material; place in approved container and disposed. Disposal should be made in accordance with federal, state, and local regulations. Prevent discharge of concentrate to waterways.

Section 7: HANDLING AND STORAGE

Recommended storage environment is between 35ºF (2ºC) and 120ºF (49ºC). Store product in original shipping container or containers designed for product storage.

Section 8: EXPOSURE CONTROLS

Exposure Limits

Component	CAS Number	PEL (OSHA)	TLV (ACGIH)
Hexylene Glycol	107-41-5	25ppm	25ppm

Personal Protective Equipment
Safety glasses, face shield, or chemical splash goggles must be worn when possibility exist for eye contact. Contact lenses should not be worn. Rubber or PVC gloves recommended. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before re-use.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point:	Not applicable
Vapor Pressure:	Not Applicable
Vapor Density:	Not Applicable
Melting Point:	Not Applicable
Evaporation Rate:	< (Butyl Acetate = 1.0)
Specific Gravity @ 25ºC:	1.04
Viscosity @ 25ºC	47 csks
Freezing Point :	-11ºC
pH:	7.3
Odor:	Bland Form:
	Liquid
Color:	Pale Yellow

Section 10: STABILITY AND REACTIVITY

Avoid use of product on burning metals, electrically energized equipment, and contact with water reactive materials. The chemical is stable and will not polymerization.

Section 11: TOXICOLOGICAL INFORMATION

This product has not been tested as a whole for acute oral and inhalation toxicity, primary eye irritation, or primary skin irritation.

Component Toxicity

Hecylene Glycol

Acute Oral Toxicity – Rat	LD50 > 2000 mg/kg
Acute Dermal Toxicity – Rabbit	LD50 > 2000 mg/kg
Acute Inhalation Toxicity – Rabbit	LD50 > than near-saturated vapor concentration

Section 12: ECOLOGICAL INFORMATION

Hecylene Glycol

Acute Toxicity – Fish	Low toxicity: LC/EC/IC50 > 1000 mg/l
Acute Toxicity – Invertebrates	Low toxicity: LC/EC/IC50 > 1000 mg/l
Acute Toxicity – Microorganism	Low toxicity: LC/EC/IC50 > 1000 mg/l

BOD_5 No data available
COD No data available

Bioaccumulation
This product has not been tested as a whole for bioaccumulation

Component Bioaccumulation
Not expected to bioaccumulate significantly. Readily biodegradable.

Section 13: DISPOSAL CONSIDERATION

This product is not RCRA-listed waste or hazardous waste as characterized by 40 CFR 261. However, state and local requirements for waste disposal may be more restrictive or otherwise different from Federal regulations. Therefore, applicable state and local regulatory agencies should be contacted regarding disposal of material.

Do not discharge into biological sewer treatment systems without prior approval. Specific concerns may be high BOD load and foaming tendency. Dilution will reduce BOD and COD factors proportionately. Low dosage flow rate or antifoaming agents acceptable to the treatment plant may be helpful.

Foam solution can be treated by wastewater treatment facilities. Discharge into biological sewer treatment facilities may be done with prior approval. Specific concerns are high BOD load. Dilution will reduce BOD and COD factors proportionately. Low dosage flow rate or antifoaming agents acceptable to the treatment plant may be helpful. Do not flush to waterways. Disposal should be made in accordance with federal, state, and local regulations.

Section 14: TRANSPORTATION INFORMATION

Shipping Class:	70
Hazard Class:	None
UN Number:	None

Section 15: REGULATORY INFORMATION

U.S Federal Regulations
All components of this product are listed in TSCA inventory

Superfund Amendments and Reauthorization Act 1986 (SARA), Title III

Section 302/304
There are no components of this material with known CAS numbers that are on the Extremely Hazardous Substances (EHS) list.

Section 311/312
Based on available information, this material contains the following components which are classified as the following health and/or physical hazards according to Section 311/312:

Hexylene Glycol	(107-41-5)	Health – Immediate and Chronic
Isopropyl Alcohol	(67-63-0)	Health – Immediate and Chronic

Section 313

This material does not contain any chemical components subject to this section.

COMPREHENSIVE ENVIROMENTAL REPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA)
This material does not contain any chemical components subject to the reporting requirements of CERCLA.

State Regulations

PENNSYLVANIA RIGHT-TO-KNOW HAZARDOUS SUBSTANCES LIST
Hexylene Glycol (107-41-5)
Isopropyl Alcohol (67-63-0)

Section 16: OTHER INFORMATION

NFPA Rating
Health: 1
Flammability: 2
Reactivity: 0

WHMIS Rating
D2B

For Further information, consult Aerix Industries™
The information contained herein is furnished without warranty either expressed or implied. This data sheet is not a part of any contract of sale. The information contained herein is believed to be correct or is obtained from sources believed to be generally reliable. However, it is the responsibility of the user of these materials to investigate, understand, and comply with federal, state, and local guidelines and procedures for safe handlings and use of this material. Aerix Industries™ shall not be liable for any loss or damage arising directly or indirectly from the use of this product and Aerix Industries™ assumes no obligation or liabilities for reliance on the information contained herin or omissions herefrom.