GOLDER

REPORT

Draft EIS Design

Peg Leg Site Alternative 5

Submitted to:

Resolution Copper Mining LLC

102 Magma Heights Road, Superior, Arizona 85173 USA

Submitted by:

Golder Associates Inc.

44 Union Boulevard, Suite 300, Lakewood, Colorado 80228 USA

+1 303 980-0540

CCC.03-26000-EB-REP-00003

Issued for USFS

June 20, 2018

Record of Issue

Date Issued	Version	Purpose
20 June 2018		Issued to USFS

Executive Summary

This report, prepared by Golder Associates Inc (Golder) on behalf of Resolution Copper Mining (RCM), presents the Draft Environmental Impact Statement (DEIS) design for the Peg Leg Site Alternative 5 – Optimized. The site is located west of the Florence-Kelvin highway approximately 18 miles south of the Superior, Arizona mill site, as shown on attached drawing G-001.

The Peg Leg site is situated on gently sloping alluvial fan deposits in a relatively remote area west of the Tortilla Mountains. Preliminary reconnaissance of the site indicates suitable topography and sufficient land area are available to meet RCM's required 1.37 Billion ton storage capacity requirements (Drawing G-002). The topography is relatively uniform and suitable for development of a large TSF. The entire staked area for the proposed tailings storage facility (TSF) is located on Bureau of Land Management (BLM) property, Arizona State Land and one private parcel (Drawing G-003). Access to the site is along an existing gravel roadway, designated the Florence-Kelvin Highway.

Tailings will be delivered to the Peg Leg site from the Superior Mill via a pipeline system. At this time, a review of two alignment options is ongoing. A western alignment heads west from the mill through several valleys heading toward Florence and then toward the Peg Leg site across the Gila River and unimproved ground east of Florence. The eastern alignment follows State Road 177 to the mountain pass 8 miles south of the mill where a tunnel extends through the mountain pass. The alignment then approximately follows the Florence-Kelvin Highway to the Peg Leg site. Two options for crossing the Gila River are being reviewed.

The subsurface characterization is based largely on a surficial geology map, site reconnaissance, geophysical investigations, and literature from nearby areas. The geotechnical and hydrogeologic characterization needed for foundation design represents the largest unknown at this stage of the design. Drawing G-004 shows the surface geology mapping that divides the site into an eastern area of granodiorite bedrock and a western area of various alluvial deposits, including some travertine deposits.

RCM requires the storage of two general tailings types: 1) a "scavenger" tailings termed NPAG (Non-Potentially Acid Generating) herein and 2) a "pyrite tailings" termed PAG (Potentially Acid Generating) herein. Given the site geology, RCM's preference for storing PAG separately from NPAG as a best management practice to minimize acid rock drainage (ARD) and the available footprint, Golder has designed separate NPAG and PAG facilities. The PAG facility is situated east of the bedrock/alluvium boundary on bedrock. The NPAG facility is situated on alluvium to the west of the alluvium/bedrock boundary. The PAG facility has been further divided into four cells to reduce the pond size required during operation as compared to a larger, single facility. The cells are arranged in a "four square" pattern to take advantage of common walls (embankments) between the cells. This PAG configuration also permits progressive closure of the cells during operations, as only one cell would be in operation at a time. The two facility footprints of 4,150 acres for the NPAG and 1616 acres for the PAG TSF result in ultimate embankment heights of about 310 feet for the NPAG facility and 180-200 feet for the PAG facilities. The downstream construction method is proposed for the PAG embankment due to the maintained water cover over the PAG, which requires a water dam type design. The centerline construction method is proposed for the NPAG embankment. Following the initial startup years, the raise rate of the NPAG facility embankment is generally less than 10 feet per year.

This layout option provides operational flexibility, the potential to develop large beach areas for tailings drying to reduce seepage and separates the benign and potentially acid producing tailings for different management approaches. Golder considers that the two proposed design approaches have previously been permitted in Arizona and Nevada. The NPAG facility is similar to a conventional TSF placed on an alluvial foundation. The PAG facility is similar to a typical gold mine TSF. At the OoM level, Golder has not identified any problematic geologic units that would indicate geotechnical stability of the embankments will be a governing design issue.

Golder considers that the governing design consideration will be to minimize water losses in this arid environment. The emphasis in the current designs is to maintain a positive water balance, defined herein as returning water to the mill rather than requiring additional water for site tailings management. To implement a positive water balance at the NPAG facility, the design includes the use of a tailings thickener to recover water from the NPAG cyclone overflow circuit, placement of a geomembrane liner in the reclaim pond area, placement of cyclone overflow (fines) in advance of tailings deposition in the remaining areas and installation of pump back wells around the NPAG facility to recover remaining seepage losses. At the PAG facility, water loss mitigation measures include the use sub-cells to reduce footprint areas, placement of an amended zone on the upstream side of the embankment and cyclone overflow placement along the base of the cell (as needed). Each PAG cell will be operated individually and closed after approximately 10 years. The water used as a cover for the PAG cells will be recycled within the PAG facility as cells are put into and taken out of commission. Seepage loss mitigation measures below both the NPAG and PAG the cyclone sand embankments includes grading the subgrade for drainage, compaction of the subgrade below the cyclone sand embankment to reduce the permeability and placement of a toe drain on the prepared foundation to recover hydraulic cell deposition water.

A detailed water balance was completed using GoldSim software. The water balance supports returning approximately 25 percent of the tailings transport water going out to the site and the precipitation captured within the TSF footprint being returned to the mill. This range is around the typical value for other Arizona TSFs. The design includes the implementation of a number of Arizona BADCT (Best Available Demonstrated Control Technology) principals, as described in Section 4.4.

Table of Contents

TABLES

DRAWINGS

APPENDICES

1.0 INTRODUCTION

This Peg Leg Site Alternative 5 report summarizes Golder's design of a partially lined facility at the Peg Leg site. The report is organized into this summary document and is supported by the following technical Appendices.

- Appendix A Peg Leg Design Basis
- Appendix B Peg Leg Site Characterization
- Appendix C Peg Leg Seismic Review
- Appendix D Peg Leg Design Input Parameter Summary
- Appendix E Peg Leg Alternative 5 Tailings Staging and Material Balance Plan
- Appendix F Peg Leg Alternative 5 Surface and Contact Water Management Plan
- Appendix G Peg Leg Alternative 5 Water Balance and Dust Management
- Appendix H Peg Leg Closure Strategy

Stability analyses are included in Appendix E and seepage analyses, consolidation, pump back wells, and thin lift deposition are discussed in attachments to Appendix G.

2.0 SITE CHARACTERIZATION

The Peg Leg site location and description of site characteristics are presented in the following sections. The site characterization technical memorandum is summarized in Appendix B.

2.1 Topography and Hydrology

The Peg Leg site is located on the western flanks of the Tortilla Mountains in central Arizona, approximately 18 miles south of Superior, Arizona (Drawing G-001). Near the Peg Leg Site, the mountains are bounded by the Gila River on the east and north, and to the west by the gently sloping alluvial surface that drains toward Donnelly Wash, which borders the Peg Leg Site to the southwest and west. The elevation of the proposed TSF site ranges from approximately 3,100 feet above mean sea level (amsl) at the eastern extent of the TSF footprint, to approximately 2,300 feet amsl at the western edge of the TSF footprint (Drawing G-002). The Peg Leg site is immediately to the east of a drainage divide separating Ripsey Wash.

The Gila River is the only permanent flowing water in the region and is located approximately 4.5 miles to the north and 7 miles east of the Peg Leg Site. Several small stock ponds, fed by wells or captured storm water runoff are present within the TSF footprint and surrounding areas.

2.2 Land Use

The Peg Leg site consists almost entirely of open desert land that has been used as open rangeland by local ranchers. There are no towns or communities within the Donnelly Wash basin. The Tea Cup Ranch and a Greek Orthodox Church retreat facility make up the only permanently inhabited structures within or near the site footprint. Two powerline corridors bisect the site and a small electrical substation is present along the northern edge of the TSF footprint. This infrastructure will need to be relocated around the facility.

2.3 Seismicity

Historical records suggest the seismic risk associated with the Peg Leg site would not be significantly different from the Near West site, located 20 miles to the north and west. The Near West site was found to have a low to moderate seismic hazard. There are no mapped, potentially active Quaternary faults near the Peg Leg site.

The current design criteria evaluate the seismic susceptibility of the embankment(s) for an event with a return period of 10,000 years. Based on the review presented in Appendix C, the following criteria are used:

- For the PAG facility founded on bedrock, a peak horizontal ground acceleration (PHGA) of 0.15 g
- For the NPAG facility founded on alluvium, a peak horizontal ground acceleration of 0.22 g

Seismic design parameters summarized from previous work are presented in Appendix C.

2.4 Regional Geology

The Tortilla Mountains lie within the Basin and Range physiographic province of the Western United States and are characterized by rugged granitic terrain incised by ephemeral drainages. The geological formations that make up the mountains and much of the surrounding area are part of much larger Precambrian intrusive complex that includes much of south-central Arizona. The oldest formation near the Peg Leg site is the Ruin Granite, a granite and quartz monzonite unit intruded by dikes and sills of diabase, andesite, and aplite. During the Laramide period, the Ruin Granite was compressed to form uplifted areas and then intruded by the Tea Cup Granodiorite. Following a period of extension and basin formation, basement rocks were eroded and Tertiary gravels filled the basins, including the Donnelly Wash Basin in which the Peg Leg site lies. Washes have been incised into the older, Tertiary gravels and are partially filled with recent sands and gravels.

2.5 Site Geology

The geology near the Peg Leg Site can be generally characterized as consisting of exposed granitic bedrock units underlying the eastern half of the TSF facility footprint, and younger alluvial deposits over a gently sloping bedrock pediment in the western half of the footprint. The granitic units include the Precambrian Ruin Granite and the Tertiary Tea Cup Granodiorite. In general, the bedrock units are expected to have low permeability and high-strength characteristics, although the degree of fracturing and continuity of fractures remains largely unknown. West of the bedrock units are alluvial valley fill deposits that include Tertiary gravel deposits, travertine, and recent alluvium. Although fracture zones have been mapped on the bedrock surface near the TSF site, there no known active seismic features on or near the site. The surface geology is shown on Drawing G-004.

2.6 Site Hydrogeology

Groundwater is expected to be present within shallow fracture zones in the bedrock units and at greater depths within the alluvial aquifers that would underlie the western half of the Peg Leg site. The primary source of groundwater to these aquifer systems is expected to be mountain front recharge or from storm water runoff that infiltrates the more permeable regolith and alluvial deposits. The depth to groundwater is expected to range from less than 50 feet below ground surface (bgs) in the fractured bedrock aquifers to several hundreds of feet near the center of the Donnelly Wash basin. The limited site water level data suggest that groundwater depths below the facility footprints is relatively shallow and extends at depths less than 50 feet (one well near the toe of the NPAG embankment has a measured level of 32 feet). Groundwater is expected to flow to the northwest, generally following the ground surface topography. Site-specific hydraulic conductivity (K) values are not available. Values derived from comparable units at the Near West and other investigation sites suggest bedrock permeability values ranging from 10^{-5} to 10^{-7} centimeters per second (cm/s) and shallow basin-fill alluvium K-values ranging from 10^{-2} to 10^{-7} cm/s. Values that are more specific are referenced in Appendix B. The interpreted groundwater and alluvial depths are also discussed in the Montgomery and Associates (M&A, 2018) technical report, included in Appendix B. Groundwater quality can be expected to have near neutral pH, possibly high concentrations of dissolved solids and low concentrations of metals.

2.7 Climate

The climate near the Peg Leg Site is semi-arid, with mild winters and hot, dry summers. The site is almost equidistant between two weather stations, located in the towns of Florence and Winkleman. Average daily maximum temperatures in July at these stations are 106 and 103 degrees Fahrenheit (°F), respectively. Average minimum temperatures in January are 36°F and 29°F, respectively. Average annual precipitation ranges from 10 to 14 inches.

3.0 TAILINGS CHARACTERIZATION

This section provides a summary of the tailings characterization, including description of the tailings types, geochemical and geotechnical characterization and discussion of the design parameters for the hydraulically placed tailings. The detailed tailings characterization is summarized in Appendix D.

3.1 Tailings Types

The proposed TSF at the Peg Leg site is designed for storage of two general tailings types: 1) a “scavenger” tailings termed NPAG (Non-Potentially Acid Generating) and 2) a “pyrite tailings” termed PAG (Potentially Acid Generating). The NPAG stream will be directed to cyclones part of the time to facilitate the TSF embankment construction. The NPAG tailings consist of the following:

- Whole tailings – Representing NPAG stream deposited directly into the TSF without going through the cyclone separation process.
- Cyclone sands – The coarse fraction of the NPAG tailings stream from the cyclone separation process (cyclone/scavenger underflow) used to construct the TSF embankments.
- Cyclone overflow – The fine fraction of the NPAG tailings after cyclone separation (cyclone overflow or fines), which are thickened and then placed in the impoundment along with any whole tailings not needed for cyclone separation.
- Beach tailings – Coarser tailings fraction located in the relative vicinity of deposition points (i.e., closer to the spigot locations). If the impoundment tailings are deposited at a solids content that allows for the segregation process to occur, beach tailings will consist of a sandier product similar to cyclone sand tailings.
- Fines – Fine grain size tailings depositing at a distal location from the deposition points. As the coarser tailings particles are removed from the inflow stream by the segregation process, these tailings may consist of relatively fine particles and may exhibit properties similar to cyclone overflow tailings.

The PAG Tailings are a fine-grained, high specific gravity, low permeability tailings subject to acid generation if exposed to the atmosphere. However, if the PAG tailings are placed sub-aqueously they are not expected to either generate acid or adversely impact water quality.

3.2 Geochemical

Mill processing will generate two geochemically discrete streams: NPAG (scavenger) and PAG (pyrite) tailings. The NPAG stream is expected to contain a very low percentage of pyrite (with a mean sulfide content of less than 0.1% by weight) and exhibit low neutralization potential (buffering capacity). The release of acidity, sulfate, and metal/metalloids from the scavenger tailings is expected to be limited by the very low sulfide and residual metal contents (Duke HydroChem 2016, KCB 2018).

The PAG tailings stream is expected to contain a high percentage of pyrite, >20% by weight per (Duke HydroChem 2016, KCB 2018) and is expected to require special consideration during operation and closure to prevent oxidation and avoid the generation of acid mine drainage (AMD). The PAG tailings will be deposited subaqueously and must remain saturated during operation and closure. Due to their low permeability and following consolidation, the PAG tailings may remain saturated during closure if surrounded by low permeability NPAG tailings.

3.3 Geotechnical

Geotechnical properties required for the tailings design are typically determined by testing or from literature sources of similar Copper tailings. The Peg Leg tailings properties were determined using the tailings information developed for the Near West site (KCB 2016, 2018). The following geotechnical properties were developed for different tailings types:

- Specific Gravity – Denoting a relative density of solid particles with respect to water. The Peg Leg design uses specific gravity of 2.75 for NPAG tailings and 3.5 for PAG tailings.
- Dry Density – Ratio between the mass of dry tailings and the tailings volume (including pores). For the TSF sizing, the dry density value of 81 pcf was used for NPAG tailings fines (cyclone overflow), 113 pcf for cyclone sand, and 99 pcf for pyrite tailings.
- Bulk Density – Ratio between the total mass of tailings (solid particles + water) and the tailings volume. For the TSF stability design considering NPAG tailings, the bulk density was assumed to range from 102 pcf for saturated tailings fines (cyclone overflow) to 134 pcf for cyclone sands. For the PAG impoundment stability design, the bulk density values were assumed to range from 152 to 162 pcf.
- Hydraulic Conductivity – Also termed permeability, varies with the level of applied effective stress, void ratio, density and the type of tailings (i.e., there is not a single unique value). For the TSF design, the hydraulic conductivity values range from approximately 1×10^{-3} cm/s for cyclone sands to approximately 1×10^{-7} cm/s for cyclone overflow (NPAG/scavenger fines) and pyrite tailings.
- Compressibility – Relationship describing the amount of strain/settlement when subjected to loading. Similar to hydraulic conductivity values, the tailings compressibility is dependent on the applied effective stress and the type of tailings. In the classical geotechnical literature, tailings compressibility is often expressed by using the compression index (defined as a change in the void ratio for the unit change in the logarithm of the effective stress). For the TSF design, the compressibility is expressed as a non-linear function with the approximate values of the compression index ranging from less than 0.1 for cyclone sands to about 0.3 for tailings fines (cyclone overflow).
- Soil Water Characteristic Curves – Relationship describing the amount of water retained in the tailings pores when subjected to negative pore pressure (suction). For cyclone sands, the value of suction required to start

the de-saturation (drying) process is less than 1 inch of water. For pyrite tailings and cyclone fines, the suction required to desaturate tailings is significantly greater.

Developed geotechnical parameters were used to determine water demands and outflows from the tailings facility, determine stability of the tailings embankments, and determine construction requirements in terms of land area-demands and volume requirements.

3.4 Rheology

Tailings rheological parameters are of primary importance for the pipeline and cyclone design as they describe the resistance of tailings to flow, affect the pipe sizing and the pump selection process, and govern the potential separation of different size fractions during the cyclone and deposition process. Rheological properties for NPAG and PAG tailings were assumed to resemble parameters determined for alternate deposition sites and based on RCM's input. Based on the available inputs, design solids content for different tailings streams were selected as follows:

Table 1: Tailings Solids Contents

Tailings Type	Solids Content (wt %)
NPAG from mill	60
PAG from mill	50
Cyclone feed (inflow of whole tailings to cyclones)	35
Cyclone underflow (before adding dilution water)	75
Cyclone underflow after dilution (to allow for pumping to embankment/construction locations)	60
Cyclone overflow before thickening	22
Cyclone overflow after thickening (before being directed into tailings impoundment)	60

4.0 DESIGN BASIS

4.1 General

The design basis provides the criteria to be used to assess the suitability of the design against regulatory requirements, recognized standards, and appropriate guidelines. The design basis criteria is independent of the site conditions and simply states that certain design aspects will be achieved by the proposed design. Where appropriate, specific values are stated in the criteria, such as storm recurrence events, seismic recurrence, etc.

Appendix A summarizes Golder's Design Basis Memorandum (DBM) and describes the design issue, criteria, and reference used to develop the basis. Applicable permit regulations and objectives of the design are also summarized in Appendix A. Design input parameters (values to be used in calculations and analyses) are not included in the design basis and are summarized in Appendix D.

4.2 Tailings Production Rate

The tailings production rate is summarized in Appendix D, Table 2, and presented graphically in Appendix D, Figure 1.

4.3 Design Regulations and Guidelines

The design is intended to meet or exceed regulatory criteria, including Arizona's Best Available Demonstrated Control Technology (BADCT, ADEQ 2005), internationally recognized criteria, such as the Canadian Dam Association (CDA 2013) and corporate governance criteria, such as the Rio Tinto D5 standard. References to these criteria along with other guidelines are summarized in Appendix A, Table 1.

4.4 BADCT Approach

This document provides the "reference" design against which BADCT control measures can be assessed. The proposed Alternative 5 design uses a number of design concepts intended to meet Arizona BADCT, including:

Site Selection and Layout

The following components of the site selection and layout are considered to be application of BADCT principles:

- Separation of the whole tailings at the Superior mill site into NPAG and PAG tailings to be stored and managed in separate impoundments is considered BADCT because these two types of facilities have been previously been permitted and are being operated in Arizona.
- Use of the NPAG tailings as embankment construction materials (cyclone sand) is a common construction technique used in Arizona and elsewhere to achieve static and seismically stable embankments.
- Physical location of the PAG facility in an area of bedrock geology, which is expected to have lower permeability than alluvial areas situated to the west.
- Capture of embankment seepage in toe blanket drains and collection in lined surface and seepage collection ponds for reuse at the site or mill.

Climatic Factors

- The NPAG facility footprint area is designed to maximize use of evaporation to promote drying of tailings on the surface and thereby reduce infiltration of water to the substrate.
- Conversely, the PAG facilities have been designed into sub-cells, which minimize surface area for both evaporation losses and infiltration of seepage.

Surface Water Control/Hydrology

- Diversion ditches are designed to route non-contact water around the facility.

Water Discharge Control Technologies

- Thickening of the NPAG and PAG tailings at the Superior mill site for water recovery prior to pipeline transport.
- Thickening of the overflow tailings to recapture the cyclone dilution water that diverts to the overflow during the cyclone separation process. This process allows recycling this water for cyclone dilution and reduces the water going to the impoundment, thereby reducing infiltration and evaporative losses.

Embankment Design Characteristics

- The PAG and NPAG impoundments will be designed to meet recognized stability criteria using downstream or centerline construction, appropriate for the two different storage approaches.

Operational Considerations

- The PAG and NPAG pond sizes will be minimized to reduce infiltration and evaporative losses.
- The startup NPAG reclaim pond will be lined with a geomembrane to reduce direct infiltration of water into the permeable alluvium soils. Following startup, the NPAG reclaim pond area will have a minimum of 18 inches of lower permeability cyclone overflow placed below the impounded tailings footprint.
- NPAG impoundment interior dust control will be managed by cycling deposition locations around the embankment perimeter to provide periodic wetting of the impoundment beach areas, control dust emissions, and permit sufficient desiccation between wetting cycles.

Closure/Post-Closure

- The PAG cells are separated into sub-cells to permit progressive closure of the sub-cells during the operational life. Sub-cells 1 through 3 can be covered with a layer of NPAG tailings followed by placement of a store and release cover to provide erosion protection and maintain saturation of the PAG tailings. Sub-cell 4 may require the milling and hydraulic deposition of benign material as a tailings cover. Sub-cell 4 may also be designed to be the smallest of the sub-cells due to the reduction in tailings production during the later years of mine life.

5.0 TAILINGS MANAGEMENT PLAN

Details of the embankment design, staging, mass balance, and stability analyses are presented in Appendix E. The appendix also includes preliminary recommendations for geotechnical monitoring as well as information needed to advance these analyses for future stages of design.

5.1 Facility Descriptions and Staging

The 1.15 Bt of NPAG tailings and 220 Mt of PAG tailings will be stored in separate facilities covering 5,765 acres that is developed through time. After year 2, the earth fill starter dams for each facility will be raised using cyclone underflow sand generated from the NPAG stream. Both the NPAG and PAG storage areas will be developed in phases to allow for enhanced control over tailings deposition and reclaim pond management during the mine operations ramp up. The use of cellular storage for the PAG tailings will also reduce the amount of water needed to maintain a water cap over the tailings and allow for progressive reclamation as described elsewhere in this document. Both the NPAG and PAG areas include partial lining systems to reduce seepage losses. General information for each facility is provided below. The development of each facility through time is shown on Drawings C-001 to C-004 and summarized on Table 2.

Table 2: Summary Stage Geometry

Stage	Maximum Centerline Height, ft (Crest Elevation, ft)				
	NPAG Embankment	PAG Cell 1 Embankment	PAG Cell 2 Embankment	PAG Cell 3 Embankment	PAG Cell 4 Embankment
Starter	110 (2,660)	50 (2,950)			
10	165 (2,715)	140 (3,040)			
20	240 (2,790)	165 (3,065(c))	185 (3,065(c))	110 (3,070(s))	
30	295 (2,845)	165 (3,065(c))	185 (3,065(c))	205 (3,165(c))	110 (3,100)
Ultimate	310 (2,860)	165 (3,065(c))	185 (3,065(c))	205 (3,165(c))	160 (3,150(c))

Notes:
(s) Indicates starter facility embankment
(c) Indicates closed facility, no longer active

NPAG Facility

- A 110-foot high (crest elevation at 2,660 feet) starter facility will be constructed using borrow materials (4.15 Mcy of starter fill) and provide up to 2 years of tailings capacity.
- After startup, the second stage will expand the facility to the north and approximately double the storage footprint for the next 2 years of tailings production. A third stage will expand the facility to the south, again doubling the NPAG storage footprint, and again providing approximately 2 years of tailings production storage. The fourth stage will combine the first three stages into a single operating facility.
- The starter facility will be fully lined with a geomembrane liner. Subsequent stages will have geomembrane liner installed in the area of the reclaim pond. Stages 2 and 3 are assumed to each have approximately 50 acres of liner. As the facility expands eastward in Stage 4, 300 acres of geomembrane will be progressively installed along a 2,000-foot wide (in the north-south direction) strip ahead of the rising reclaim pond.
- The 1.15 Bt of NPAG tailings will be stored in the following locations/structures:
  - NPAG facility will contain 805 Mt of cyclone overflow and whole tailings behind a centerline-raised, cyclone sand embankment.
  - Construction of the NPAG embankment will utilize 200 Mt of underflow tailings.
  - Construction of the PAG embankments will utilize 145 Mt of underflow tailings.
- The ultimate crest elevation of the NPAG dam is 2,860 feet and maximum centerline height is approximately 310 feet.
- Ultimate crest length is approximately 35,500 feet (6.7 mi).
- The total embankment footprint is 603 acres.
- The total NPAG impoundment footprint is 4,149 acres, including the embankment area.
- Towards the end of the impoundment operations, tailings deposition will be sequenced to generate the final landform surface, which drains towards the southeast (See Appendix H).

PAG Facility

The 220 Mt PAG facility design is a four-cell concept arranged in a square where each cell is filled sequentially.

- A 10-foot-deep water cap will be maintained over the active PAG storage cell to reduce the risk of oxidizing the sulfide minerals in the PAG tailings.
- The 50-foot high (crest elevation 2,950 feet) starter facility for the first cell will be constructed using borrow materials (1.41 Mcy of starter fill) and provide up to 2 years of tailings capacity.
- Ultimate cell capacities vary from 53.2 to 62.7 Mt of PAG tailings; the fourth cell does not need to be developed to its full capacity and will only receive 45.8 Mt of tailings.
- Construction of each cell embankment to its full height would require 34.2 to 40.6 Mt of NPAG underflow tailings; as the fourth cell will not be filled to capacity, only 28.0 Mt of NPAG underflow tailings will be utilized.
- The upstream slope of the PAG embankment will have a 20-foot-wide zone of amended cyclone sand (cyclone sand mixed with cyclone overflow or other material to create a low permeability zone, which does not materially affect the overall cyclone sand demand). The near surface granodiorite and granite bedrock is assumed to provide geologic containment on the floor of each cell.
- The two western cells (1 & 2) are designed to an ultimate crest elevation of 3,065 feet with maximum centerline heights ranging from 165 to 185 feet.
- The two eastern cells (3 & 4) are designed to an ultimate crest elevation of 3,165 feet with maximum crest heights of 175 to 205 feet; the fourth cell will only be raised to a crest elevation of 3,150 feet (a maximum height of 160 feet).
- The perimeter crest length for the combined cells is approximately 29,600 feet (5.6 mi).
- Interior dividing berms range from approximately 4,250 to 4,380 feet long.
- The plan footprint of the downstream (exterior) slope of the ultimate embankment is 304 acres.
- The total PAG facility footprint is 1,616 acres.
- As each cell reaches its maximum storage capacity, the water cap will be displaced by hydraulically placing NPAG tailings. Displaced water can be drained to the adjacent PAG cell or pumped to the reclaim tank. To close the final cell at the cessation of mining operations, NPAG tailings could be repulped and pumped to the PAG facility, or benign material could be processed through the mill facilities and transported using the existing tailings distribution infrastructure.

5.2 Borrow Plan

Borrow material for starter dam construction is expected to be primarily alluvial sand and gravel and expected to be available in sufficient quantity. Borrow materials for the NPAG facility will be excavated from the footprint to develop the central reclaim pond and train other smaller, reclaim areas toward the center of the facility. Borrow materials for the Cell 1 PAG starter embankment will be composed of alluvium gathered on the interior of the facility and in proximity to the embankment construction. Minor quantities of borrow materials may be obtained from the alluvium present in drainages below the embankment footprints and excavations for seepage collection ponds along the toe of each dam.

Construction of starter dams for subsequent cells/stages and raises of the dams will be completed using cyclone underflow sand generated from the NPAG tailings. Following initial construction excavated borrow materials will not be required, but can be used to supplement dam construction, for supplemental seepage collection ponds and as excavations are needed to control or route the reclaim pond.

Potential riprap materials to line drainages and provide rock armoring are situated within the PAG TSF footprint. It is preferable to use these rock outcrops for the riprap required for diversion ditches and covers by initially developing these areas as rip rap borrow and flattening or leveling the local undulating topography.

5.3 Construction Methodology

The proposed NPAG and PAG tailings embankments will be constructed using hydraulic cells. Each cell will be operated independently for underflow deposition. Cells will be separated by berms constructed of underflow sand. Cyclone sand hydraulic cells will be sized for efficient placement based on the rate of rise and material-handling requirements – dimensions would typically vary from 300 to 2,000 feet long and 30 to 100 feet wide as is typical for this type of construction.

The NPAG embankment will be developed using a centerline-raise construction method. The PAG embankment will be developed using a downstream-raise construction method due to the 10 feet of free water above the PAG. An amended sand, low permeability layer is incorporated into the upstream slope to control water losses and provide for long-term envelopment of the PAG. A downstream slope of 3H:1V has been selected for both the PAG and NPAG embankments for stability and closure considerations and to compare to the Near West site. An upstream slope of 2.5H:1V has been selected for the PAG facility. The upstream slope allows for the potential geomembrane liner placement, should subsequent studies determine a liner is necessary.

Foundation preparation below the NPAG and PAG embankments will include clearing and grubbing followed by the removal of loose, potentially liquefiable materials, such as recent alluvial sands. The foundation areas will also be shaped to drain towards existing drainages and compacted with a smooth drum roller to reduce infiltration of water from the initial hydraulic cell deposition. The toe drainage system will then be placed on the prepared foundation.

5.4 Stability

The static, seismic, and post-earthquake stability of the PAG and NPAG embankments was evaluated for two cross sections through the PAG facility and one cross section through the NPAG facility. As the dams are expected to be drained and will comprise dense, dilatant material not susceptible to pore water pressure buildup and strength loss during a design seismic event, the pseudo-static method was used in accordance with BADCT Engineering Design Guidance. Golder utilized the screening-level pseudo-static method developed by Hynes-Griffin and Franklin (1984) to evaluate the dynamic stability of the PAG and NPAG embankments. Deformations are expected to generally be less than 3 feet for stability factors of safety greater than 1.0 computed using this method. For both the PAG and NPAG embankments, a horizontal acceleration coefficient of 0.09 g was used, equal to 60 percent of the maximum peak horizontal ground acceleration (PHGA) of 0.15 g, based on Arizona Dam Safety requirements. This differs slightly from the Hynes-Griffin and Franklin method that suggests using 50 percent of the maximum PHGA. The shear strengths of the cyclone sand embankment and alluvial materials were reduced by 20 percent in accordance with the method.

The results of the stability analyses indicate that slip surfaces approaching the infinite slope conditions had the lowest computed factors of safety for all cases evaluated. All calculated factors of safety were found to be above the minimum design criterion in Appendix A – DBM. These analyses will need to be verified once foundation conditions are characterized. Based upon our current knowledge and these results, the 3H:1V design embankment slopes are expected to be geotechnically stable.

6.0 WATER MANAGEMENT PLAN

6.1 Surface Water Management System

The surface water management plan was developed with the following objectives:

- Keep non-contact (i.e., runoff derived from undisturbed natural ground) and contact water (i.e., water that has come into contact with the process facilities or tailings) separate to the extent practical.
- Divert non-contact water around the TSF footprints and process facilities to release the water back into the natural waterways that convey the water downstream of the facility. In this case, water will be diverted into unnamed washes to the north and south of the TSF that flow into the Gila River.
- Capture contact water from the embankment up to the design storm event and convey the water back into the TSF to be re-used as reclaim water.
- Store the probable maximum flood within the TSF during the facility operation life.
- Protect the TSF and diversion structures from erosion or overtopping during the design storm event.

Within the TSF footprint area, a series of ephemeral drainages convey runoff from precipitation events in generally an east-to-west direction at about a 3% to 5% slope to the Gila River. Non-contact water diversions will be constructed up gradient of the TSF and around the process facility footprints to divert water north and south into natural drainages that are located outside of the TSF boundary. Similarly, temporary diversion channels will be constructed during the early phases of the facilities to reduce the mixing of contact water and non-contact water.

Water that falls within the TSF area will be considered contact water and will be captured within the facility or in a storm water/toe drain collection ditches and ponds located around the perimeter of the TSF. The storm water/toe drain collection system consists of lined toe channels that convey runoff and flows collected in the toe drain to seepage collection ponds located west of the embankment. Water from the seepage collection ponds will be pumped to the reclaim tank to be reused as reclaim water. The surface water management plan is described in Appendix F.

6.2 Water Balance

A water balance for the Alternative 5 design was developed using GoldSim software based on monthly average climate inputs and the annual tailings production schedule provided by RCM. The model provides an understanding of the monthly inflows, outflows, storage, and water demands of the TSF. The water balance estimates water losses through seepage, entrainment, and evaporation and was used to identify water shortages that will require a makeup water source. The water balance was also used to estimate the volume of reclaim water, as discussed in Section 6.3 for storage and water transfer needs.

Appendix G summarizes the results of the water balance analysis. A schematic of the operational water balance flows is provided in Appendix G, Figure A2. Various tables summarizing annual water balance results in units of acre-feet per annum and gallons per minute (gpm) are presented in Appendix G. A summary of the water balance results in terms of percent of inflow is presented on Table 3.

Table 3: Water Balance Summary in Terms of Percent Inflows and Outflows

Inflow, Outflow, or Storage	Parameter	Unit	Year							Life of Mine
			2	4	6	10	20	30	41	
Inflow	Inflow from precipitation	% of Inflow	32%	21%	16%	15%	21%	27%	73%	27%
Inflow	Inflow water transported with tailings		66%	78%	84%	85%	79%	73%	0%	71%
Inflow	Makeup water (from external source)		2%	0%	0%	0%	0%	0%	27%	2%
Available Storage	Pond Storage		3%	2%	1%	1%	0%	4%	0%	1%
Unavailable Storage	Entrainment		32%	38%	39%	35%	33%	31%	-3%	30%
Outflow	Seepage to native ground		17%	12%	6%	5%	4%	4%	9%	5%
Outflow	Evaporation		25%	21%	21%	22%	28%	29%	65%	30%
Outflow	Construction and dust suppression		1%	1%	1%	2%	5%	9%	27%	7%
Outflow	Reclaim tank to plant		21%	26%	32%	36%	29%	23%	2%	26%

Water that is not lost through evaporation, seepage, or permanent storage (i.e., entrainment) is collected in the reclaim tank. The available water through seepage collection, tailings thickening, and reclaim pond pumping exceeds the makeup water demand in most years of operations, thus the surplus water can be returned to the concentrator. However, in the early years of production when the water entering the facilities through tailing stream is relatively small and late years of production when the facility footprints are large resulting in higher evaporation and seepage losses, some makeup water is required. The cumulative makeup water required for the life of the mine is about 20,000 acre-feet. The excess water returned to the plant and the makeup water is shown in Appendix G, Figures A19 and A20, respectively.

Upon closure, it is intended that the PAG tailings will maintain greater than 85 percent saturation. To ensure this high degree of saturation around the tailings, the cyclone sand embankment has been amended to produce a low permeability layer enveloping the PAG tailings. The 10 feet of NPAG tailings cover is also intended to maintain saturation above the PAG. The PAG tailings themselves are very low permeability and will release very little, if any, water. A store and release cover is considered to be sufficient provided the tailings are below the evapotranspiration zone (considered to be greater than 6.5 ft). Monitoring the PAG saturation will be required for a period after closure to ensure no acid is generated due to contact water reaching the PAG tailings during prolonged dry periods. This is readily accomplished during operations due to the progressive subcell closure concept, so that adjustments in the cover design can be made.

6.3 Reclaim Water

The water reclaim from the TSF originates from two sources: precipitation falling within the TSF footprint and contributing drainage areas and reclaim water from the tailings deposition processes. NPAG tailings will be transported to a cyclone station where the tailings will be split into underflow and overflow. The NPAG underflow sand will be used to construct the embankments for the NPAG and PAG TSFs. The NPAG overflow will be transported to a thickener where the available water will be recovered from the tailings stream to produce a 60 percent solids thickener underflow. Reclaiming the water through the thickening process is an important water management strategy to reduce the need of additional makeup water sources.

The NPAG thickened overflow and NPAG whole tailings[1] will be deposited into the NPAG facility by rotating deposition locations to manage potential dust by wetting the beaches regularly and to provide for an even raise of the tailings surface. From the deposition location, solids settle out of suspension and the available water separates from the deposited tailings, forming a pool near the center of the facility. As the NPAG facility is initially developed, supplemental, mobile pumping systems or ditches will be needed to transfer water to a common reclaim pond area, where clarification will occur. These pumps will need to be positive displacement pumps to accommodate high suspended solids. The water in the NPAG reclaim pond is pumped to the reclaim tank[2] when water is available to satisfy operational demands (i.e., not lost through evaporation or seepage).

The PAG tailings will be deposited sub-aqueously in separate cells. The tailings will have a minimum 10-foot water cover that must be maintained throughout the operational life of the TSF. When the depth of the water cap is greater than 10 feet, the additional water is pumped to the reclaim tank. When the depth of the water cap is less than 10 feet, water will be pumped from the reclaim tank into the PAG TSF.

Finally, water is also recovered through the toe collection system and pumped to the reclaim tank. The seepage collection system consists of lined toe channels and contact water collection ponds that collect runoff from the embankment in addition to water transported in the toe drains. Seepage pump back wells are also located downstream of the NPAG TSF to capture a portion of the water that enters the native ground from the impoundments. The seepage water recovered through the seepage pump back wells is estimated to be the flows that have entered the native ground above the downstream aquifer capacity.

The water that is recovered via the cyclone overflow thickening, seepage collection system, and TSF ponds is collectively called reclaim water. The reclaim water can be used for dust suppression on the sand embankments, dilution water at the cyclone facility, construction water, and/or to maintain the PAG water cap. If the reclaimed water exceeds the water demand, it may be pumped back to the concentrator plant. On average, during the early stages of the facility when the tailings production is ramping up, additional water is needed from a makeup water source or additional storage is needed to manage temporary surpluses of water to meet the demands of operations. After about year 4, the reclaimed water is sufficient to meet the demands for several years. Again, later in the mine life (after about year 31), additional makeup water or additional storage is again required to meet the operational demands.

6.4 Deposition Management Plan

The intent of the Alternative 5 design approach is to begin deposition using proven, well accepted hydraulic deposition practices and then transition to less water intensive technology, such as ”thin lift” deposition. The primary goal of thin-lift deposition is to reduce infiltration into the subgrade by evaporation, thereby reducing infiltration and the need for lining. The potential to achieve such deposition was assessed by two methods:

- Completion of the GoldSim water balance
- Calculations assessing the surface area required to “evaporate” the excess water from the tailings voids.

---

1 The embankment material balance does not require that the entire NPAG tailings stream be processed through the cyclones; therefore, there will be periods of time when the whole tailings by pass the cyclones. Secondly, during upsets and maintenance, NPAG whole tailings will also be spigotted by themselves.

2 In the water balance, the term “reclaim tank” is used in the generic sense and the concept of the reclaim tank facilitates tracking in the water balance. The reclaim tank can be a steel tank, lined pond or bladder type system (geosynthetic cover and liner) to reduce water losses. At this stage of design, the concept of the reclaim tank facilitates tracking in the water balance.

Review of the GoldSim water balance indicates that insufficient water is placed on the tailings surface beginning about year 10 onward for supernatant water to return to the reclaim pond. The second calculation is based on the assumption that all water in excess of the amount contained in the pores of a fully saturated tailings sample at its shrinkage limit is expelled by evaporation. Results of the thin-lift deposition assessment indicate that the tailings management may utilize the thin-lift approach from approximately year 15 with limited benefits of thin-lift deposition realized as early as Year 3 of the NPAG TSF operation. During the early years (prior to 15), surface evaporation exceeds deposition water for seven months out of the year. Therefore, a reclaim pond would develop during those five months when insufficient evaporation is present. Details of the assessment are presented in Attachment 4 to Appendix G.

6.5 Seepage Management Plan

Alternative 5 is a partly lined option that uses select geomembrane lining to reduce seepage losses and tailings deposition management practices to reduce infiltration. The following summarizes the elements of the seepage management concept:

- Utilize deposition management to create long beach lengths following startup. Due to the production ramp up, the initial deposition areas occupy only a portion of the overall north-south facility. During and following the startup, the intent will be to create long beach lengths extending north to south and south to north towards a central reclaim pond. The objective of this deposition management approach is to evaporate the remaining thickened cyclone overflow or whole scavenger tailings transport water, thereby reducing infiltration.
- The deposition management approach also uses the inherent low permeability of the cyclone overflow tailings. Prior to depositing tailings into the interior of the NPAG and PAG cells, a layer of cyclone overflow will be placed as a liner on the natural ground. Details of this placement will need to be developed along with a quality assurance program to confirm that the cyclone overflow has been properly placed throughout the TSF impoundment areas.
- At the NPAG reclaim pond area, a geomembrane liner will be placed to reduce infiltration of standing water above the natural ground surface. The need and area to extend this liner eastward can be assessed as operations proceed.
- The foundation areas below the cyclone sand hydraulic cells will be graded to drain and proof-rolled with smooth drum equipment to create a “lower permeability” surface. Depending on site investigation findings, the foundation areas may also be amended to reduce permeability.
- Toe collection ditches and ponds will be geomembrane lined.

The geomembrane-lined areas in the current design are shown on Drawing C-008, Water Management Plan.

6.5.1 Seepage Assessment

Seepage from the PAG and NPAG TSF embankments was partly estimated using a two-dimensional finite element method (FEM) software developed by Rocscience as part of the SLIDE V7.0 software package. Vertical seepage within the impoundment areas was assessed using Darcy’s law within the GoldSim model. The objective of completing the seepage model was to gain an approximate order of magnitude estimate of the amount of seepage water that could be captured and/or lost based on current knowledge of the site and the Alternative 5 geometry.

The following seepage models were completed, as described in Attachment 2 to Appendix G:

- Cross sections evaluated for this study are shown on Appendix G, Attachment 2 Figure 1
- The PAG facility was modeled using a West to East cross section representing one of the deposition or closed cells
- The NPAG facility was modeled using both west to east and north to south cross sections

The flow quantities were determined by drawing "discharge sections" at select locations in the model, across which SLIDE would calculate the flow quantities. The primary discharge sections used in our model were sections drawn through 1) the toe of the embankment simulating the toe drain flow and 2) a vertical boundary through the foundation and downstream of the embankment toe that provides the total flow lost to the foundation (to compare to the GoldSim estimate). Other boundaries were used to confirm mass balance and estimate seepage through areas of interest, such as the PAG tailings/sand embankment interface and along the base of the tailings into the foundation. The total flow quantity (Q) from these two-dimensional models was estimated by multiplying the flow per foot of model depth (ft^3/day/ft) times the appropriate embankment lengths. Judgement was used in selecting the total embankment lengths where the idealized two-dimensional seepage flow would occur. A description of the seepage model is provided in Attachment 2 of the Appendix G water balance.

The potential to recover seepage lost to the foundation was estimated using analytical solutions developed by Mansur and Kaufman (1962) to estimate well drawdown and flow in partially penetrating wells. A description of this method is also provided in Appendix G, Attachment 2. A total of 15 to 30 wells are estimated, although the actual number will be dependent on the site investigation findings.

6.5.2 Seepage Estimates

Two types of seepage will result from the construction of both TSF facilities: 1) Steady state seepage resulting from the impounded tailings and the increased head caused by the rising facility and 2) transient seepage resulting from hydraulic cell operation at both facilities and periodic wetting of the beaches at the NPAG facility. At the PAG facility, steady state seepage dominates the flow quantities due to the ARD management criteria of maintaining a 10 feet water cover over the PAG tailings. At the NPAG facility, the steady state seepage also dominates because of the facility size and the fact that the hydraulic cells would only be operated incrementally around the long embankment perimeter.

Seepage from the PAG facility would primarily be managed through the toe drains, as the foundation losses on bedrock are expected to be lower than those from the NPAG facility, situated on alluvium. Groundwater is expected to flow from the PAG tailings towards the NPAG tailings and would be partially recovered in the pump back wells situated along the toe of the NPAG facility.

Toe drains at the NPAG facility will be less effective than at the PAG facility. The NPAG toe drain effectiveness largely depends on the depth assumptions used for the alluvial aquifer. For a shallow water table assumption, the phreatic surface (or groundwater mound) developing from the NPAG impoundment will extend through the embankment and toe drain. Under this scenario, the toe drain will capture steady state seepage and transmit this water to the toe. Under a deeper water table assumption in the alluvium, the phreatic surface will be much lower and may not intercept the toe drain. Therefore, the toe drain would primarily be recovering the transient hydraulic cell deposition. The addition of pump back wells beyond the embankment toe will further depress the phreatic surface, causing the toe drains to be less effective at capturing steady state flow (on this pervious foundation).

Seepage flowing to the foundation may be lost if not recaptured. To capture this “foundation seepage,” Golder evaluated the installation of pump back wells to lower the phreatic surface and create a hydraulic barrier to reducing seepage losses. The analytic solutions to developing a continuous “cone of depression” along the toe of the embankment described above were used.

Based on these considerations, the seepage losses and recoveries are as follows:

- Seepage lost to the foundation from the PAG facility varies from 130 to 1,500 gpm
- Seepage lost to the foundation from the NPAG TSF varies from 200 to 2,400 gpm
- Recovery from pump back wells varies from 0 to about 3,000 gpm
- The downstream aquifer capacity and estimated seepage not recovered is about 830 gpm
- Toe drain recovery from the NPAG facility averages around 1,200 gpm during peak production years
- Toe drain recovery from the PAG facility averages around 800 gpm during peak production years

The water captured in the pump back wells and from the toe drains would be collected in lined ponds located along the western toe of both the PAG and NPAG facilities, as shown on drawing C-008. Water from the seepage collection ponds is subsequently pumped back to the reclaim tank.

7.0 DUST MANAGEMENT PLAN

Dust management at the TSF site will use several approaches:

- Method A – Sequencing hydraulic cell deposition of cyclone sands to control dust emissions on the interior of the sand deposition cells.
- Method B – Wetting of the impoundment tailings surfaces, which consist of cycling deposition around the embankment perimeter.
- Methods C and D – Use of excess water from the reclaim tank and/or tackifiers to control dust emissions on the embankment face, roadways, borrow areas, etc. The use of tackifiers is preferred.
- Method E – Asphalt paving of administration, select roadways, and maintenance areas.
- Method F – placement of rip rap, store and release cover or vegetation (closure covers).

Specifically, for the PAG impoundment dust control is mainly needed for the embankment, since the impoundment interior is a water cover. Until the embankment footprint(s) reach their final toe, the periodic application of dust suppressants will be required. Further detail regarding dust management is described in Appendix G.

Dust control for the NPAG facility will comprise sequencing of whole tailings and cyclone overflow deposition on the impoundment interior to wet the impoundment surfaces at least 8 hours every 7 days. The impoundment deposition is facilitated by extending tailings distribution pipelines from the cyclone plant on the east side of the facility with two pipeline systems extending along the north and south sides of the NPAG facility and meeting in the center of the west embankment.

To construct embankments, cyclone sand deposition will be sequenced within hydraulic deposition cells. Cyclone sand deposition will be sequenced in these cells and dust control will primarily be required on the exterior of the cells. This will require the use of dust suppressants (tackifiers).

Table 4 summarizes a description of the areas subject to dust control, the applicable methods, and the acreage of those areas. Also included is Golder's estimate of the percent of those areas subject to dust generation given the management controls.

Table 4: Alt 6 Dust Management Areas (Ultimate Footprints)

Description	Method[1]	Area (acres)	Percent of Area Susceptible to Wind Erosion (%)
PAG TSF (ultimate)			
Embankment outer slopes[2]	D, F	320	20
Embankment crest	D, F	25	80
Active hydraulic cells (4)	A, F	18	0
Inactive hydraulic cells (varies)	D, as needed, F	300	30
Impoundment interior	B, F	1,310	0
NPAG TSF (ultimate)			
Embankment slopes[2]	D, G	635	20
Embankment crest	D, G	40	80
Active hydraulic cells	A	18	0
Inactive hydraulic cells	D, as needed, F	610	30
Interior	B, F	3,545	30
Facilities			
Administration/maintenance	E	18	20-30 [0] [3]
Plant facilities	C, E	27	20-30 [0] [3]
Pipeline distribution roads	C	75	50 [50] [3]
Diversion ditches, powerline, and perimeter roadway corridor	C, D, F	26	20-30 [0] [3]

Notes:
1) See methods described previously
2) Slope areas are adjusted to the 3H:1V slope from the footprint areas
3) First value are the expected percent dust emissions during construction (Years 1-2), value in bracket [ ] is after construction complete.

8.0 RECLAMATION AND CLOSURE PLAN

The closure strategy for the Alternative 5 begins during operations and tailings deposition planning, and continues through closure. The primary performance objectives for closure are to:

- Develop a stable landform for both the PAG and NPAG facilities
- Develop a vegetated cover on the NPAG facility that limits net infiltration, minimizes the potential for ponded water, and protects surface water runoff quality
- Develop a vegetated thick cover on the PAG facility to reduce net infiltration and reduce exposure to atmospheric oxygen
- Control wind and water erosion on the reclaimed surfaces of the PAG and NPAG facilities
- Continue to divert run-on from uphill around both the PAG and NPAG facilities

The closure of the NPAG facility is intended primarily to control wind and water erosion, grow vegetation, and reduce infiltration into the underlying materials. The top surface will be covered with a 1.0-foot thick store and release cover. The top surface of the closed facility will slope to the east and runoff from incident precipitation will report to an approximately north-south closure channel to convey runoff to the operational diversions. Closure channels may be needed on the top surface, pending an evaluation of where runoff will concentrate. Based on consolidation predictions, certain areas of the top surface will require additional localized fill for closure to prevent depressions forming over the long-term. The out slopes will remain at their operational angle of 3H:1V for long-term stability and will be covered with a 1.5-foot thick store and release soil cover. Given the length for the 3H:1V outslopes, intermediate benches with armored vee-ditches will be installed to create slope segments approximately 200 to 300 feet long, thereby reducing the potential for erosion. The vee-ditches will connect to armored down chutes to convey runoff to the operational diversions. Both the top surface and outslopes will be revegetated.

The closure of the PAG facility is intended primarily to maintain long-term saturation of the PAG material greater than 85 percent and provide erosion protection. At the end of operations in each cell, a 10 feet thick layer of NPAG tailings (or other inert material) will be placed as a stabilization and isolation layer on top of the PAG material. The NPAG layer will be thickened and shaped towards the center to account for long-term consolidation settlement and provide drainage. A sand and gravel layer approximately 1.5 feet thick will then be placed on top of the NPAG to reduce the potential for wind and water erosion. The cover will be designed as a store and release cover, which tends to minimize infiltration. Unsaturated flow modeling has indicated that the PAG tailings will maintain a high degree of saturation when situated below the evapotranspiration zone. The outer slopes will remain at their operational angle of 3H:1V for long-term stability and will be covered with a 1.5-foot thick store and release cover.

Long-term seepage will be managed for both the NPAG and PAG facilities. As is typically the case for a closed TSF, the seepage drain down curve for the NPAG and PAG facilities will decrease exponentially and eventually reach a steady low flow as the tailings slowly consolidate and drain. In contrast, the seepage drain down curve for the PAG facility will be slower due to the tailings permeability. At a conceptual level, toe seepage management will consist of passive evaporation in evaporation ponds (E-Pond) and/or evapotranspiration cells (ET-Cell). Perimeter seepage management will consist of seepage extraction wells downgradient of the facility that pump back to the E-Ponds and/or ET-Cells. The E-Ponds and/or ET-Cells for the facility can eventually be closed by encapsulating the accumulated sludge in a geomembrane liner and backfilling with soil to grade.

The closure plan, basis for closure cost estimating is summarized in Appendix H.

9.0 PROCESS FACILITIES

A pipeline corridor will deliver NPAG and PAG tailings to the northeast portion of the site and provide a return water pipeline. An area (Drawing G-005) has been designated at the northeastern portion of the site to house process facilities, provide space for a substation, provide administration and maintenance facilities, and serve as laydown area during operations. A roadway corridor will extend from this process/administration area around the NPAG and PAG facilities. The corridor will provide vehicle, power and pipeline access and currently has been designated to be up to 200 feet in width. This width also includes the areas for pump back wells and surface water collection ditches.

In summary, Alternative 5 will require the following process facilities within the designated northeast area:

- Feed sumps and pumps to the NPAG cyclone facility
- The cyclone separation plant
- Cyclone overflow thickeners
- The “reclaim tank” described in the water balance
- Water pumping facilities to the PAG cells
- A substation
- Vehicle maintenance and fueling shop
- A warehouse for spares along with outside storage areas
- Administration and locker room facilities
- Parking facilities

Extending from the cyclone plant and thickener will be the following:

- Cyclone sand distribution pipelines to both the NPAG and PAG facilities
- NPAG distribution pipelines to the embankment crest
- PAG distribution pipelines to the deposition barge
- Return water lines from the reclaim and toe collection pond(s)

The process equipment for the slurry transport and deposition consists primarily of both positive displacement and horizontal centrifugal pumps to provide the motive energy for slurry transport. Other pump types such as inclined submersibles and vertical turbines will also be used at the Peg Leg TSF. At the TSF, besides the pumps, major process equipment will consist of cyclones for water recovery and sand production and thickeners for water recovery and the associated sumps to contain these slurries.

These process facilities are shown on process flow diagrams included as drawings CCC.03-25200-EM-DWG-00001 and 00002 (the last two drawings). The layout of these facilities is yet to be determined, but sufficient areas and corridors have been included in the disturbance acreage estimate.

10.0 CLOSING

Golder appreciates the opportunity to support the development of the Resolution Mine Tailings Storage Facility. If you have questions or comments regarding this report, please contact the undersigned.

10.1 Limitations

This report and the accompanying Drawings and Technical Appendices have been prepared by Golder Associates Inc. for the exclusive use of Resolution Copper Mining, its staff and consultants for specific application in design of the project at the site described in this report.

The DEIS design and recommendations presented in this report were prepared in accordance with generally accepted professional engineering principles in use during preparation of this report. Golder makes no other warranties, either expressed or implied. If project details change and as site investigations progress, Golder should be notified so that designs and recommendations presented in this report and accompanying documents can be verified or adjusted accordingly. In the event of changes to conclusions, designs, or recommendations contained in this report, they shall not be considered valid unless the changes are reviewed by Golder and conclusions of this report are verified or modified in writing.

10.2 References

See individual appendices for references cited.

Signature Page

Golder Associates Inc.

Joergen Pilz
Senior Consultant

David Babcock
Senior Engineering Consultant

David Kidd, PE
Principal in Charge

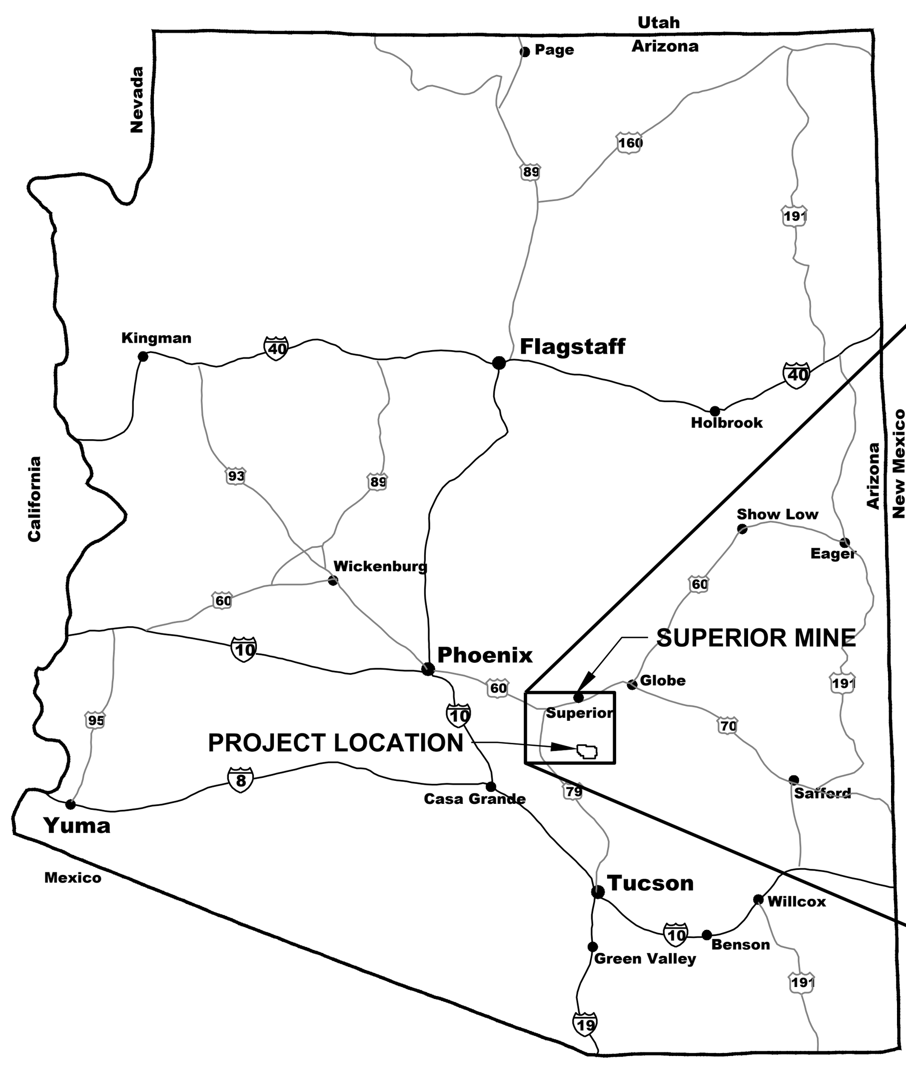
JP/DB/rg

1788500-1000-1255-16-R-0-Alt5_TSF_Study_DEIS_20JUN18.docx

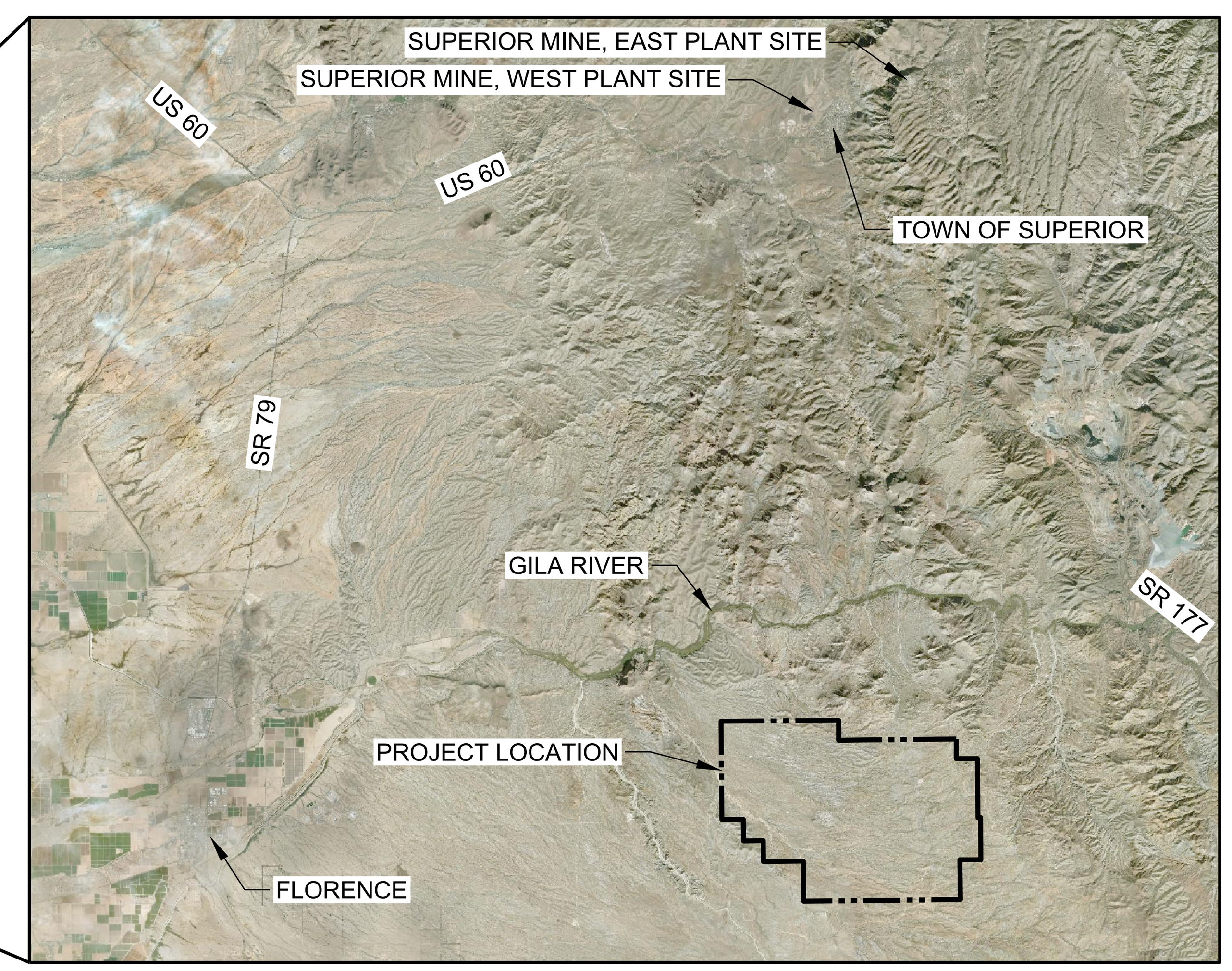
Drawings

RESOLUTION COPPER

RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5
JUNE 2018



STATE OF ARIZONA
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

LIST OF DRAWINGS

No.	DRAWING TITLE
G-001	TITLE SHEET
G-002	GENERAL ARRANGEMENT EXISTING SITE MAP
G-003	GENERAL ARRANGEMENT LAND OWNERSHIP
G-004	GENERAL ARRANGEMENT SURFACE GEOLOGY MAP
C-001	STARTER FACILITY AND YEAR 4 GRADING AND FILL PLAN
C-002	YEAR 6 AND YEAR 10 IMPOUNDMENT GRADING AND FILL PLAN
C-003	YEAR 20 AND YEAR 30 IMPOUNDMENT GRADING AND FILL PLAN
C-004	ULTIMATE IMPOUNDMENT GRADING AND FILL PLAN
C-005	ULTIMATE TAILINGS DELIVERY AND DISTRIBUTION PIPING PLAN
C-006	NPAG AND PAG FACILITY CROSS-SECTIONS
C-007	NPAG AND PAG FACILITY TYPICAL DETAILS
C-008	ULTIMATE WATER MANAGEMENT PLAN
C-009	WATER MANAGEMENT TYPICAL DETAILS
C-010	WATER RECLAMATION TYPICAL DETAILS

REFERENCE(S)

1. AERIAL IMAGERY © 2018 MICROSOFT CORPORATION © 2018 DIGITALGLOBE © CNES (2018) DISTRIBUTION AIRBUS DS bing.
2. THE EXISTING GROUND SURFACE WAS DEVELOPED BY GOLDER ASSOCIATES BASED ON FILES PROVIDED BY RCM FROM INTERMAP TECHNOLOGIES INC. DATA SETS. THE FILES WERE PROVIDED IN SHAPE FILE FORMAT AND CONVERTED FROM THE ORIGINAL GEOGRAPHIC NAD83 COORDINATE SYSTEM AND NAVD88 DATUM IN METERS TO ARIZONA STATE PLANE CENTRAL ZONE NAD83 (NA2011) INTERNATIONAL FEET COORDINATE SYSTEM AND THE NAVD88 VERTICAL DATUM IN FEET.

NOTE(S)

1. PRELIMINARY PIPING, DIVERSION CHANNELS, TOE COLLECTION CHANNELS, TOE COLLECTION PONDS, AND WATER RECLAIM PONDS ARE SHOWN AS SCHEMATIC AND ARE SIZED OR SPACED FOR CLARITY ON THE DRAWINGS. PLEASE REFER TO SURFACE WATER MANAGEMENT APPENDIX FOR PRELIMINARY DIMENSIONS AND SPACING. DIMENSIONS AND SPACING WILL BE CONFIRMED DURING DETAILED DESIGN. SUBGRADE PREPARATION WILL NOT BE REQUIRED WHERE THE EXCAVATION IS LOCATED WITHIN NATIVE BEDROCK.
2. THE PEG LEG ALTERNATIVE 5 DESIGN WAS DEVELOPED PRIOR TO COMPLETION OF SITE INVESTIGATIONS AND MAY BE MODIFIED DURING DETAILED DESIGN.

NOT FOR CONSTRUCTION

DRAFT

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

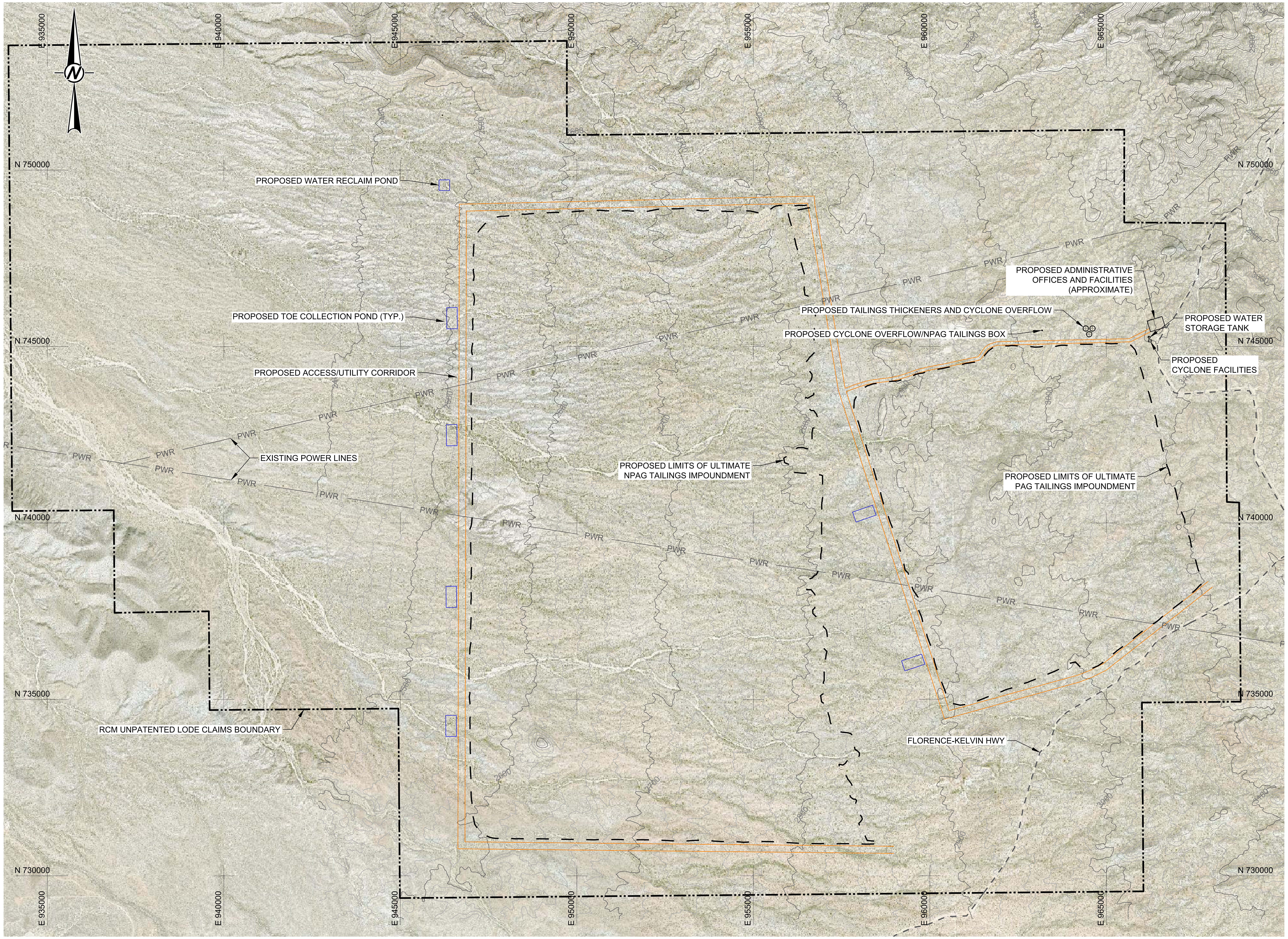
CONSULTANT
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
TITLE SHEET

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	1 of 14	G-001



GENERAL LEGEND

3600	EXISTING GROUND CONTOURS (ft -MSL)
	EXISTING ROADS
	RCM UNPATENTED LODE CLAIMS BOUNDARY
PWR	EXISTING POWER LINES
3600	DESIGN CONTOURS (ft -MSL)
	GRADE BREAK
	ULTIMATE FACILITY FOOTPRINT
	PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
	PROPOSED ACCESS/UTILITY CORRIDOR
	PROPOSED DIVERSION CHANNEL
PWR	PROPOSED RELOCATED POWER LINES
	PROPOSED NPAG AND PAG PIPELINE ROUTE
3H:1V or 3H 1V	3 HORIZONTAL TO 1 VERTICAL SLOPE
1%	GRADE INDICATOR
1 C-009	DETAIL CALLOUT DETAIL ID DRAWING SHEET LOCATION
A C-009	CROSS-SECTION CALLOUT SECTION ID DRAWING SHEET LOCATION

GENERAL HATCH LEGEND

- ANCHOR TRENCH BACKFILL
- EMBANKMENT FILL
- NATIVE GROUND/ PREPARED SUBGRADE
- DRAIN FILL
- STRUCTURAL FILL
- RIPRAP
- BEDDING
- TAILINGS
- CONCRETE FILL

LIST OF ABBREVIATIONS

BLM	BUREAU OF LAND MANAGEMENT	EL.	ELEVATION
BOR	BUREAU OF RECLAMATION	ft	FEET
TSF	TAILING STORAGE FACILITY	in	INCHES
MAX.	MAXIMUM	-MSL	ABOVE MEAN SEA LEVEL
MIN.	MINIMUM		
N.T.S.	NOT TO SCALE		
TYP.	TYPICAL		

NOTE(S)

1. SEE NOTE 1 ON DRAWING G-001.

NOT FOR CONSTRUCTION

DRAFT

0 1500 3000
1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

CONSULTANT
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

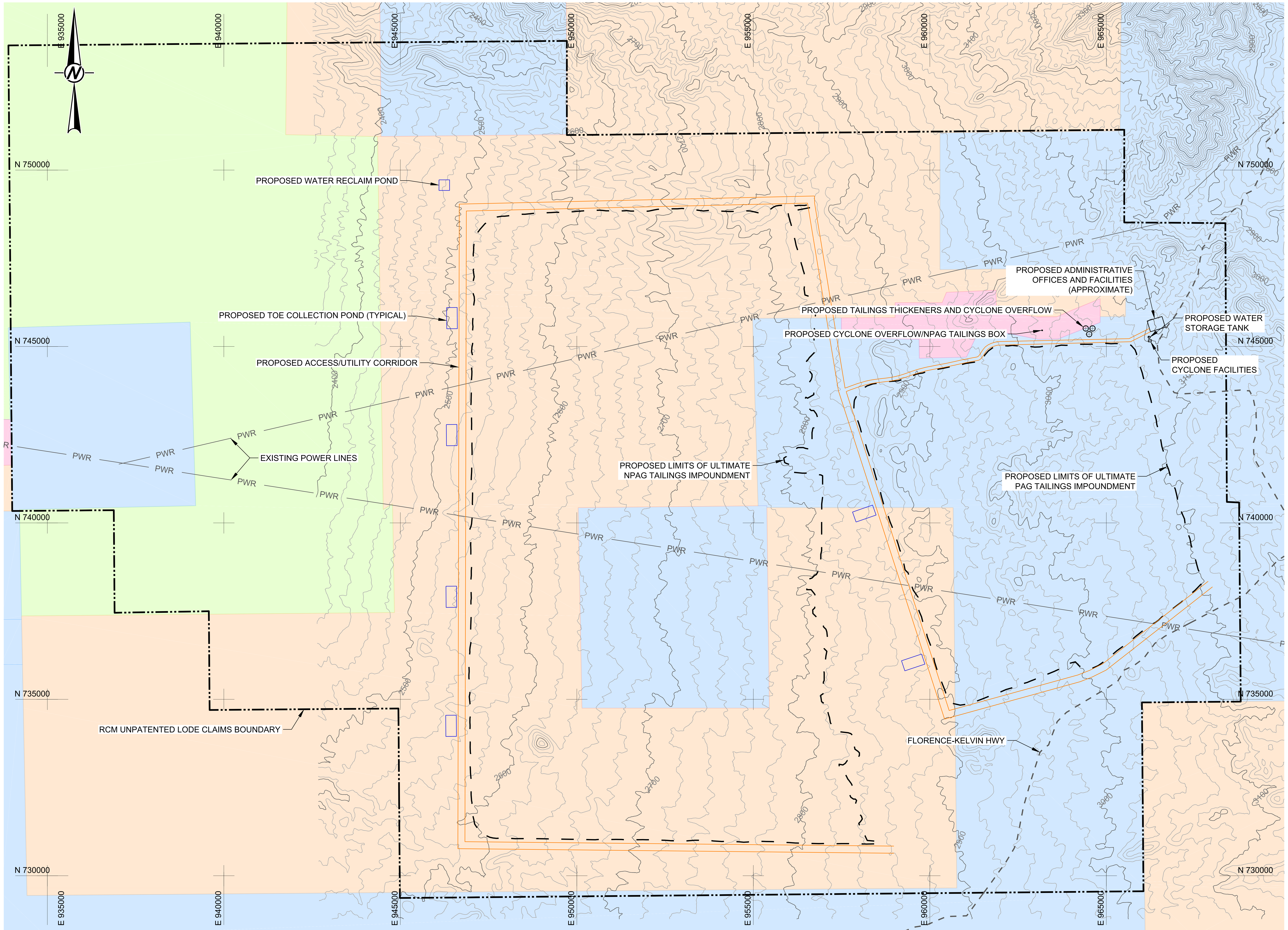
PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
GENERAL ARRANGEMENT - EXISTING SITE MAP

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	2 of 14	G-002

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1 in



LEGEND

3600	EXISTING GROUND CONTOURS (ft -MSL)
	EXISTING ROADS
	RCM UNPATENTED LODE CLAIMS BOUNDARY
PWR	EXISTING POWER LINES
	ULTIMATE FACILITY FOOTPRINT
	PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
	PROPOSED ACCESS/UTILITY CORRIDOR

LAND OWNERSHIP LEGEND

- ARIZONA STATE LAND
- BUREAU OF LAND MANAGEMENT (BLM) LAND
- BUREAU OF RECLAMATION (BOR) LAND
- PRIVATE LAND

NOTE(S)

1. LAND OWNERSHIP INFORMATION OBTAINED FROM THE ARIZONA STATE LAND DEPARTMENT.
2. SEE NOTE 1 ON DRAWING G-001.

NOT FOR CONSTRUCTION

DRAFT

0 1500 3000

1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT

RESOLUTION COPPER

CONSULTANT

GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT

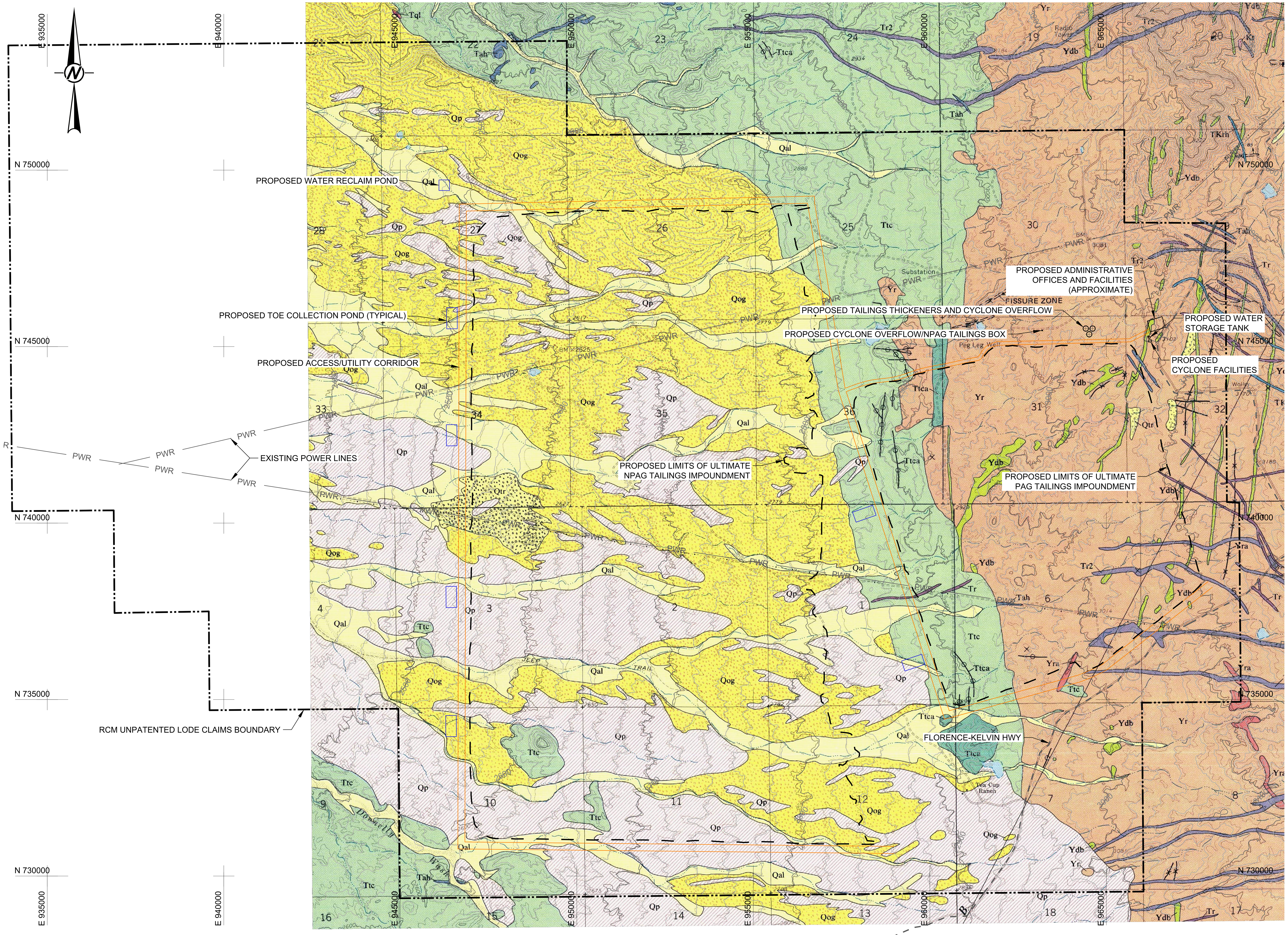
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE

GENERAL ARRANGEMENT - LAND OWNERSHIP

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	3 of 14	G-003

Path: \\tucson\cadd\RCML\Superior\99_projects\1788500_oom_altsstudy\1300_Alt7Unlined\02_PRODUCTION\DWG\ | File Name: 1788500_1300_G_003.dwg | Last Edited By: jlsanchez Date: 2018-06-20 Time:10:25:41 AM | Printed By: JLSanchez Date: 2018-06-20 Time:2:39:58 PM



LEGEND

3600	EXISTING GROUND CONTOURS (ft -MSL)
	EXISTING ROADS
	RCM UNPATENTED LODE CLAIMS BOUNDARY
PWR	EXISTING POWER LINES
	ULTIMATE FACILITY FOOTPRINT
	PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
	PROPOSED ACCESS/UTILITY CORRIDOR

GEOLOGIC LEGEND WITHIN ULTIMATE FOOTPRINT

Qal	Qal - ALLUVIUM
Qtr	Qtr - TRAVERTINE
Qp	Qp - PEDIMENT VENEER
Qog	Qog - OLDER GRAVEL
Tah	Tah - ANDESITE
Tr2	Tr2 - RHYODACITE PORPHYRY
Tr	Tr - RHYODACITE PORPHYRY
Ttca	Ttca - ALPITE, TEA CUP GRANODIORITE
Ttc	Ttc - TEA CUP GRANODIORITE
Ydb	Ydb - DIABASE
Yr	Yr - RUIN GRANITE

NOTE(S)

1. SURFACE GEOLOGY OBTAINED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS) GEOLOGIC QUADRANGLE MAP GQ-1206, *GEOLOGIC MAP OF THE GRAYBACK QUADRANGLE, PINAL COUNTY, ARIZONA*, 1975.
2. SEE NOTE 1 ON DRAWING G-001.

NOT FOR CONSTRUCTION

DRAFT

0 1500 3000

1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT

RESOLUTION COPPER

CONSULTANT

GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT

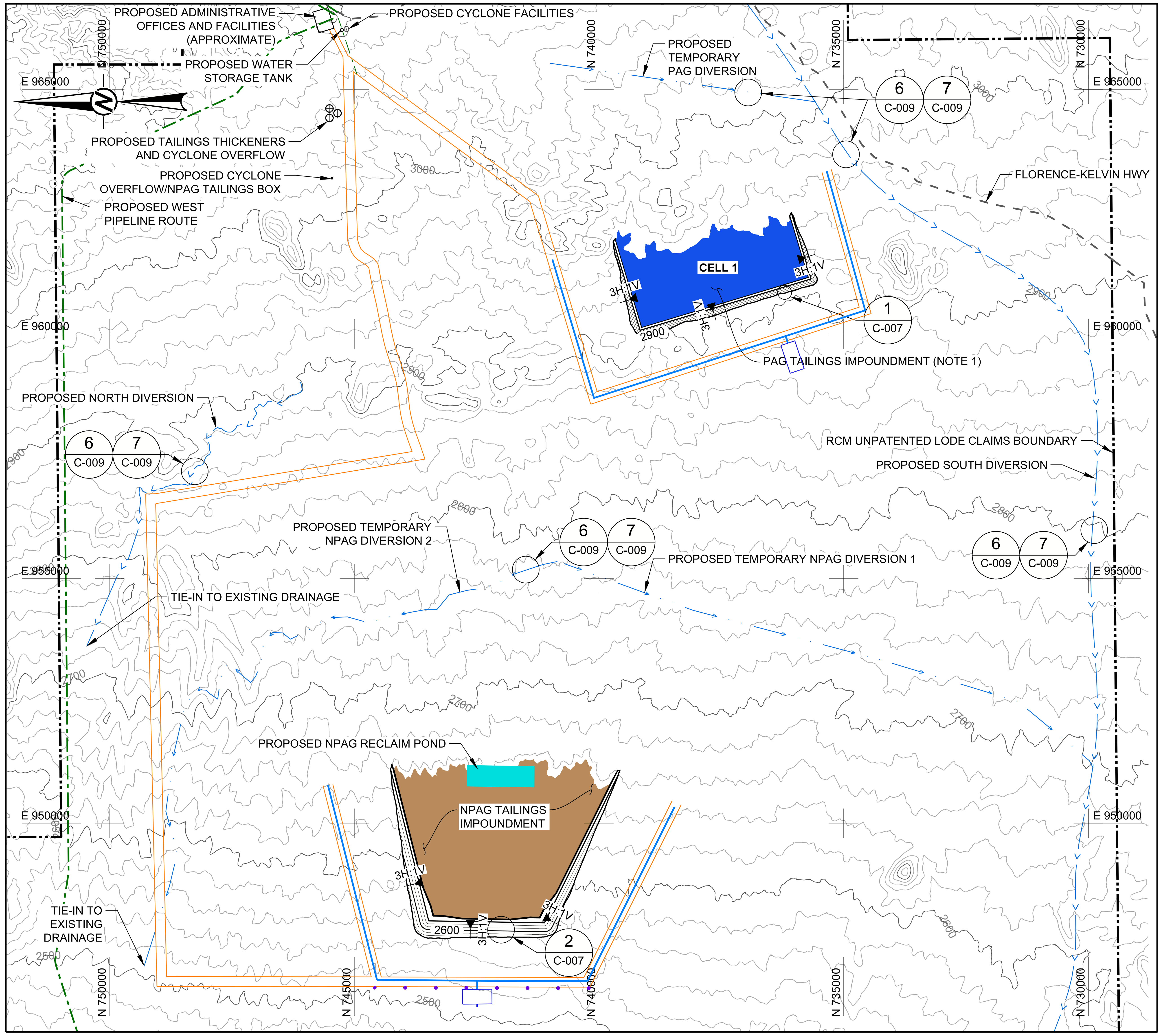
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE

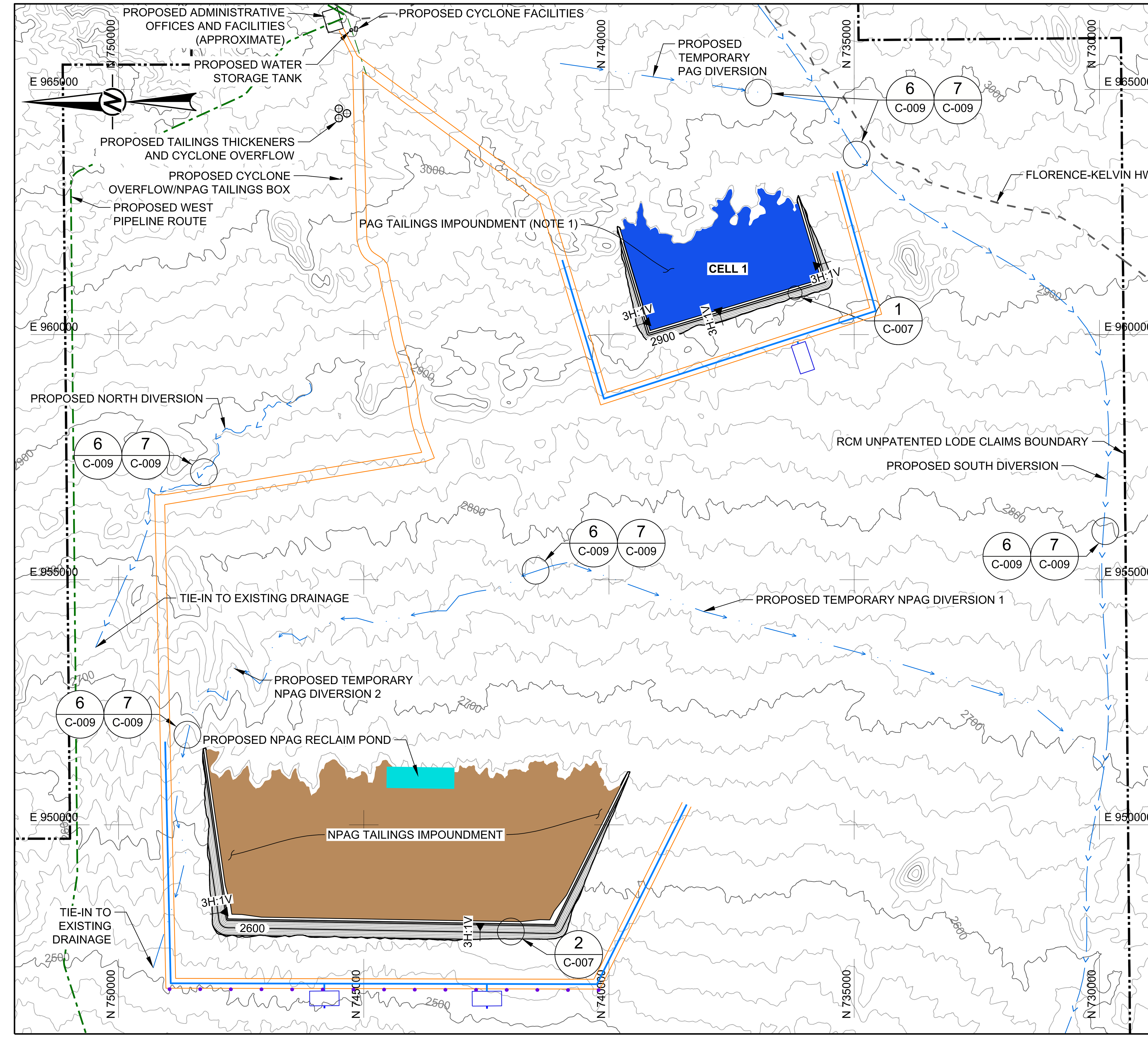
GENERAL ARRANGEMENT - SURFACE GEOLOGY MAP

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	4 of 14	G-004

Path: \\tucson\cadd\RCM\Superior\99_projects\1788500_corn_altsstudy\1300_AltTunlined\02_PRODUCTION\DWG\ | File Name: 1788500_1300_G_004.dwg | Last Edited By: jlsanchez Date: 2018-05-24 Time:10:06:35 AM | Printed By: JLSanchez Date: 2018-06-20 Time:2:40:33 PM



STARTER PAG AND NPAG IMPOUNDMENTS
SCALE 1" = 1500'



YEAR 4 PAG AND NPAG IMPOUNDMENTS
SCALE 1" = 1500'

LEGEND

- EXISTING GROUND CONTOURS 20-ft INTERVAL (ft -MSL)
- EXISTING ROADS
- RCM UNPATENTED LODE CLAIMS BOUNDARY
- DESIGN CONTOURS 20-ft INTERVAL (ft -MSL)
- PROPOSED ACCESS/UTILITY CORRIDOR
- GRADE BREAK
- PAG WATER COVER (NOTE 1)
- NPAG TAILINGS
- NPAG RECLAIM POND
- PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
- PROPOSED TEMPORARY DIVERSION CHANNEL (NOTE 2)
- PROPOSED DIVERSION CHANNEL (NOTE 2)
- PROPOSED NPAG AND PAG PIPELINE ROUTE
- 3H:1V or 3H 1V — 3 HORIZONTAL TO 1 VERTICAL SLOPE
- PUMP BACK WELLS

NOTE(S)

1. A WATER COVER SHALL BE MAINTAINED OVER THE PAG TAILINGS DURING OPERATION. A STORE AND RELEASE COVER WILL REPLACE THE WATER COVER AT CLOSURE.
2. SEE NOTE 1 ON DRAWING G-001.
3. BORROW MATERIAL FOR CONSTRUCTION OF THE PAG AND NPAG STARTER FACILITIES WILL BE EXCAVATED FROM WITHIN THE NPAG FACILITY FOOTPRINT.
4. PUMP BACK WELLS WILL BE LOCATED AT 625 ft SPACING ALONG THE EXTERIOR EDGE OF THE ACCESS/UTILITY CORRIDOR AS SHOWN. AN APPROXIMATE TOTAL NUMBER OF 30 PUMP BACK WELLS WILL BE IN PLACE AT THE ULTIMATE FACILITY CONFIGURATION.

NOT FOR CONSTRUCTION
DRAFT

0 1500 3000
1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

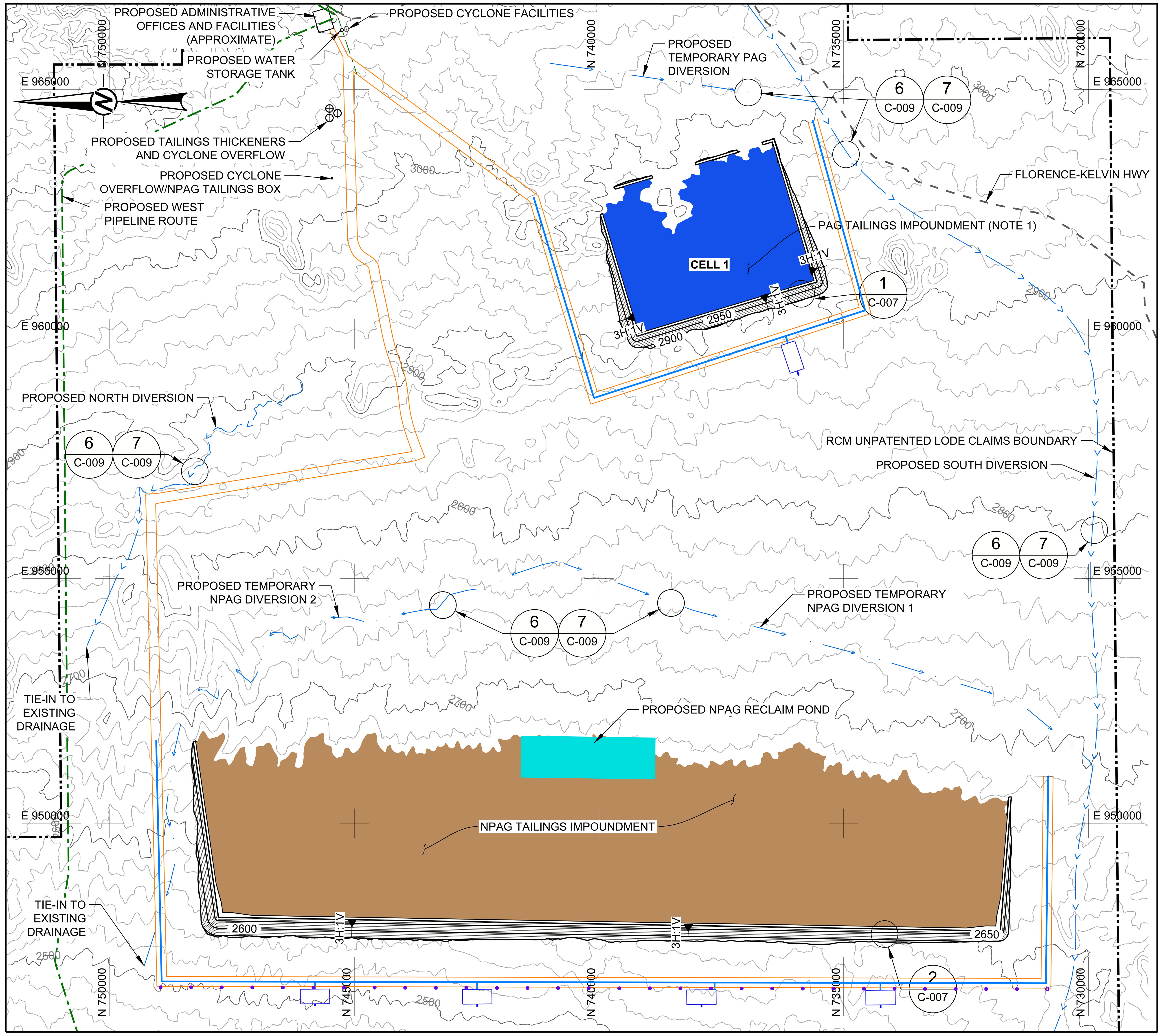
CONSULTANT
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

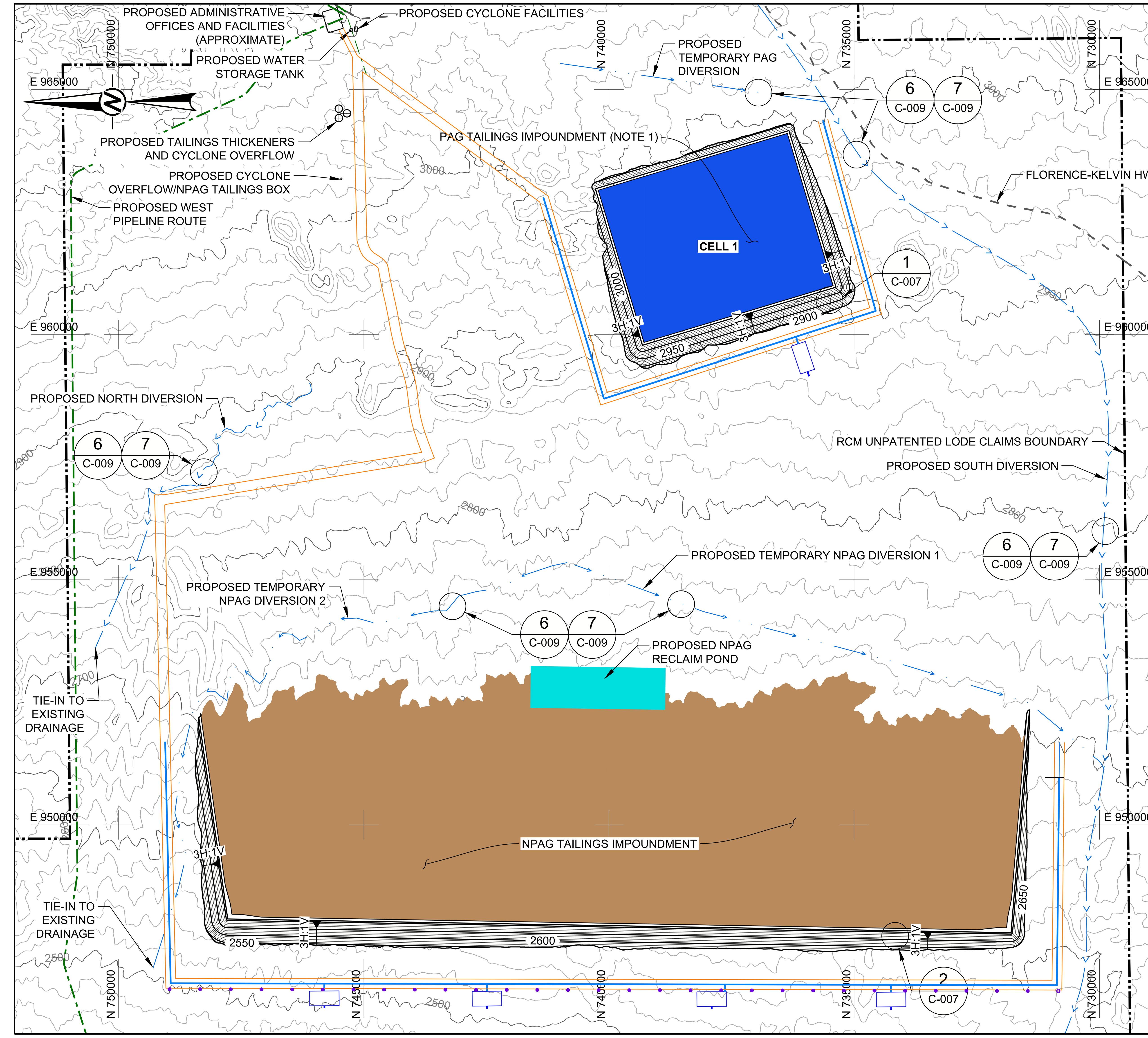
TITLE
STARTER FACILITY AND YEAR 4 GRADING AND FILL PLAN

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	5 of 14	C-001



YEAR 6 PAG AND NPAG IMPOUNDMENTS

SCALE 1" = 1500'



YEAR 10 PAG AND NPAG IMPOUNDMENTS

SCALE 1" = 1500'

- 3600 EXISTING GROUND CONTOURS 20-ft INTERVAL (ft -MSL)
- EXISTING ROADS
- RCM UNPATENTED LODE CLAIMS BOUNDARY
- 3600 DESIGN CONTOURS 20-ft INTERVAL (ft -MSL)
- PROPOSED ACCESS/UTILITY CORRIDOR
- GRADE BREAK
- PAG WATER COVER (NOTE 1)
- NPAG TAILINGS
- NPAG RECLAIM POND
- PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
- PROPOSED TEMPORARY DIVERSION CHANNEL (NOTE 2)
- PROPOSED DIVERSION CHANNEL (NOTE 2)
- PROPOSED NPAG AND PAG PIPELINE ROUTE
- 3H:1V or 3H 1V — 3 HORIZONTAL TO 1 VERTICAL SLOPE
- PUMP BACK WELLS

NOTE(S)

1. A WATER COVER SHALL BE MAINTAINED OVER THE PAG TAILINGS DURING OPERATION. A STORE AND RELEASE COVER WILL REPLACE THE WATER COVER AT CLOSURE.
2. SEE NOTE 1 ON DRAWING G-001.
3. BORROW MATERIAL FOR CONSTRUCTION OF THE PAG AND NPAG STARTER FACILITIES WILL BE EXCAVATED FROM WITHIN THE NPAG FACILITY FOOTPRINT.
4. PUMP BACK WELLS WILL BE LOCATED AT 625 ft SPACING ALONG THE EXTERIOR EDGE OF THE ACCESS/UTILITY CORRIDOR AS SHOWN. AN APPROXIMATE TOTAL NUMBER OF 30 PUMP BACK WELLS WILL BE IN PLACE AT THE ULTIMATE FACILITY CONFIGURATION.

NOT FOR CONSTRUCTION

DRAFT

0 1500 3000
1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

CONSULTANT
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

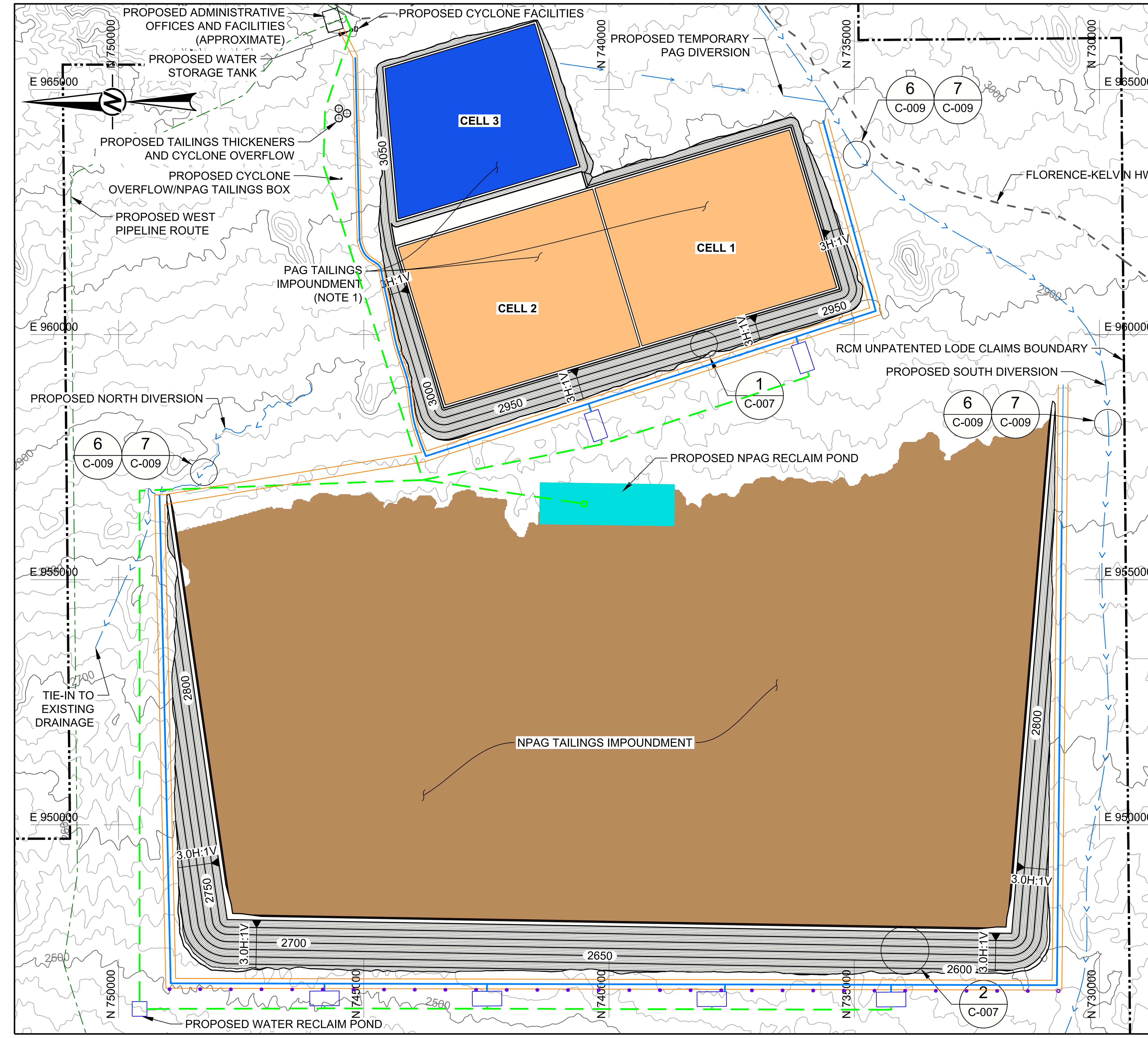
PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
YEAR 6 AND YEAR 10 IMPOUNDMENT GRADING AND FILL PLAN

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	6 of 14	C-002

YEAR 20 PAG AND NPAG IMPOUNDMENTS

SCALE 1" = 1500'



YEAR 30 PAG AND NPAG IMPOUNDMENTS

SCALE 1" = 1500'

3600	EXISTING GROUND CONTOURS 20-ft INTERVAL (ft -MSL)
	EXISTING ROADS
	RCM UNPATENTED LODE CLAIMS BOUNDARY
3600	DESIGN CONTOURS 20-ft INTERVAL (ft -MSL)
	PROPOSED ACCESS/UTILITY CORRIDOR
	GRADE BREAK
	PAG WATER COVER (NOTE 1)
	NPAG TAILINGS
	NPAG RECLAIM POND
	PAG STORE AND RELEASE COVER (NOTE 1)
	PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
	PROPOSED WATER RECLAIM PIPELINE ROUTE
	PROPOSED TEMPORARY DIVERSION CHANNEL (NOTE 2)
	PROPOSED DIVERSION CHANNEL (NOTE 2)
	PROPOSED NPAG AND PAG PIPELINE ROUTE
3H:1V or 3H / 1V	3 HORIZONTAL TO 1 VERTICAL SLOPE
	PUMP BACK WELLS

NOTE(S)

1. A WATER COVER SHALL BE MAINTAINED OVER THE PAG TAILINGS DURING OPERATION. A STORE AND RELEASE COVER WILL REPLACE THE WATER COVER AT CLOSURE.
2. SEE NOTE 1 ON DRAWING G-001.
3. PUMP BACK WELLS WILL BE LOCATED AT 625 ft SPACING ALONG THE EXTERIOR EDGE OF THE ACCESS/UTILITY CORRIDOR AS SHOWN. AN APPROXIMATE TOTAL NUMBER OF 30 PUMP BACK WELLS WILL BE IN PLACE AT THE ULTIMATE FACILITY CONFIGURATION.

NOT FOR CONSTRUCTION

DRAFT

0 1500 3000
1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

CONSULTANT
GOLDER

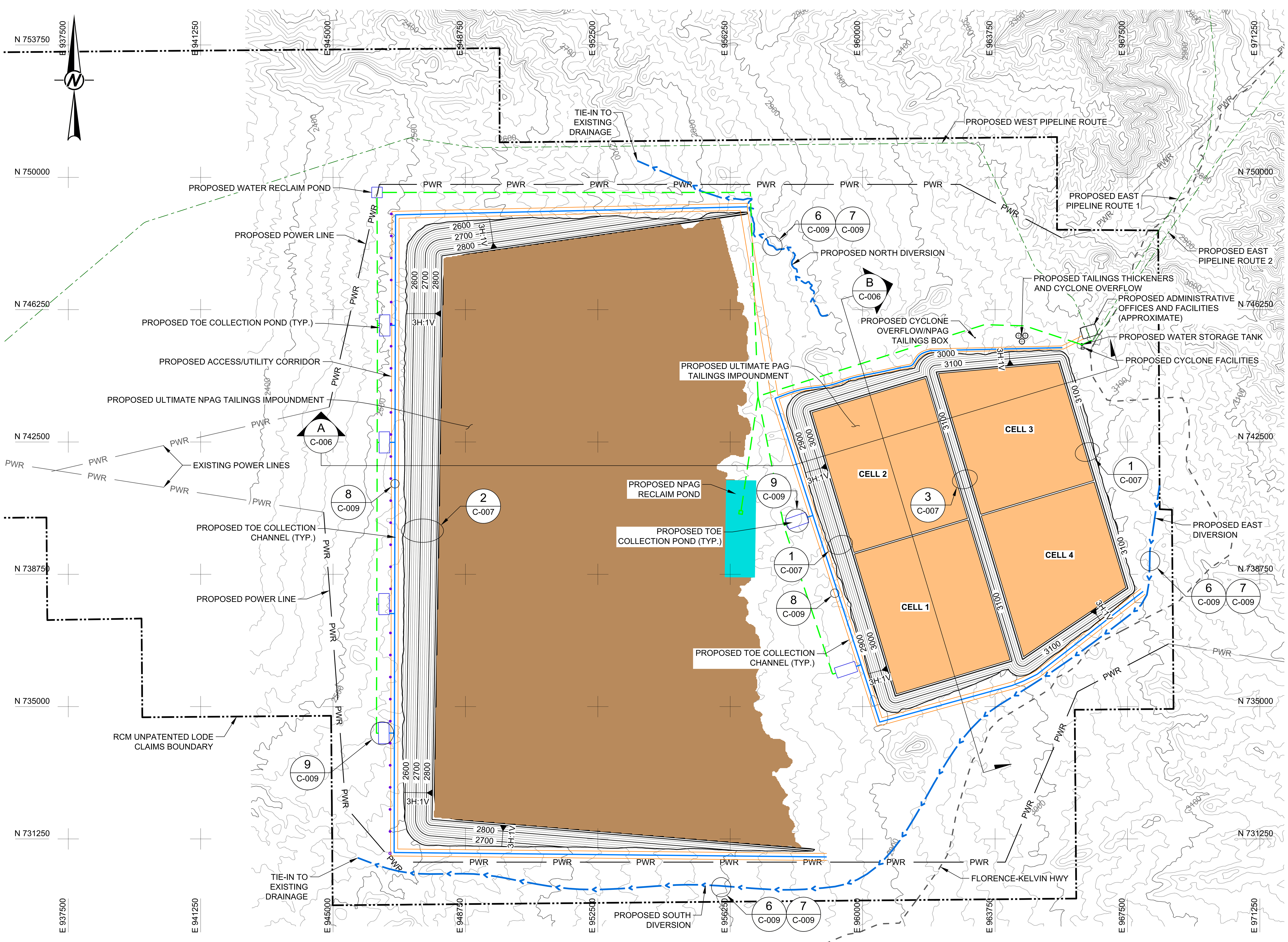
TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
YEAR 20 AND YEAR 30 IMPOUNDMENT GRADING AND FILL PLAN

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	7 of 14	C-003

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



LEGEND

3600	EXISTING GROUND CONTOURS (ft -MSL)
	EXISTING ROADS
	RCM UNPATENTED LODE CLAIMS BOUNDARY
PWR	EXISTING POWER LINES
3600	DESIGN CONTOURS (ft -MSL)
	GRADE BREAK
	PAG STORE AND RELEASE COVER (NOTE 1)
	NPAG TAILINGS
	NPAG RECLAIM POND
	PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
	PROPOSED ACCESS/UTILITY CORRIDOR
	PROPOSED DIVERSION CHANNEL (NOTE 2)
PWR	PROPOSED RELOCATED POWER LINES
	PROPOSED NPAG AND PAG PIPELINE ROUTE
3H:1V or 3H 1V	3 HORIZONTAL TO 1 VERTICAL SLOPE
	PROPOSED WATER RECLAIM PIPELINE ROUTE
	PUMP BACK WELLS

NOTE(S)

1. A WATER COVER SHALL BE MAINTAINED OVER THE PAG TAILINGS DURING OPERATION. A STORE AND RELEASE COVER WILL REPLACE THE WATER COVER AT CLOSURE.
2. SEE NOTE 1 ON DRAWING G-001.
3. PUMP BACK WELLS WILL BE LOCATED AT 625 ft SPACING ALONG THE EXTERIOR EDGE OF THE ACCESS/UTILITY CORRIDOR AS SHOWN. AN APPROXIMATE TOTAL NUMBER OF 30 PUMP BACK WELLS WILL BE IN PLACE AT THE ULTIMATE FACILITY CONFIGURATION.

NOT FOR CONSTRUCTION

DRAFT

0 1500 3000
1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

CONSULTANT
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

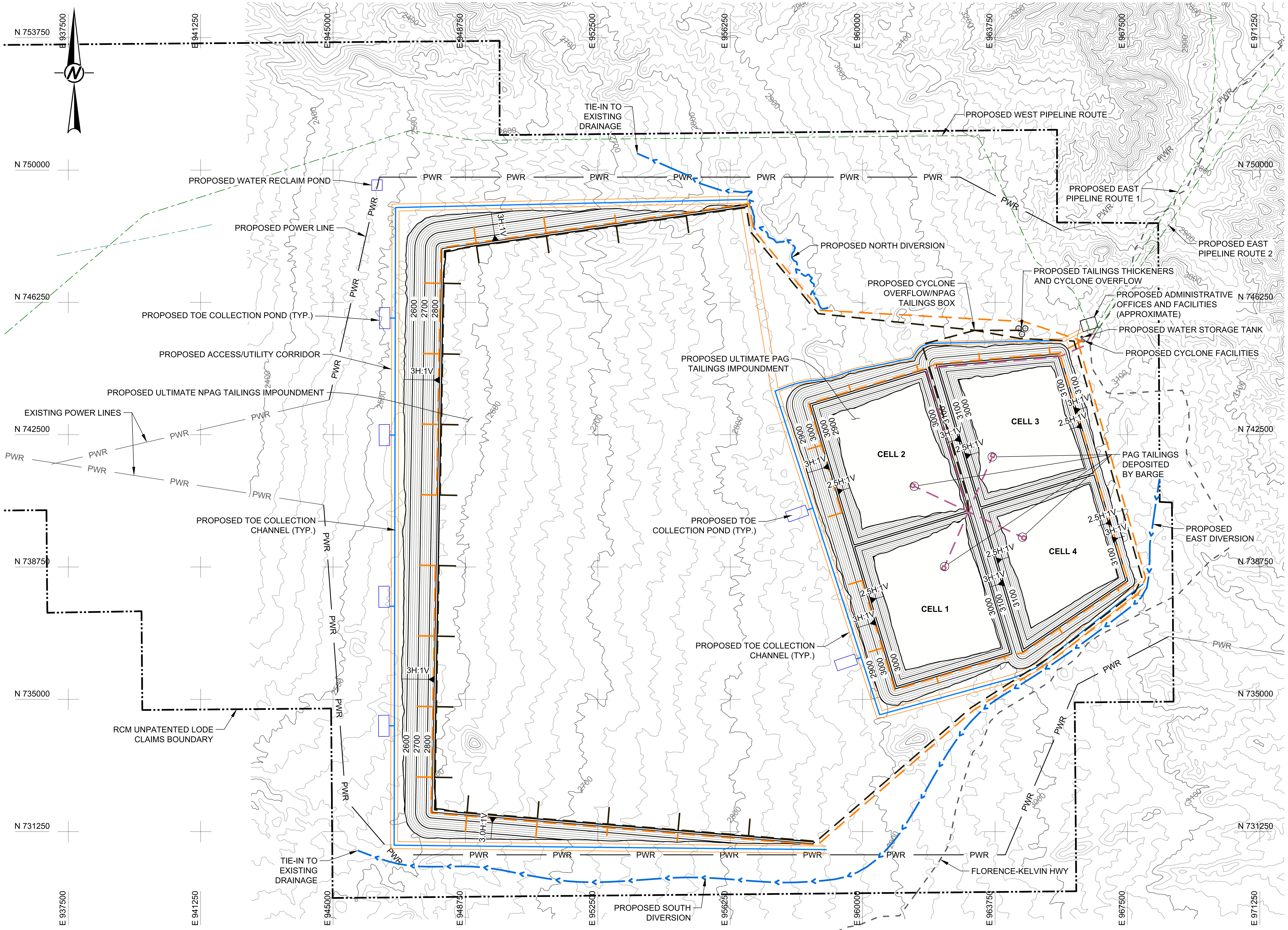
PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
ULTIMATE IMPOUNDMENT GRADING AND FILL PLAN

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	8 of 14	C-004

Path: \\tucson\cadd\RCML\Superior\99_projects\1788500_1300_Alt\Unlined\02_PRODUCTION\DWG\ | File Name: 1788500_1300_C_004.dwg | Last Edited By: jlsanchez Date: 2018-06-20 Time: 2:31:16 PM | Printed By: JLSanchez Date: 2018-06-20 Time: 2:42:38 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



LEGEND

3600	EXISTING GROUND CONTOURS (ft -MSL)
	EXISTING ROADS
	RCM UNPATENTED LODE CLAIMS BOUNDARY
PWR	EXISTING POWER LINES
3600	DESIGN CONTOURS (ft -MSL)
	GRADE BREAK
	PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE)
	PROPOSED ACCESS/UTILITY CORRIDOR
	PROPOSED DIVERSION CHANNEL (NOTE 2)
PWR	PROPOSED RELOCATED POWER LINES
	PROPOSED NPAG AND PAG PIPELINE ROUTE
	CYCLONED SANDS EMBANKMENT HEADER PIPE
	NPAG WHOLE TAILINGS/THICKENERS UNDERFLOW DEPOSITION HEADER PIPE
	PAG TAILINGS HEADER PIPE
3H:1V or 3H/1V	3 HORIZONTAL TO 1 VERTICAL SLOPE

NOTE(S)

1. SEE NOTE 1 ON DRAWING G-001.
2. WATER RECLAIM SYSTEM SHOWN ON DRAWING C-008.

NOT FOR CONSTRUCTION

DRAFT

0 1500 3000
1" = 1500' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

CONSULTANT
GOLDER

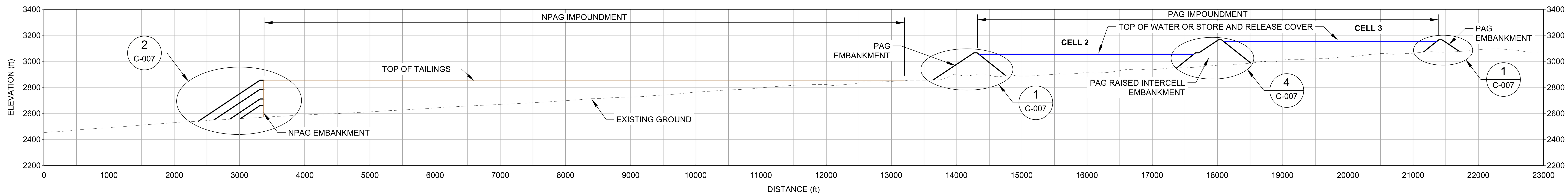
TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

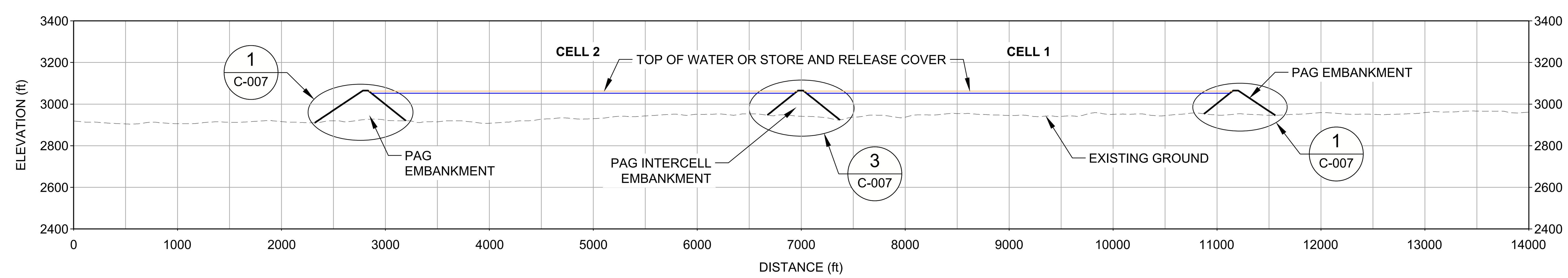
TITLE
ULTIMATE TAILINGS DELIVERY AND DISTRIBUTION PIPING PLAN

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	9 of 14	C-005

Path: \\tucson\cadd\RCM\Superior\99_projects\1788500_1300_AltTunlined\02_PRODUCTION\DWG\ | File Name: 1788500_1300_C_005.dwg | Last Edited By: jlsanchez Date: 2018-06-20 Time:10:49:39 AM | Printed By: JLSanchez Date: 2018-06-20 Time:2:43:06 PM



HORIZ. SCALE 1" = 800'
VERT. SCALE 1" = 400'
A C-006 NPAG AND PAG FACILITIES CROSS-SECTION A



HORIZ. SCALE 1" = 800'
VERT. SCALE 1" = 400'
B C-006 PAG FACILITY CROSS-SECTION B

NOT FOR CONSTRUCTION
DRAFT

0 800 1600
1" = 800' FEET
0 400 800
1" = 400' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

CONSULTANT
GOLDER

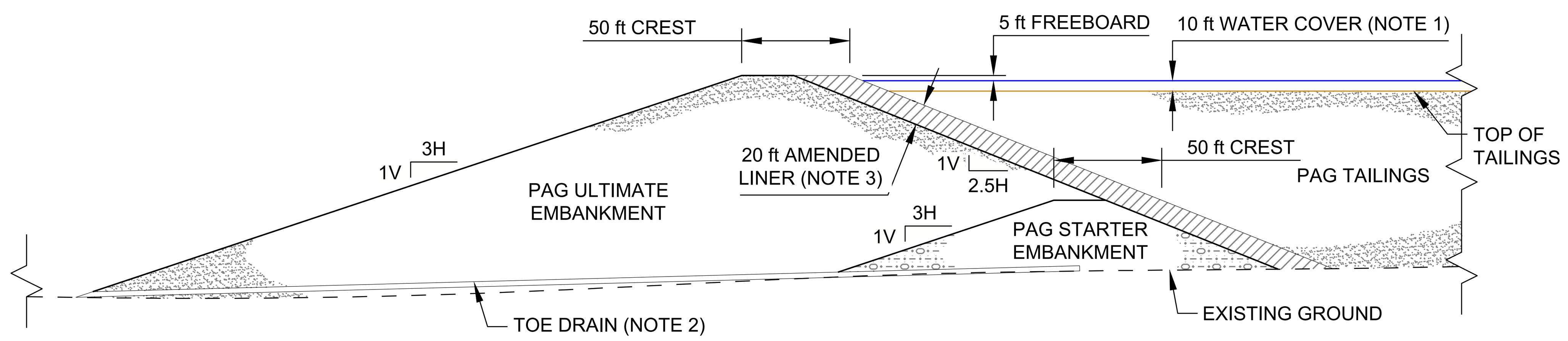
TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

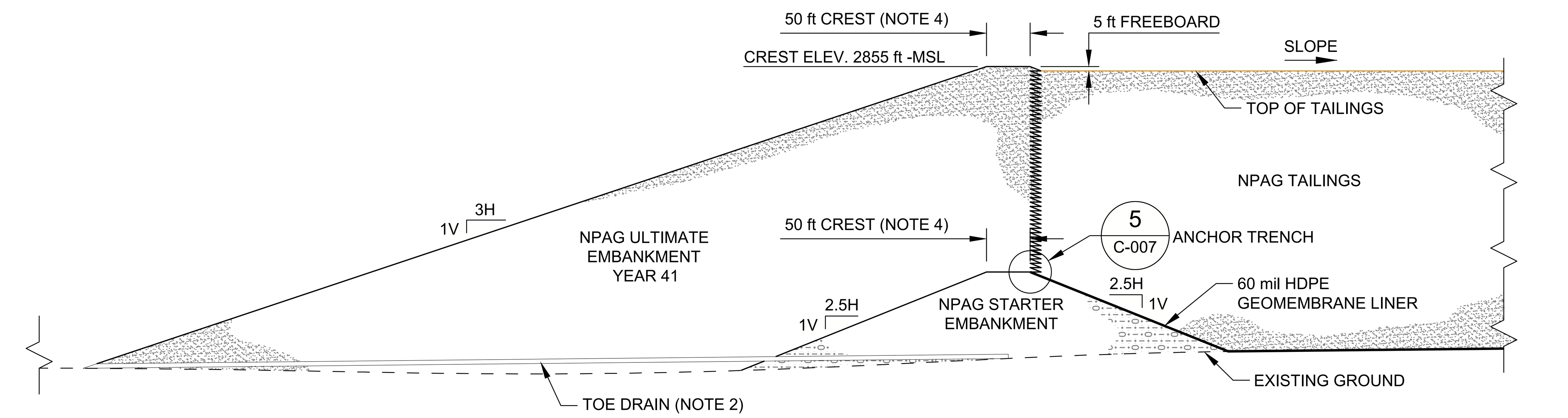
TITLE
NPAG AND PAG FACILITY CROSS-SECTIONS

PROJECT NO. 1788500 | CONTROL 1300 | REV. D | 10 of 14 | DRAWING C-006

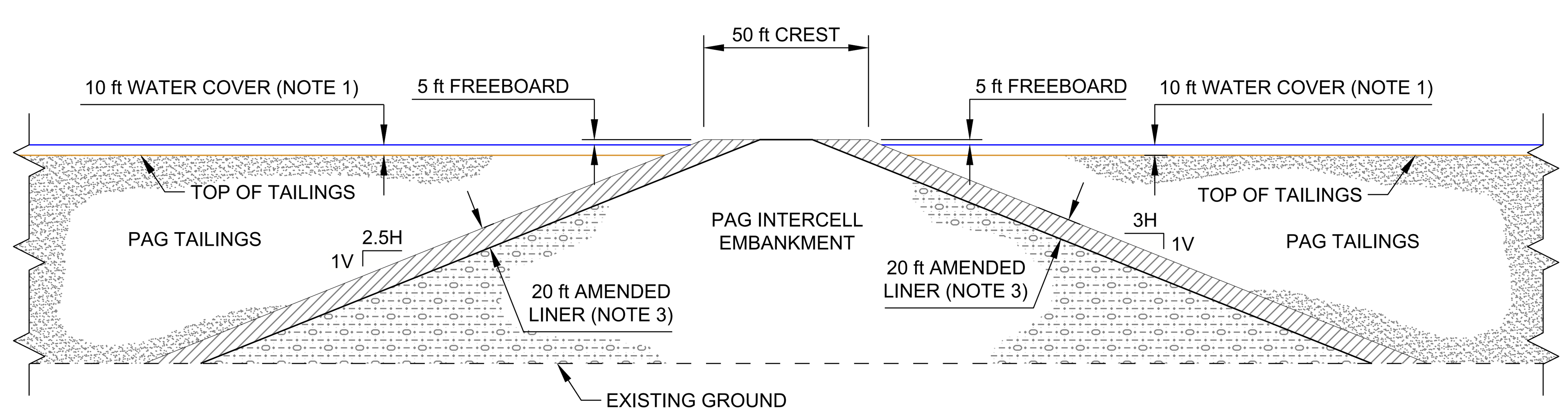
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



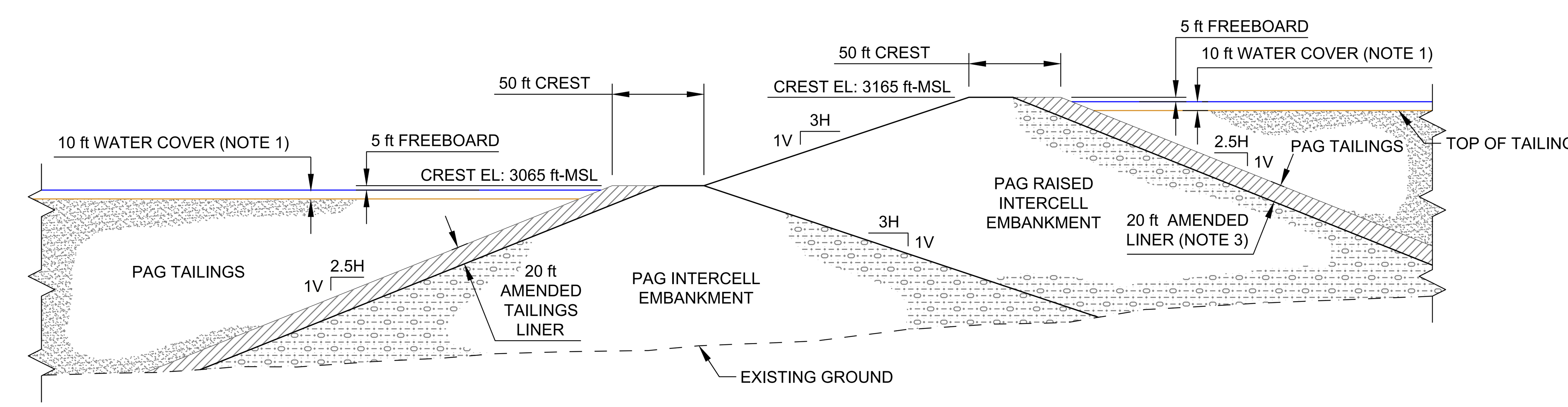
NOT TO SCALE 1 C-007 TYPICAL PAG TAILINGS EMBANKMENT DETAIL



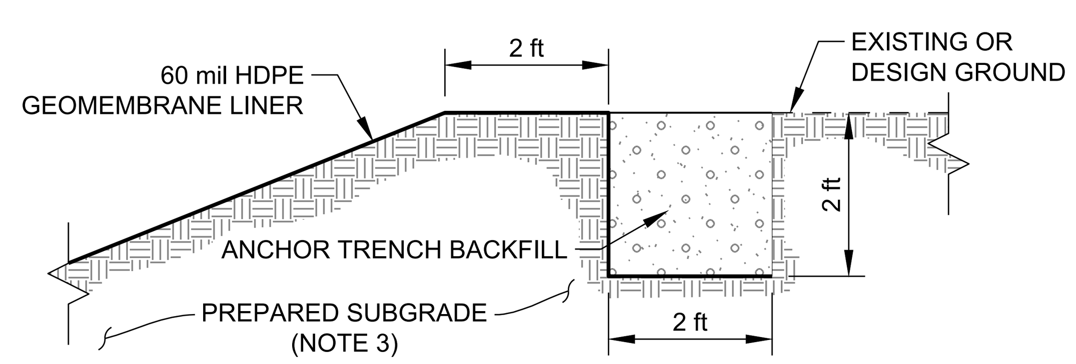
NOT TO SCALE 2 C-007 TYPICAL NPAG EMBANKMENT DETAIL



NOT TO SCALE 3 C-007 TYPICAL PAG TAILINGS INTERCELL EMBANKMENT DETAIL



NOT TO SCALE 4 C-007 TYPICAL PAG TAILINGS RAISED INTERCELL EMBANKMENT DETAIL



NOT TO SCALE 5 C-007 TYPICAL ANCHOR TRENCH DETAIL

NOTE(S)

1. A WATER COVER SHALL BE MAINTAINED OVER THE PAG TAILINGS DURING OPERATION. A STORE AND RELEASE COVER WILL REPLACE THE WATER COVER AT CLOSURE.
2. TOE DRAIN DETAILS WILL BE ADVANCED DURING DETAILED DESIGN.
3. RIPRAP OR SLOPE PROTECTION (AMENDED LINER) WILL BE REQUIRED ON THE UPSTREAM SLOPE OF PAG FACILITY.
4. CREST WIDTH INCREASES FROM 50 ft TO 100 ft AT THE NPAG EMBANKMENT CORNERS.

NOT FOR CONSTRUCTION

DRAFT

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT

RESOLUTION COPPER

CONSULTANT

GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

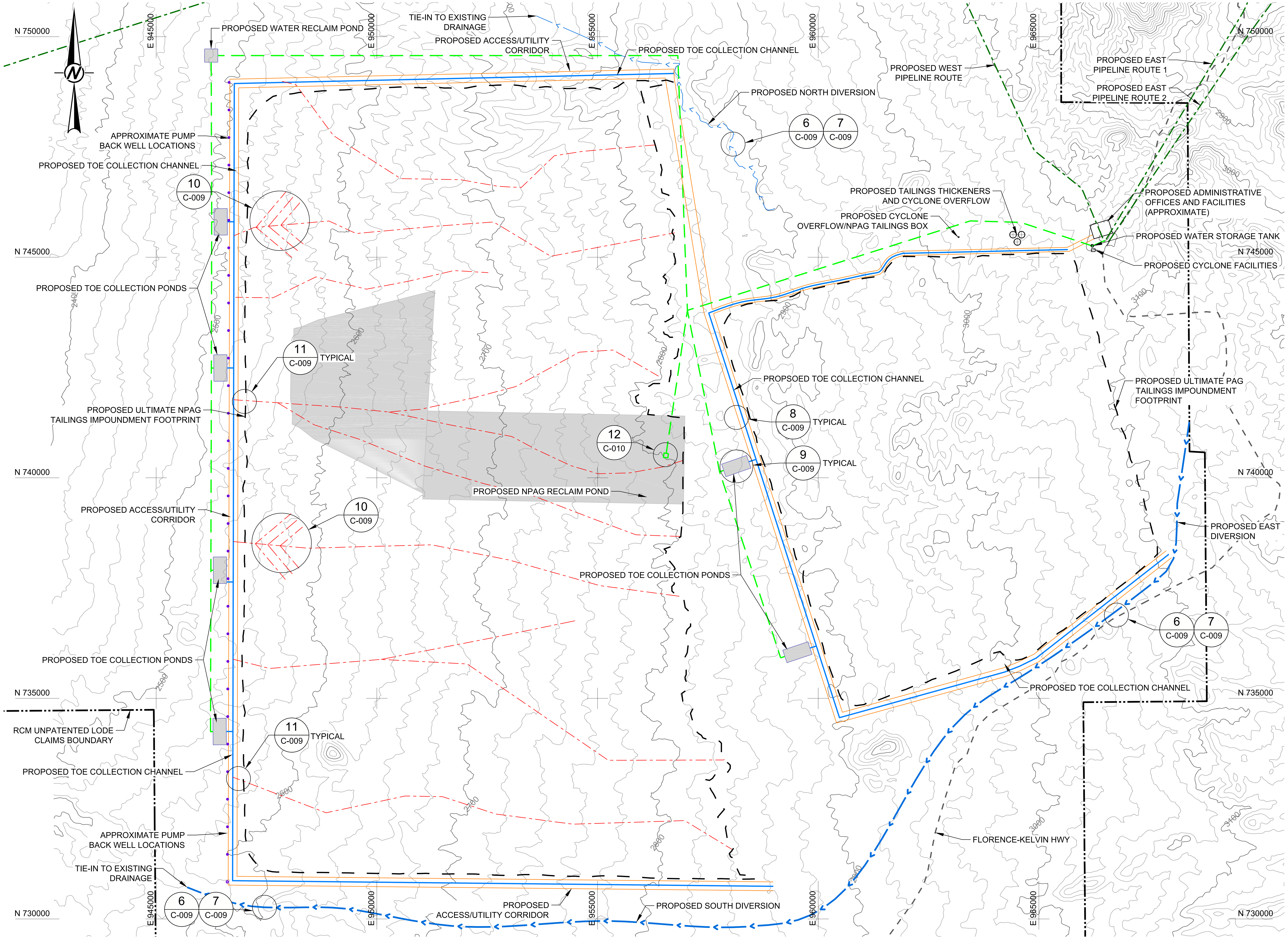
PROJECT

RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE

NPAG AND PAG FACILITY TYPICAL DETAILS

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	11 of 14	C-007



LEGEND

3600	EXISTING GROUND CONTOURS (ft -MSL)
	EXISTING ROADS
	RCM UNPATENTED LODE CLAIMS BOUNDARY
	ULTIMATE FACILITY FOOTPRINT
	PROPOSED DIVERSION CHANNEL (NOTE 2)
	PROPOSED NPAG AND PAG PIPELINE ROUTE
	PROPOSED PUMP BACK WELL LOCATIONS (NOTE 3)
	PROPOSED TOE COLLECTION CHANNEL (NOTE 3)
	PROPOSED TOE COLLECTION POND BOUNDARY (APPROXIMATE) (NOTE 3)
	ACCESS/UTILITY CORRIDOR (NOTE 3)
	PROPOSED UNDERDRAIN
	PROPOSED WATER RECLAIM PIPELINE ROUTE
	GEOMEMBRANE LINER EXTENTS (APPROXIMATE)

NOTE(S)

1. A WATER COVER SHALL BE MAINTAINED OVER THE PAG TAILINGS DURING OPERATION. A STORE AND RELEASE COVER WILL REPLACE THE WATER COVER AT CLOSURE.
2. SEE NOTE 1 ON DRAWING G-001.
3. PUMP BACK WELLS WILL BE LOCATED AT 625 ft SPACING ALONG THE EXTERIOR EDGE OF THE ACCESS/UTILITY CORRIDOR AS SHOWN. AN APPROXIMATE TOTAL NUMBER OF 30 PUMP BACK WELLS WILL BE IN PLACE AT THE ULTIMATE FACILITY CONFIGURATION.

NOT FOR CONSTRUCTION

DRAFT

0 1200 2400
1" = 1200' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT
RESOLUTION COPPER

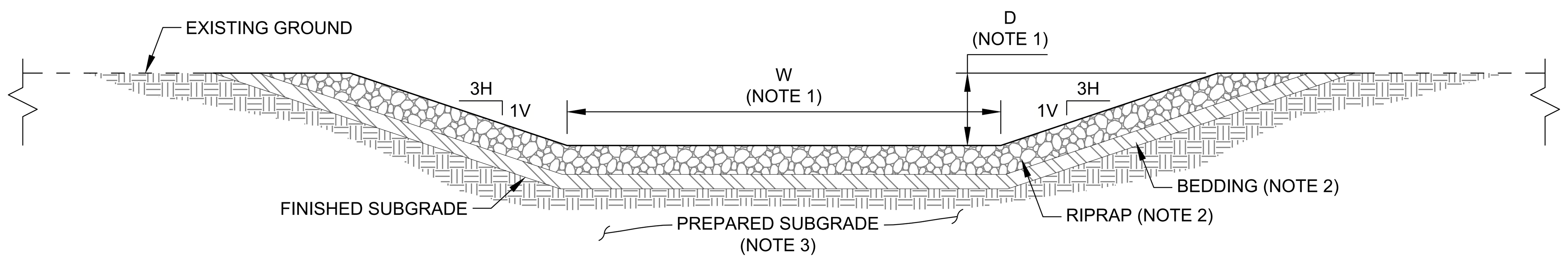
CONSULTANT
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

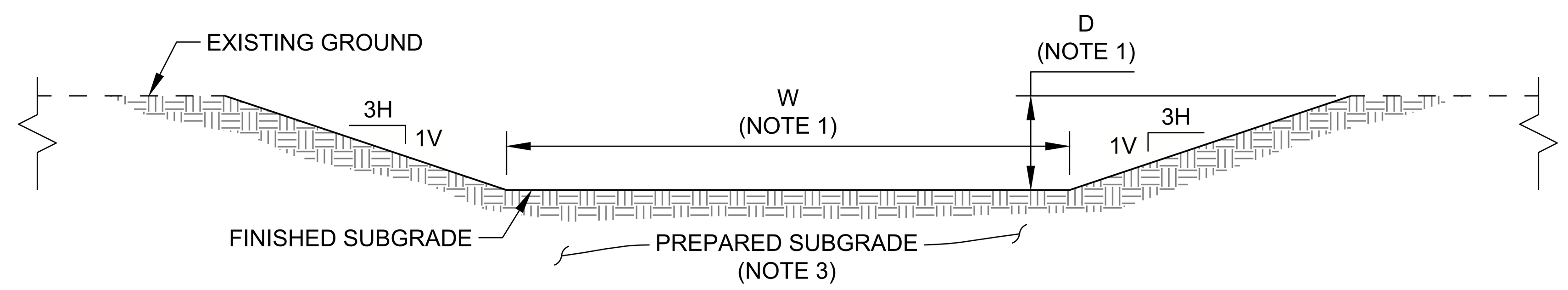
PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
ULTIMATE WATER MANAGEMENT PLAN

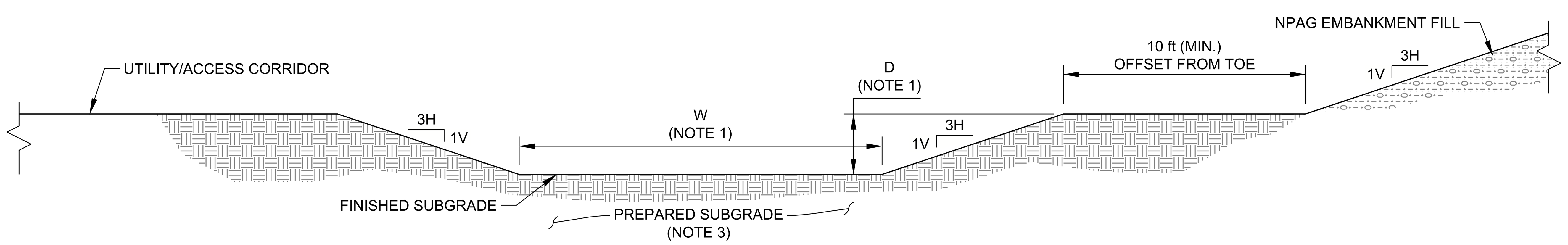
PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	12 of 14	C-008



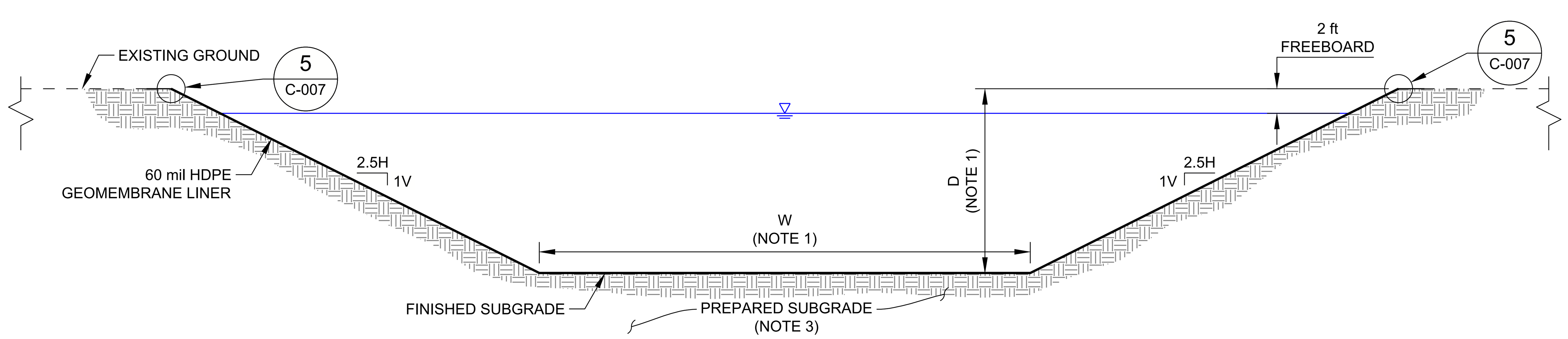
NOT TO SCALE 6 C-009 TYPICAL ARMORED DIVERSION CHANNEL DETAIL



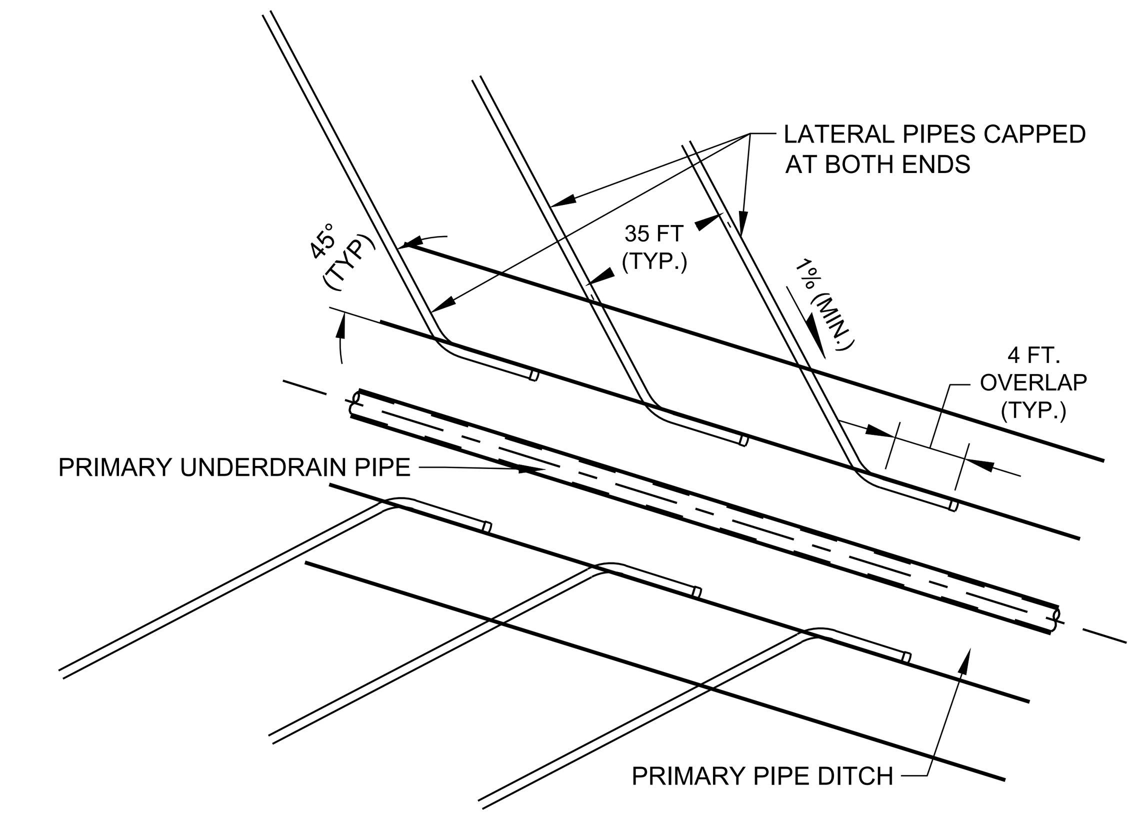
NOT TO SCALE 7 C-009 TYPICAL UNARMORED DIVERSION CHANNEL DETAIL



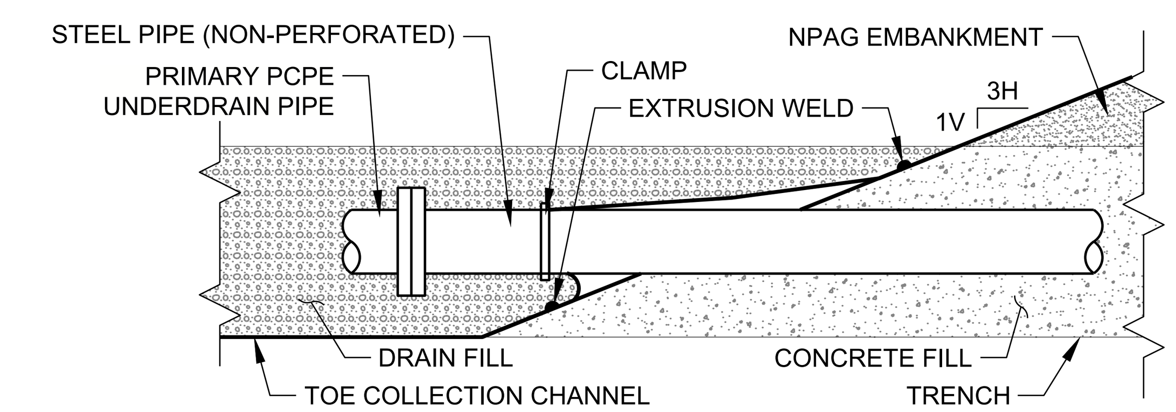
NOT TO SCALE 8 C-009 TYPICAL TOE COLLECTION CHANNEL DETAIL



NOT TO SCALE 9 C-009 TYPICAL TOE COLLECTION POND DETAIL



NOT TO SCALE 10 C-009 TYPICAL UNDERDRAIN DETAIL



NOT TO SCALE 11 C-009 TYPICAL UNDERDRAIN PIPE TO TOE COLLECTION CHANNEL DETAIL

NOTE(S)

1. SEE NOTE 1 ON DRAWING G-001.
2. RIPRAP SIZE, THICKNESS, AND BEDDING GRADATION WILL BE DETERMINED DURING DETAILED DESIGN.
3. SUBGRADE PREPARATION WILL NOT BE REQUIRED WHERE THE EXCAVATION IS LOCATED WITHIN NATIVE BEDROCK.
4. UNDERDRAIN DETAILS WILL BE ADVANCED DURING DETAILED DESIGN.

NOT FOR CONSTRUCTION

DRAFT

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT

RESOLUTION COPPER

CONSULTANT

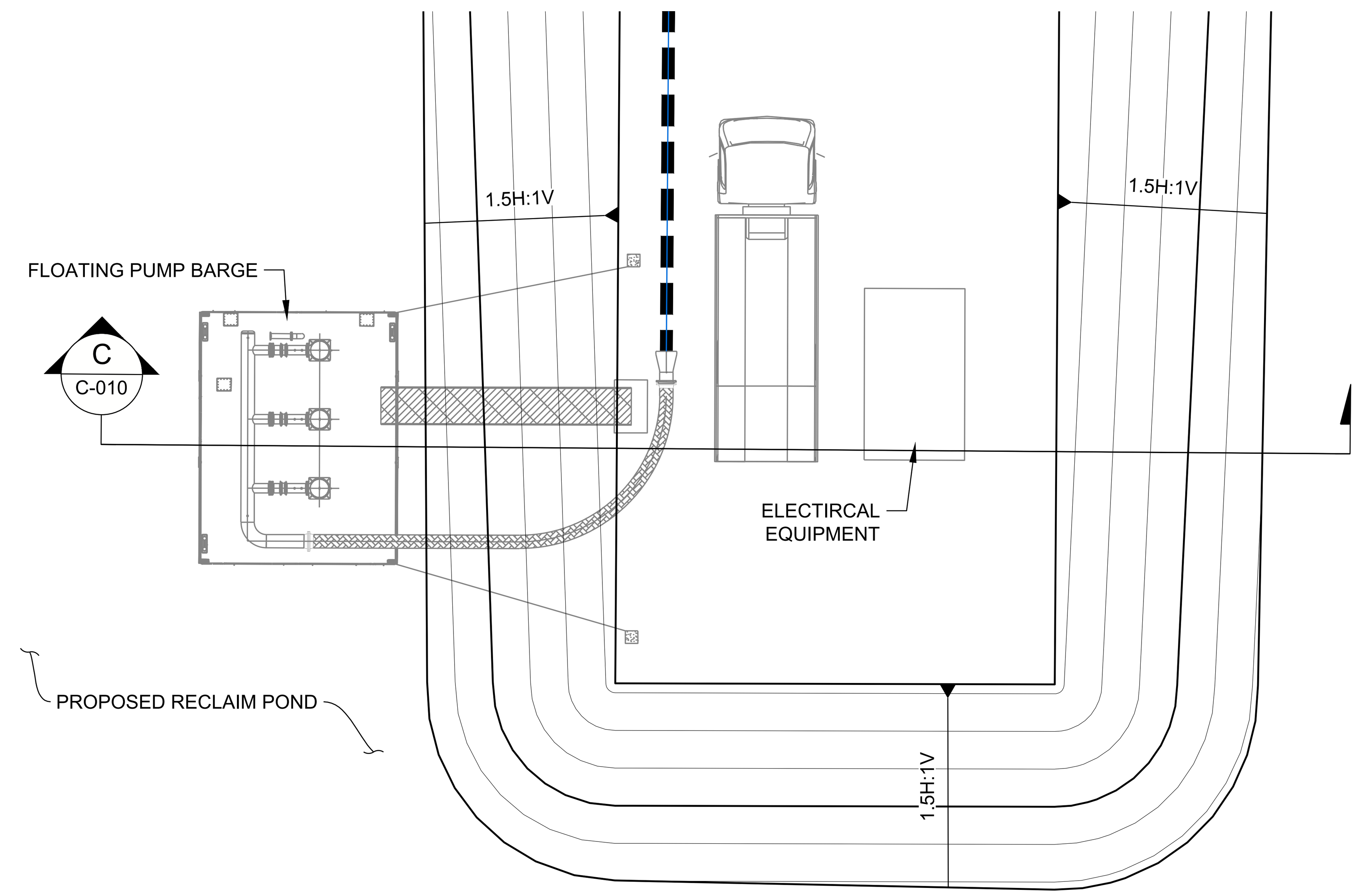
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

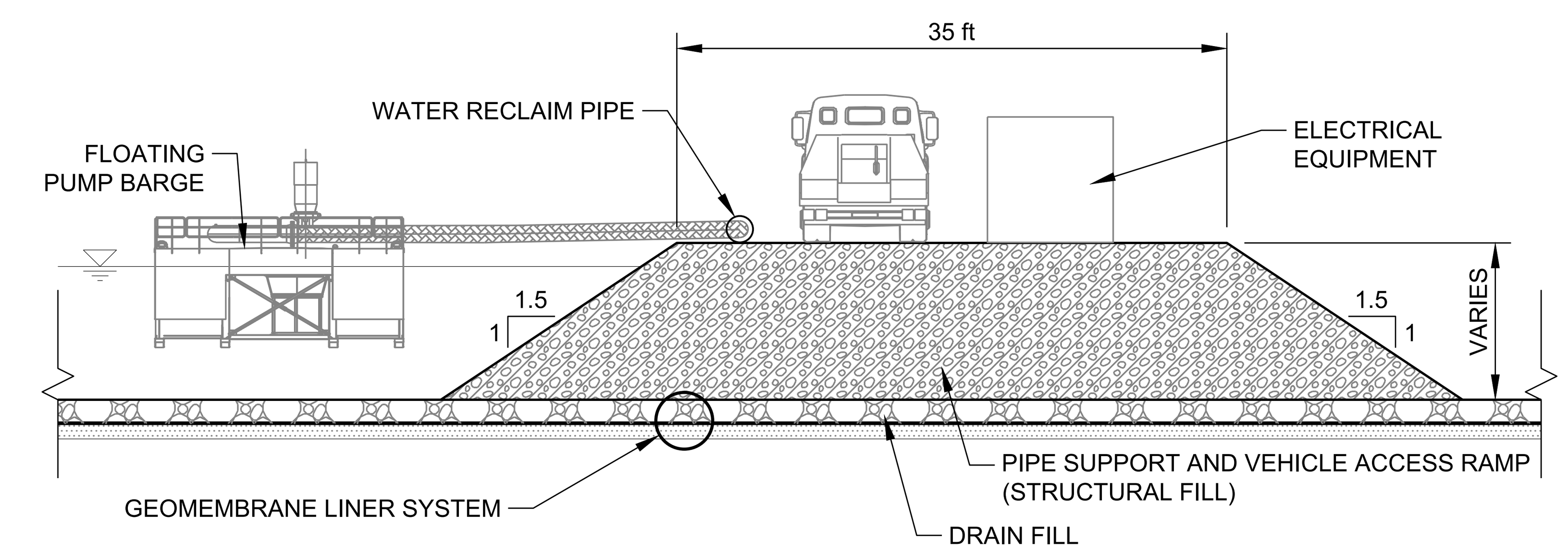
PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
WATER MANAGEMENT TYPICAL DETAILS

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	13 of 14	C-009



NOT TO SCALE 12 C-010 TYPICAL RECLAIM BARGE DETAIL



NOT TO SCALE C C-010 RECLAIM BARGE SECTION

NOT FOR CONSTRUCTION

DRAFT

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
D	2018-06-20	REVISED - ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
C	2018-05-25	ISSUED FOR AGENCY REVIEW	HNL	JLS	HNL	JP
B	2018-05-18	ISSUED FOR CLIENT REVIEW	HNL	NIL	HNL	JP
A	2018-05-10	ISSUED FOR INTERNAL REVIEW	HNL	NIL	HNL	JP

SEAL

CLIENT

RESOLUTION COPPER

CONSULTANT

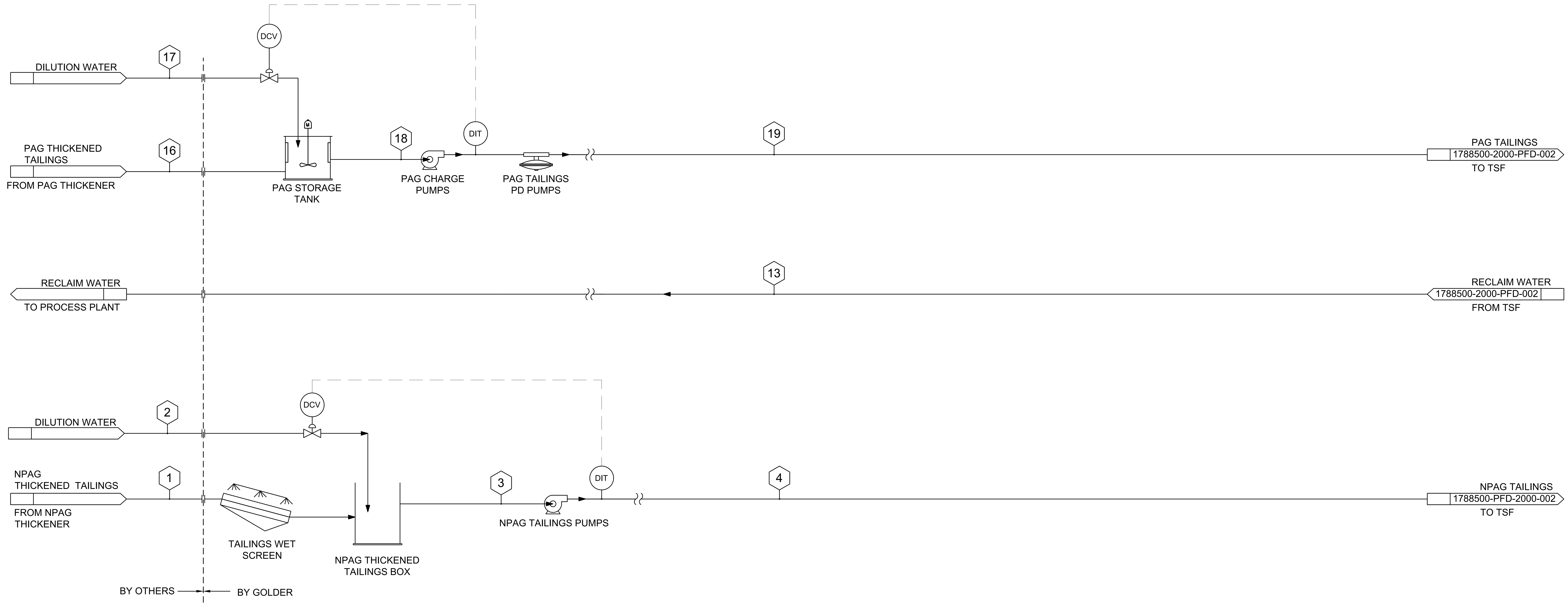
GOLDER

TUCSON OFFICE
4730 N. ORACLE ROAD, STE. 210
TUCSON, ARIZONA
UNITED STATES OF AMERICA
[+1] (520) 888 8818
www.golder.com

PROJECT
RESOLUTION COPPER PROJECT
TAILINGS DISPOSAL ALTERNATIVES
PEG LEG ALTERNATIVE 5

TITLE
WATER RECLAMATION TYPICAL DETAILS

PROJECT NO.	CONTROL	REV.		DRAWING
1788500	1300	D	14 of 14	C-010



BASIS: 144,000 SHORT TONS □DAY OF WHOLE TAILINGS (92□ MILL CAPACITY)

DESCRIPTION			NPAG THICKENED TAILINGS	DILUTION WATER FOR NPAG TAILINGS (NOTE 2)	NPAG TAILING PUMP SUCTION	NPAG TAILING PUMP DISCHARGE	RECLAIM WATER TO PLANT (NOTE 2)	PAG THICKENED TAILINGS	DILUTION WATER FOR PAG TAILINGS (NOTE 2)	PAG TAILINGS PUMPS SUCTION	PAG TAILINGS PUMPS DISCHARGE
STREAM			1	2	3	4	13	16	17	18	19
TEMPRETURE		(F)	-	-	-	-	-	-	-	-	-
PRESSURE		(PSIG)	-	-	-	-	-	-	-	-	-
MASS	SOLIDS	(STPD)	120,960	-	120,960	120,960	-	23,040	-	23,040	23,040
	SOLIDS	(STPH)	5,040	-	5,040	5,040	-	960	-	960	960
	WATER	(STPH)	3,360	500	3,360	3,360	901	960	100	960	960
	SLURRY	(STPH)	8,400	-	8,400	8,400	-	1,920	-	1,920	1,920
	SOLIDS Cw	(%)	60%	-	60%	60%	-	50%	-	50%	50%
VOLUME	SOLIDS	(GPM)	7,320	-	7,320	7,320	-	1,096	-	1,096	1,096
	WATER	(GPM)	13,421	1,997	13,421	13,421	3,598	3,834	399	3,834	3,834
	SLURRY	(GPM)	20,741	-	20,741	20,741	-	4,930	-	4,930	4,930
	SOLIDS Cv	(%)	35%	-	35%	35%	-	22%	-	22%	22%
S.G.	SOLIDS	-	2.75		2.75	2.75	`	3.50	-	3.50	3.50
	WATER	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	SLURRY	-	1.62		1.62	1.62	-	1.56	-	1.56	1.56

NOTES:

1. TAILINGS DAM CONFIGURATION ON HOLD.
2. FOR SIZING PURPOSES ONLY, NOT FOR BALANCE.
3. BOOSTER PUMP STATIONS WILL BE ADDED, IF CENTRIFUGAL PUMP OPTION SELECTED FOR SCAVENGER TAILINGS.
4. PAG - POTENTIALLY ACID GENERATING TAILINGS (PYRITE)
5. NPAG - NON-POTENTIALLY ACID GENERATING TAILINGS (SCAVENGER)

APPROVED FOR RESOLUTION COPPER MINING, LLC.

APPROVED FOR GOLDER

GOLDER ISSUE DATE: 2018-06-20

REF DWG NO	REFERENCE DRAWING TITLE	REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
			.	.	.	.	.
			.	.	.	.	.
			.	.	.	.	.
		C	ISSUED FOR FINAL REVIEW	2018-06-20	SP	BN	RS
		B	ISSUED FOR CLIENT APPROVAL	2018-02-28	SP	BN	RS
		A	ISSUED FOR CLIENT REVIEW	2018-02-02	SP	BN	RS

THIS DRAWING IS NOT VALID UNLESS THE LAST REVISION IS HAND SIGNED

REV C
WBS CODE: 25200
DISCIPLINE: PROCESS
DWG No: PFD-001

THIS DRAWING PRODUCED BY GOLDER

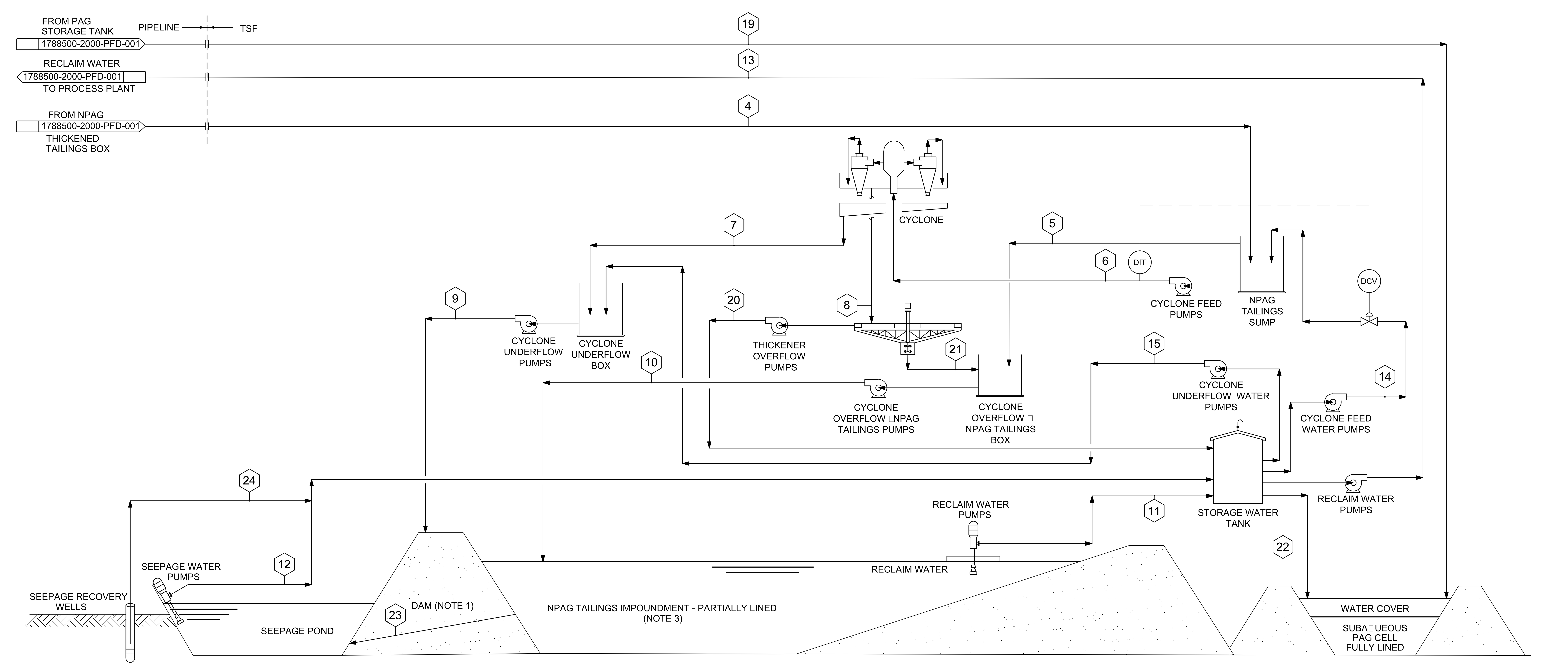
APPROVED BY
NAME :
SIGNATURE
REG No :
ORIGINAL DATE :
REVISION DATE :

DRAWN BY: SP
DATE: 2018-02-22

RESOLUTION COPPER

THIS DRAWING MAY BE REDUCED FROM ORIGINAL SIZE, DO NOT SCALE
This drawing is produced electronically and is only valid for construction if it contains the seal and original signature of an authorised Professional Engineer

CLIENT	Resolution Copper Mining
PROJECT	1788500 RCM OOM STUDY
LOCATION	SUPERIOR, AZ
AREA	TAILING THICKENING □ CORRIDOR
SUB-AREA	TAILINGS CORRIDOR, PUMPS AND PIPELINE
TITLE	PROCESS FLOW DIAGRAM ALT 5 UNLINED TSF
SCALE:	NTS
GOLDER FILE No	1788500□2000□PFD□001
DWG No	CCC.03-25200-EM-DWG-00001
REV	C



BASIS: 144,000 SHORT TONS DAY OF WHOLE TAILINGS (92 MILL CAPACITY)

DESCRIPTION			NPAG TAILING PUMP DISCHARGE	WHOLE NPAG TAILING	CYCLONE FEED	CYCLONE UNDERFLOW	CYCLONE OVERFLOW	DILUTED CYCLONE UNDERFLOW	THICKENED CYCLONE OVERFLOW/ NPAG TAILING TO POND	RECLAIM WATER TO STORAGE TANK (NOTE 2)	SEEPAGE WATER TO TANK (NOTE 2)	RECLAIM WATER TO PLANT (NOTE 2)	CYCLONE FEED DILUTION WATER	CYCLONE UNDERFLOW DILUTION WATER (NOTE 2)	PAG TAILINGS PUMPS DISCHARGE	THICKENER OVERFLOW	THICKENER UNDERFLOW	WATER TO PAG CELL COVER	TSF UNDER FLOW	SEEPAGE RECOVERY WELLS
STREAM			4	5	6	7	8	9	10	11	12	13	14	15	19	20	21	22	23	24
TEMPRETURE		(F)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRESSURE		(PSIG)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MASS	SOLIDS	(STPD)	120,960	120,960	120,960	61,246	59,714	61,246	120,960	-	-	-	-	-	23,040	-	59,714	-	-	-
	SOLIDS	(STPH)	5,040	5,040	5,040	2,552	2,488	2,552	5,040	-	-	-	-	-	960	-	2,488	-	-	-
	WATER	(STPH)	3,360	3,360	9,500	851	8,649	1,701	3,360	175	1,502	901	6,140	851	960	6,990	1,659	776	1,502	25
	SLURRY	(STPH)	8,400	8,400	14,540	3,403	11,137	4,253	8,400	-	-	-	-	-	1,920	-	4,147	-	-	-
	SOLIDS Cw	(%)	60%	60%	35%	75%	22%	60%	60%	-	-	-	-	-	50%	-	60%	-	-	-
VOLUME	SOLIDS	(GPM)	7,320	7,320	7,320	3,707	3,614	3,707	7,320	-	-	-	-	-	1,096	-	3,614	-	-	-
	WATER	(GPM)	13,421	13,421	37,947	3,398	34,547	6,795	13,421	700	6,000	3,598	24,526	3,398	3,834	27,921	6,625	3,100	6,000	100
	SLURRY	(GPM)	20,741	20,741	45,267	7,104	38,160	10,502	20,741	-	-	-	-	-	4,930	-	10,239	-	-	-
	SOLIDS Cv	(%)	35%	35%	16%	52%	9%	35%	35%	-	-	-	-	-	22%	-	35%	-	-	-
S.G.	SOLIDS	-	2.75	2.75	2.75	2.75	2.75	2.75	2.75	-	-	`	-	-	3.50	-	2.75	-	-	-
	WATER	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	SLURRY	-	1.62	1.62	1.28	1.91	1.17	1.62	1.62	-	-	-	-	-	1.56	-	1.62	-	-	-

NOTES:

1. FOR TAILINGS DAM CONFIGURATION SEE ALTERNATE 5 REPORT, APPENDIX E.
2. FOR SIZING PURPOSES ONLY, NOT FOR BALANCE.
3. FOR SEEPAGE AND EVAPORATION LOSSES SEE ALTERNATIVE 5 REPORT, APPENDIX G (WATER BALANCE)
4. PAG- POTENTIALLY ACID GENERATING TAILINGS (PYRITE).
5. NPAG - NON-POTENTIALLY ACID GENERATING TAILINGS (SCAVENGER).

APPROVED FOR RESOLUTION COPPER MINING, LLC.

APPROVED FOR GOLDER

GOLDER
ISSUE DATE: 2018-02-28

REV	DESCRIPTION	DATE	BY	DES	PROJ MGR
C	ISSUED FOR FINAL REVIEW	2018-06-20	SP	BN	RS
B	ISSUED FOR CLIENT APPROVAL	2018-02-28	SP	BN	RS
A	ISSUED FOR INTERNAL REVIEW	2018-02-02	SP	BN	RS

REF DWG NO | REFERENCE DRAWING TITLE

THIS DRAWING IS NOT VALID UNLESS THE LAST REVISION IS HAND SIGNED

THIS DRAWING PRODUCED BY GOLDER

APPROVED BY . NAME SIGNATURE REG No ORIGINAL DATE REVISION DATE

DRAWN BY: SP DATE: 2018-02-22

RESOLUTION COPPER

THIS DRAWING MAY BE REDUCED FROM ORIGINAL SIZE, DO NOT SCALE. This drawing is produced electronically and is only valid for construction if it contains the seal and original signature of an authorised Professional Engineer

CLIENT: Resolution Copper Mining
PROJECT: 1788500 RCM OOM STUDY
LOCATION: SUPERIOR, AZ
AREA: TAILING THICKENING CORRIDOR
SUB-AREA: TAILINGS CORRIDOR, PUMPS AND PIPELINE
TITLE: PROCESS FLOW DIAGRAM - ALT 5 UNLINED TSF
SCALE: NTS
GOLDER FILE No 1788500 2000 PFD 002
CCC.03-25200-EM-DWG-00002 | REV C

WBS CODE: 25200
DISCIPLINE: PROCESS
DWG No: PFD-002

RESOLUTION
COPPER

102 Magma Heights – P.O. Box 1944
Superior, AZ 85173
Tel.: 520.689.9374
Fax: 520.689.9304

June 21, 2018

Ms. Mary Rasmussen
US Forest Service
Supervisor's Office
2324 East McDowell Road
Phoenix, AZ 85006-2496

Subject: Resolution Copper mining, LLC – Mine Plan of Operations and Land Exchange – Peg Leg TSF Alternative DEIS Design.

Dear Ms. Rasmussen,

Enclosed for your review and consideration, please find the report titled *Draft EIS Design, Peg Leg Site Alternative 5*.

Sincerely,

Vicky Peacey

Vicky Peacey,

Senior Manager, Environment, Permitting and Approvals; Resolution Copper Company, as Manager of Resolution Copper Mining, LLC

Cc: Ms. Mary Morissette; Senior Environmental Specialist; Resolution Copper Company

Enclosure: *Draft EIS Design, Peg Leg Site Alternative 5*