Overview

The Forest Service developed reasonable and feasible alternatives to the proposed action to resolve, minimize, or reduce impacts on people and resources by identified issues while meeting the purpose of and need for the proposed action.

Alternatives are a mix of strategies that meet the purpose of and need for the proposed action and resolve or address key issues identified during scoping.

Alternatives for this EIS include the proposed action and no action alternative, along with a range of reasonable action alternatives.

Alternatives, Including the Proposed Action

2.1 Introduction

Council on Environmental Quality regulations describe the alternatives section as the "heart of the Environmental Impact Statement," and require Federal agencies to "rigorously explore and objectively evaluate all reasonable alternatives and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated" (40 CFR 1502.14).

Chapter 2 summarizes the alternatives development process, summarizes alternatives eliminated from further consideration, and describes the alternatives carried forward for detailed analysis in the EIS. This chapter presents the range of alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for comparison and choice among options by the decision maker and the public. The differences between alternatives include changes in the location, design, or engineering of the alternative (e.g., acreage required for the footprint of each tailings storage facility); these are discussed in section 2.2. Other differences between alternatives are based on the environmental effects (e.g., the amount of dust caused by different tailings processing methods), social effects (e.g., the miles of roads used for recreation that are lost), and economic effects (e.g., the reduction in property values near the tailings storage facility) of implementing each alternative. Section 2.5 and appendix E include a summary of these effects; chapter 3 provides a more detailed analysis of these effects.

The alternatives development process included comments provided during the scoping period for alternatives that should be considered in the EIS. Alternatives consist of a mix of strategies that meet the purpose of and need for the proposed action and resolve or address key issues identified during scoping. The additional alternatives that were determined to be outside the scope of the project, duplicative of the alternatives already being considered in detail, or technically or economically infeasible or that were determined to include components that would cause unnecessary environmental harm, are further described in Appendix F, Alternatives Considered but Dismissed from Detailed Analysis.

Alternatives considered but dismissed from detailed analysis in this EIS include the following:

- Alternative mining techniques,
- Brownfield tailings disposal, and
- Other alternative tailings disposal locations.

The Forest Service developed the following six alternatives for analysis in the EIS, which include the no action and proposed action alternatives, in response to issues raised by the public, the Tonto National Forest, or cooperating agencies (see section 1.7).

For reference in reviewing this chapter and the EIS in general, a comprehensive glossary of technical mining terminology is included in chapter 7.

2.2 Alternatives Considered in Detail

- Alternative 1 – No Action Alternative. The land exchange would not occur, and the GPO would not be approved. Existing activities occurring on private land would continue as permitted (see section 2.2.3).
- Alternative 2 – Near West Proposed Action. This alternative is a variation of the proposed action described in the May 9, 2016, version of the GPO. Alternative 2 would include a split-stream tailings processing method with two tailings types deposited at a facility at the "Near West" location with a modified centerline embankment (see section 2.2.4).
- Alternative 3 – Near West – Ultrathickened. Alternative 3 proposes to reduce the amount of water retained in the non-potentially acid generating (NPAG)[10] tailings as well as reduce seepage potential through on-site ultrathickening of NPAG tailings at a facility at the "Near West" location with a modified centerline embankment (see section 2.2.5).
- Alternative 4 – Silver King. This is the only alternative that proposes to use filtered tailings instead of slurry tailings at a facility located north of Superior and the West Plant Site. After filtering, conveyors and mobile equipment would mechanically deposit potentially acid generating (PAG)[11] and NPAG tailings in two separate, adjacent storage facilities (see section 2.2.6).
- Alternative 5 – Peg Leg. This alternative allows for a comparison of the impacts of slurry tailings if placed in a flatter alluvial setting instead of in an upland wash or canyon. The tailings would be placed behind a centerline embankment at a location approximately 20 miles south of Superior. Two different corridors for tailings transportation are under consideration (see section 2.2.7).
- **Alternative 6 – Skunk Camp (Lead Agency Preferred).** This alternative uses a centerline, cross-valley embankment at a location approximately 20 miles southeast of Superior. This location requires less fill material to retain tailings, compared with a ring-like impoundment, simplifying construction and operations. Two different corridors for tailings transportation are under consideration (see section 2.2.8).

The tailings storage facility and type of tailings processing and placement formed the most substantial differences between alternatives, as shown in table 2.2-1.

2.2.1 Forest Service Preferred Alternative

The Forest Service has identified Alternative 6 – Skunk Camp North Tailings Corridor Option as the Lead Agency's preferred alternative and seeks public feedback during the 90-day comment period for the DEIS regarding this choice.

2.2.2 Elements Common to All Action Alternatives

Elements that are common to the proposed action and action alternatives are described in this section. Later sections in chapter 2 describe specific features or changes that are particular to each individual alternative. The elements that are common to all alternatives include the land exchange process, a GPO, and amendments to the Forest Plan (see section 1.4.3).

2.2.2.1 Land Exchange

Section 3003 of the NDAA authorizes and directs the Secretary of Agriculture to administer a land exchange between Resolution Copper and the Forest Service. The NDAA also directs the Forest Service

10. *Scavenger* is another term found in reference documents and is synonymous with NPAG.

11. *Pyrite* and *cleaner* are other terms found in reference documents and are synonymous with PAG.

Table 2.2-1. Tailings storage facility comparison

Alternative	Tailings Storage Facility and Tailings Corridor (acres)	Embankment Length and Type	Separate PAG Cell?	Distance for Tailings Slurry (miles)	Tailings Type	Total Groundwater Pumped from Desert Wellfield (acre-feet)
Alternative 2 – Near West Proposed Action	4,981	10-mile-long modified centerline embankment	Not separated	5.3	Thickened slurry (NPAG and PAG)	600,000
Alternative 3 – Near West –Ultrathickened	4,981	10-mile-long modified centerline embankment	Separate cell using an internal splitter berm	5.3	Ultrathickened NPAG slurry; thickened PAG slurry	500,000
Alternative 4 – Silver King	5,691	Not applicable – compacted structural zone	Separated, 1 cell	0.2	Filtered	180,000
Alternative 5 – Peg Leg West Tailings Corridor Option	12,455	7-mile-long centerline embankment	Separated, 4 cells	28.1	Thickened slurry (NPAG and PAG)	550,000
Alternative 5 – Peg Leg East Tailings Corridor Option	12,122	7-mile-long centerline embankment	Separated, 4 cells	22.7	Thickened slurry (NPAG and PAG)	550,000
Alternative 6 – Skunk Camp North Tailings Corridor Option	10,112	3-mile-long centerline embankment	Separated, 2 cells	19.8	Thickened slurry (NPAG and PAG)	550,000
Alternative 6 – Skunk Camp South Tailings Corridor Option	10,591	3-mile-long centerline embankment	Separated, 2 cells	25.2	Thickened slurry (NPAG and PAG)	550,000

to carry out the land exchange in accordance with the requirements of NEPA with a single EIS. The land exchange is not a discretional decision, but required by the NDAA; therefore, no decision will be issued for the land exchange process. As detailed in the NDAA, the land exchange would convey 2,422 acres of NFS land (selected lands) to Resolution Copper. The land being transferred to Resolution Copper is located east of the town of Superior in an area known as Oak Flat.

In exchange for the transfer of the Oak Flat Federal Parcel out of Federal ownership, Resolution Copper would convey private land parcels to the Federal Government consisting of approximately 5,376 acres of private land (offered lands) on eight parcels located elsewhere in Arizona.

The selected and offered land exchange parcels are listed in the legislation authorizing the land exchange (figure 2.2.2-1 and Appendix B, Existing Conditions of Offered Lands). See table 1.4.2-1 in chapter 1 for a summary of the land exchange components. Detailed figures for each of the land exchange parcels are provided in Appendix B.

Selected Lands

The selected lands include 2,422 acres of NFS lands, known as the Oak Flat Federal Parcel, located east of Superior in Pinal County, Arizona. The lands transferred from the NFS to Resolution Copper would become private lands (both surface and subsurface mineral estate).

The Oak Flat Withdrawal Area includes a 50-acre campground with 16 campsites, known as the Oak Flat Campground. The Oak Flat Campground would be conveyed to Resolution Copper during the land exchange. As a condition of conveyance of the Federal land, Resolution Copper must agree to provide access to the surface of Oak Flat Campground to members of the public until such a time that mine operations preclude access for safety reasons.

The Oak Flat Federal Parcel is adjacent to and surrounding Resolution Copper private land on which the existing East Plant Site mining facilities are located. The underground mining operations would take place beneath the Oak Flat Federal Parcel, and additional infrastructure would be located on the Oak Flat Federal Parcel after approval of the final GPO and execution of the land exchange.

Offered Lands

The offered lands include approximately 5,376 acres of Resolution Copper private land on eight parcel groups located throughout Arizona. The parcels of offered lands would be transferred to the United States, for administration by either the Forest Service or BLM.

FOREST SERVICE

Land exchange parcel locations are shown in figure 2.2.2-1. Five of the eight parcels Resolution Copper would transfer to the Federal Government would administratively fall under the Forest Service.

Apache Leap South End Parcel. The Apache Leap South End Parcel consists of 142 acres located near the eastern edge of the town of Superior in Pinal County, Arizona. The Apache Leap South End Parcel would become part of the Apache Leap SMA, administered by the Tonto National Forest, Globe Ranger District. Upon completion of the land exchange, Resolution Copper would surrender all mining claims and interests to this parcel.

The parcel includes lands located above and below Apache Leap, an escarpment of sheer cliff faces, hoodoos, and buttresses that forms the scenic backdrop to the town of Superior. Vegetation on the parcel includes shrubs, cacti, and trees such as mesquite, paloverde, and ironwood below the escarpment and woody evergreens and shrubs such as oaks above the escarpment. Current land uses on the parcel include informal recreation and livestock grazing. Additionally, there are multiple historic mining features and remnants of old mining-related roads located throughout the parcel. The acreage of this parcel was updated based on a cadastral survey completed by the BLM in 2018.

Tangle Creek Parcel. Located in Yavapai County, Arizona, approximately 35 miles north of the towns of Cave Creek and Carefree, the Tangle Creek Parcel is a 148-acre private inholding within the Tonto

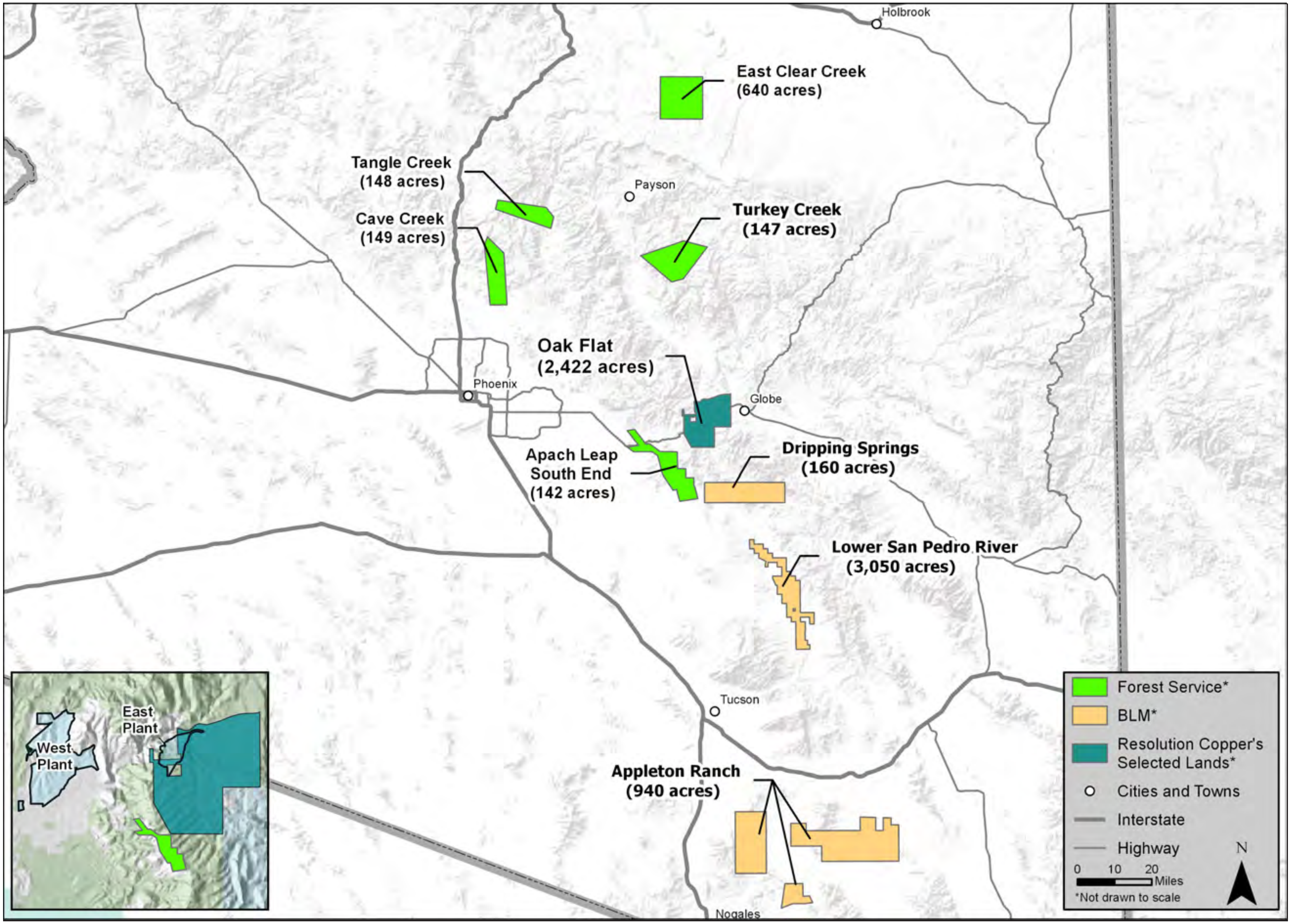


Figure 2.2.2-1. Land exchange parcels overview

National Forest. The parcel would be administered by the Tonto National Forest, Cave Creek Ranger District.

The Tangle Creek Parcel is located in Bloody Basin, a rugged and scenic basin in central Arizona with abundant hiking, camping, and hunting opportunities. The parcel was homesteaded in the 1890s by the Babbitt family. The historically cultivated farm fields are in the process of reverting to open woodlands and thickets of hackberry, mesquite, and catclaw acacia. Features of the Tangle Creek Parcel include Tangle Creek (an intermittent stream) and associated riparian habitat, as well as mature netleaf hackberry, mesquite, ash, and sycamore trees, which provide habitat for migratory birds and nesting songbirds. The parcel also contains a power line transmission corridor.

Turkey Creek Parcel. The Turkey Creek Parcel is a 147-acre parcel located approximately 8 miles southeast of the community of Pleasant Valley in Gila County, Arizona. The Turkey Creek Parcel is a private inholding within the Tonto National Forest and would be administered by the Tonto National Forest, Pleasant Valley Ranger District.

The parcel includes a historic 1880s-era homestead, including the cabin site foundation, hand-dug well, and fruit trees. Turkey Creek (an intermittent stream) and associated riparian habitat also provide varied wildlife habitat for elk, mule deer, and native fish and proposed critical habitat and two protected activity centers for Mexican spotted owl.[12]

Cave Creek Parcel. The Cave Creek Parcel is a 149-acre parcel located approximately 7 miles north of Cave Creek in Maricopa County, Arizona. The Cave Creek Parcel is a private inholding surrounded by Tonto National Forest lands. Upon completion of the land exchange, the parcel would be administered by the Tonto National Forest, Cave Creek Ranger District.

The Cave Creek Parcel includes Cave Creek (an intermittent stream) and its riparian habitat corridor, with stands of cottonwood and mesquite trees. Perennial waters provide wildlife habitat for migratory songbirds, raptors, amphibians, javelina, mule deer, and coyotes. The parcel also encompasses numerous archaeological sites, including petroglyphs, structure ruins, and grinding sites.

East Clear Creek Parcel. The East Clear Creek Parcel is a 640-acre private inholding within the Coconino National Forest, located north of Payson in Coconino County, Arizona. The parcel would be administered by the Coconino National Forest, Mogollon Rim Ranger District. The East Clear Creek Parcel is located in a transitional zone between the upper plateau and riparian ecosystems on the Mogollon Rim. The parcel includes portions of East Clear Creek Canyon and several secondary side canyons, which provide riparian wildlife habitat and raptor nesting and roosting sites.[13] East Clear Creek is a perennial stream.

BUREAU OF LAND MANAGEMENT

The BLM would administer the remaining three parcels of land to be transferred from Resolution Copper to the Federal Government.

Lower San Pedro River Parcel. The Lower San Pedro River Parcel is approximately 3,050-acre parcel located near Mammoth in Pinal County, Arizona. In November 1988, Congress designated 40 miles and approximately 56,000 acres of the upper San Pedro corridor as the San Pedro Riparian National Conservation Area. The parcel, which includes approximately 7 miles of the Lower San Pedro River (an intermittent stream at this location), would be administered by the BLM Gila District, Tucson Field Office, as part of the San Pedro Riparian National Conservation Area. The parcel is non-contiguous to, and roughly 60 miles northwest of, the existing BLM-administered San Pedro Riparian National Conservation Area. The riparian corridor in the parcel includes more than 800 acres of mesquite woodland that features a spring-fed wetland. The parcel's riparian areas and woodlands provide habitat for a wide variety of wildlife, including many migratory bird species and

12. The Bear Fire (July 2018) had minimal burn effects on the Turkey Creek Parcel.

13. The Tinder Fire (April 2018) did burn a large portion of the East Clear Creek Parcel, with vegetation burned from grass through crown level.

lowland leopard frogs. This parcel acreage is approximate and would be updated after BLM completes a cadastral survey in 2019.

Appleton Ranch Parcel. The Appleton Ranch Parcel includes approximately 940 acres of non-contiguous private lands south of Elgin in Santa Cruz County, Arizona. The parcels are within the Appleton-Whittell Research Ranch and Las Cienegas National Conservation Area acquisition area. The parcels are to be administered by the BLM Gila District, Tucson Field Office, as part of the Las Cienegas National Conservation Area. The Las Cienegas National Conservation Area, established in 2000, is a 45,000-acre conservation area containing cottonwood-willow riparian forests and marshlands associated with Cienega Creek, rolling grasslands, and woodlands. The Appleton-Whittell Research Ranch was established in 1969 by the Appleton family in partnership with the National Audubon Society, Forest Service, and BLM as a sanctuary for native plants and animals and a research facility for the study of grassland ecosystems. The ranch, currently managed by the National Audubon Society, contains more than 90 species of native grass and 480 native plant species and is used by more than 200 species of birds for wintering, breeding, or migratory habitat. This parcel acreage is approximate and will be updated after BLM completes a cadastral survey in 2019.

Dripping Springs Parcel. The Dripping Springs Parcel is a 160-acre parcel located northeast of Kearny in Gila and Pinal Counties, Arizona. The parcel, situated in the Dripping Spring Mountains near Tam O'Shanter Peak, is almost completely surrounded by BLM-administered lands, with some adjacent ASLD-administered State Trust land. The parcel would be administered by the BLM Gila District, Tucson Field Office. Vegetation on the parcel includes shrubs, cacti, and desert trees such as paloverde, ironwood, and mesquite, as well as areas of semidesert grassland with desert grasses and shrubs. The parcel's abundant rock formations are known for offering recreational rock-climbing opportunities.

Land Exchange Appraisal

NDAA Section 3003(c)(5) requires that the private lands to be exchanged also be of equal monetary value to the Federal lands; however, the NDAA specifically waives the Federal Land Policy and Management Act (FLPMA)-mandated 25 percent cap, allowing a larger percentage of cash payment on the differences in exchange values, if any exist, for the Resolution Copper project. This allows the Secretary of Agriculture to accept a payment in excess of the FLPMA-mandated 25 percent cap in order to achieve a parity in overall exchange values.

APPRAISAL PROCESS

The appraisal will use the Uniform Standards of Professional Appraisal Practice, the Uniform Appraisal Standards for Federal Land Acquisitions, and Federal regulations under 36 CFR 254.9 (Forest Service appraisal procedures). The Uniform Standards of Professional Appraisal Practice are the industry standard for real estate appraisals. The Uniform Appraisal Standards for Federal Land Acquisitions are an additional set of appraisal standards for Federal land acquisitions and exchanges. The appraisal process began with the Notice of Exchange Proposal Land-For-Land Exchange published on December 12, 2017.

The NDAA requires the joint selection of a qualified appraiser by both parties (the Federal Government and Resolution Copper). The appraiser was selected and began work in 2019. The completed appraisal reports will be reviewed by a Forest Service review appraiser. The review appraiser will ensure that the appraisal follows the appraisal instructions, Uniform Standards of Professional Appraisal Practice and Uniform Appraisal Standards for Federal Land Acquisitions standards, Federal regulations, and the special requirements found in the NDAA. The review appraiser will ensure that the values concluded by the appraiser are sound and well supported.

The NDAA specifies "a detailed income capitalization approach analysis of the market value of the Federal land which may be utilized, as appropriate, to determine the value of the Federal land." The income capitalization approach is one of three commonly used approaches used for real property appraisals.

The NDAA specifies that the appraisal reports (or a summary thereof) supporting the land exchange will be made available for public review prior to completion of the land exchange. The appraisal information will be made available after it is reviewed and approved by the Forest Service review appraiser.

2.2.2.2 General Plan of Operations Components

The proposed action consists of three main components: (1) the Southeast Arizona Land Exchange, a congressionally mandated exchange of land between Resolution Copper and the United States; (2) approval of the GPO for any operations on NFS land associated with the Resolution Copper Project; and (3) amendments to the forest plan. Because the land exchange and forest plan amendment would be the same under the proposed action and all action alternatives, those aspects of the proposed action are described in Section 2.2.2, Elements Common to all Action Alternatives.

This section summarizes the components of the proposed action as described in detail in the GPO. For a full description of the proposed mining operation, including the construction, operation, closure, and reclamation phases of the proposed mine, please refer to the GPO, as amended, which is available online at http://www.resolutionmineeis.us/documents/resolution-copper-gpo or at the Tonto National Forest Supervisor's Office, 2324 East McDowell Road, Phoenix, Arizona 85006.

The description of the GPO is organized as follows:

1. The mine's main facilities (existing and new).
2. The mining processes and activities that would occur during operations of the mine.
3. The closure and reclamation processes that would occur, including financial assurance for reclamation activities.

The proposed action is composed of new mining facilities, existing mining facilities, and existing facilities that are proposed for expansion. The main facilities can be summarized as the East Plant Site, West Plant Site, tailings storage facility, and filter plant and loadout facility (figure 2.2.2-2). In addition, detailed information is provided for several linear corridors, including the ore conveyor/infrastructure corridor and the MARRCO corridor. Surface subsidence is also expected above the underground mine, and this subsidence area is described in relation to the underground mining process (see "Predicted Subsidence Area" later in this section). Table 2.2.2-1 summarizes the direct surface disturbance areas for each of the main mining facilities.

Mine Phases: Construction, Operation, and Closure and Reclamation Time Frames

The estimated overall life of the mine is 51 to 56 years and would consist of three phases: (1) construction, (2) operations, and (3) closure and reclamation. The time frames for these phases and the general activities that would occur under each phase are summarized in figure 2.2.2-3. The term "mine year" is defined as 1 year after the final ROD has been signed and the final GPO has been approved by the Forest Service.[14] These phases were initially defined in table 1.8-1 in the GPO[15] and showed a 45-year operations phase. Subsequent design work and analysis to support the DEIS refined the length of active mining to be 40 years.

14. Should construction implementation be substantially delayed after the GPO has been approved by the Forest Service (for example, by litigation), the Forest Service would review and update the trigger for tracking mine years. Terminology for mine phases is described further in Rigg (2017).

15. Multiple versions of the GPO exist. See the process memorandum titled "History of Revisions to General Plan of Operations" (Garrett 2016) for full details. The version of the GPO cited here is dated May 9, 2016 (Resolution Copper 2016d).

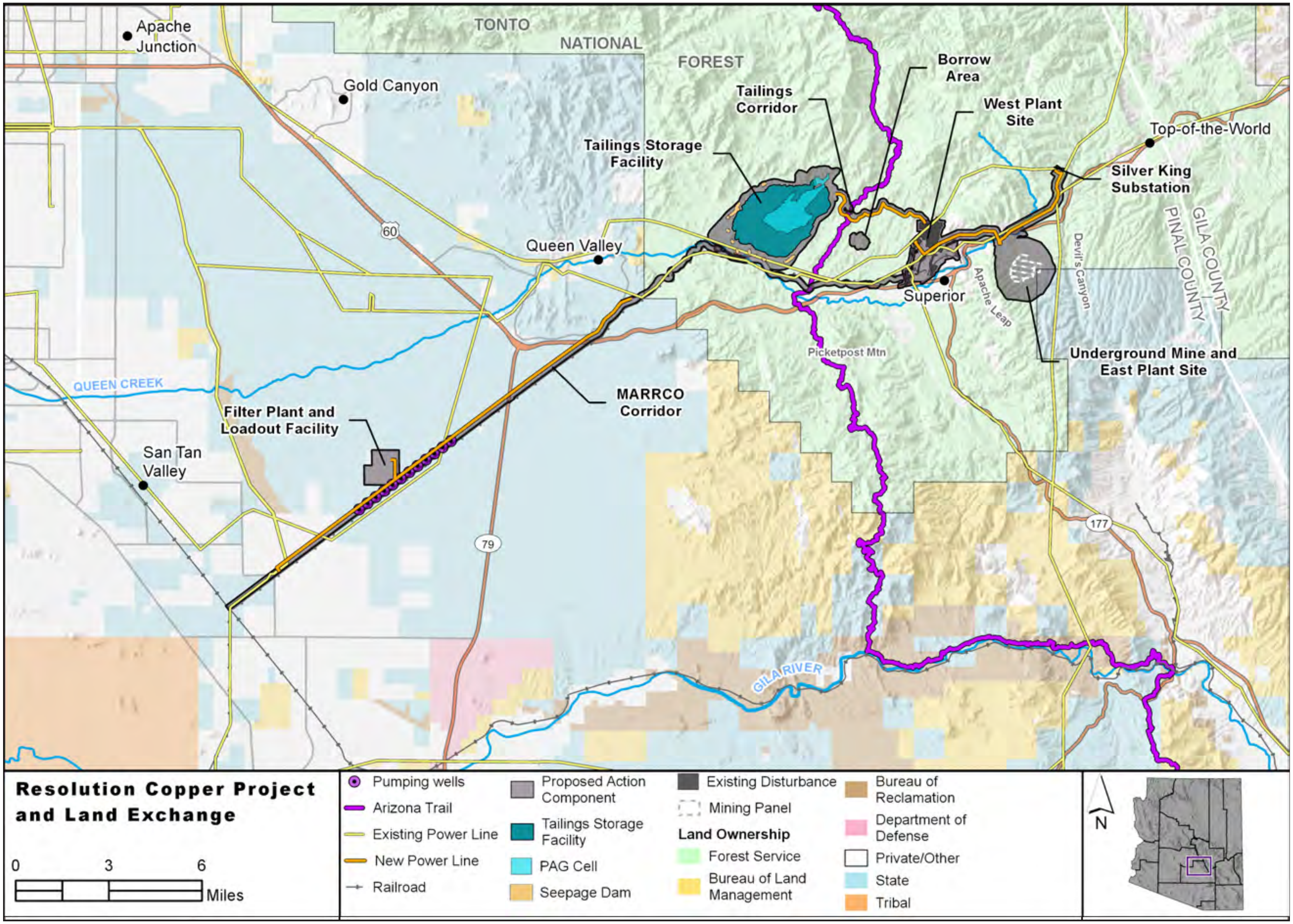


Figure 2.2.2-2. Alternative 2 – Near West Proposed Action overview

Table 2.2.2-1. Summary of project surface disturbance by proposed action

Facility	Total Disturbance (acres rounded to whole numbers)
East Plant Site (includes Magma Mine Road). Note that all NFS acreage shown in the East Plant Site would become private following the land exchange.	189 (140 NFS and 49 private)
West Plant Site	940 (all private)
Tailings storage facility and tailings pipeline corridor	4,986 (4,933 NFS, 53 private)
Filter plant and loadout facility	553 (all private)
Subsidence area. Note that all NFS acreage shown in the subsidence area would become private following the land exchange.	1,686 (1,501 NFS, 145 ASLD, 40 private)
MARRCO corridor	169 (65 NFS, 81 ASLD, 23 private)
Total	**8,523 (6,639 NFS, 226 ASLD, 1,658 private)**

Mining Process Overview

The Resolution Copper Mine, including all facilities described in this document, would operate 24 hours per day, 365 days per year. Figure 2.2.2-4 shows an overview of the entire mining process that would occur at full operation.

Mining the copper deposit would occur between approximately 4,500 and 7,000 feet below ground. At full operation, underground mining would produce 132,000 to 165,000 tons of ore per day. Ore would be crushed underground before being transported to two production shafts that would hoist the ore to an offloading station approximately halfway to the surface. From the offloading station, a conveyor system would transport the ore underground to the concentrator complex at the West Plant Site, approximately 2.25 miles west of the East Plant Site.

Once arriving at the concentrator complex, the ore would either be processed right away or stockpiled for future processing at a covered stockpile. The ore would then be conveyed into a concentrator building for additional crushing and grinding to a sand-size fraction and then further processed by flotation, whereby copper and molybdenum minerals are separated from non-economic minerals in a water bath with the addition of air and reagents. This process produces two products: molybdenum concentrate and copper concentrate. The molybdenum concentrate would be sent to the molybdenum plant for additional processing, packaging, and delivery to market via truck. Approximately 24,145 tons of molybdenum concentrate would be produced per year and sent to market during the operations phase. The copper concentrate slurry would be partially dewatered and pumped about 21 miles to the filter plant and loadout facility through two 8-inch high-density polyethylene (HDPE)-lined steel pipelines that would be located within the MARRCO corridor.

At the filter plant and loadout facility, copper concentrate would be filtered to remove more water and prepared for transport by railcar to Magma Junction for unloading at the Union Pacific Railroad. During the operations phase, between 6,000 and 7,000 wet tons per day of copper concentrate would be produced and sent out for smelting at an off-site smelter. The final smelter destination is unknown at this time. Water recovered during the filter process would be returned to the process water pond at the West Plant Site through the mine's main water supply pipeline in the MARRCO corridor.

The non-economic sand-like material that remains after the ore has been crushed and the copper and other valuable minerals has been extracted is called tailings. Tailings would be sent to a tailings storage facility approximately 4.7 miles west of the West Plant Site through two pipelines (42-inch pipe for NPAG, 2-inch pipe for PAG; reclaimed water would return to West Plant Site in a 24-inch pipe).

Approximately 1.37 billion tons of tailings would be created during the mining process and would be permanently stored at the tailings storage facility. Tailings leaving the processing plant would be split into two separate streams. About 16 percent of the tailings are classified as

Construction

Construction on Federal lands would begin after the final GPO is approved.

- Construction of new facilities at East Plant Site such as new shafts, new roads, new substation, and new refrigeration plant.
- Construction of new facilities at West Plant Site such as concentrator complex, process water pond, water treatment plant, substations, and new/rerouted roads. Ore processing facilities would be operational at approximately mine year 6 and would begin processing ore.
- Construction of the filter plant and loadout facility (completed by mine year 2).
- Construction activities at the tailings storage facility would include constructing new roads, an admin building, and soil stockpiling; however construction of the tailings storage facility would continue through entire mine life while tailings are being produced (see section 3.3.10.7 of the GPO for a detailed description of tailings storage facility construction phases).
- Construction of MARRCO corridor upgrades to accommodate new utilities.

Operations

All main facilities would be fully operational at mine year 6, although construction of ancillary facilities would still be occurring at various locations until mine year 9. Activities include the following:

- Mining 132,000 to 165,000 tons of ore per day. Ore would be excavated from the East Plant Site and processed at the West Plant Site every day for 40 years.
- Processing of ore into copper concentrate at the West Plant Site that would be transported through a pipeline within the MARRCO corridor to the filter plant and loadout facility.
- Processing concentrate further at the filter plant and loadout facility that would be sent via rail for delivery to off-site smelters.
- Piping approximately 1.4 billion tons of tailings from the West Plant Site to the tailings storage facility that would be stored in perpetuity.

Closure and Reclamation

After mining operations cease in mine year 50, closure and final reclamation would occur at the following disturbed surfaces:

- Decommissioning, removing, and/or closing facilities
- Recontouring and regrading disturbed surfaces
- Replacing growth media (i.e., stockpiled soils)
- Revegetating surfaces by seeding and/or direct planting of seedlings where appropriate
- Reclamation activities are not expected to only occur during this phase; some reclamation activities will occur concurrently during the construction and operations phases.
- Post-closure monitoring would continue after the closure and reclamation phase is completed, and long-term facility and water management would occur.

Figure 2.2.2-3. Mine phases, time frames, and mine activities by phase

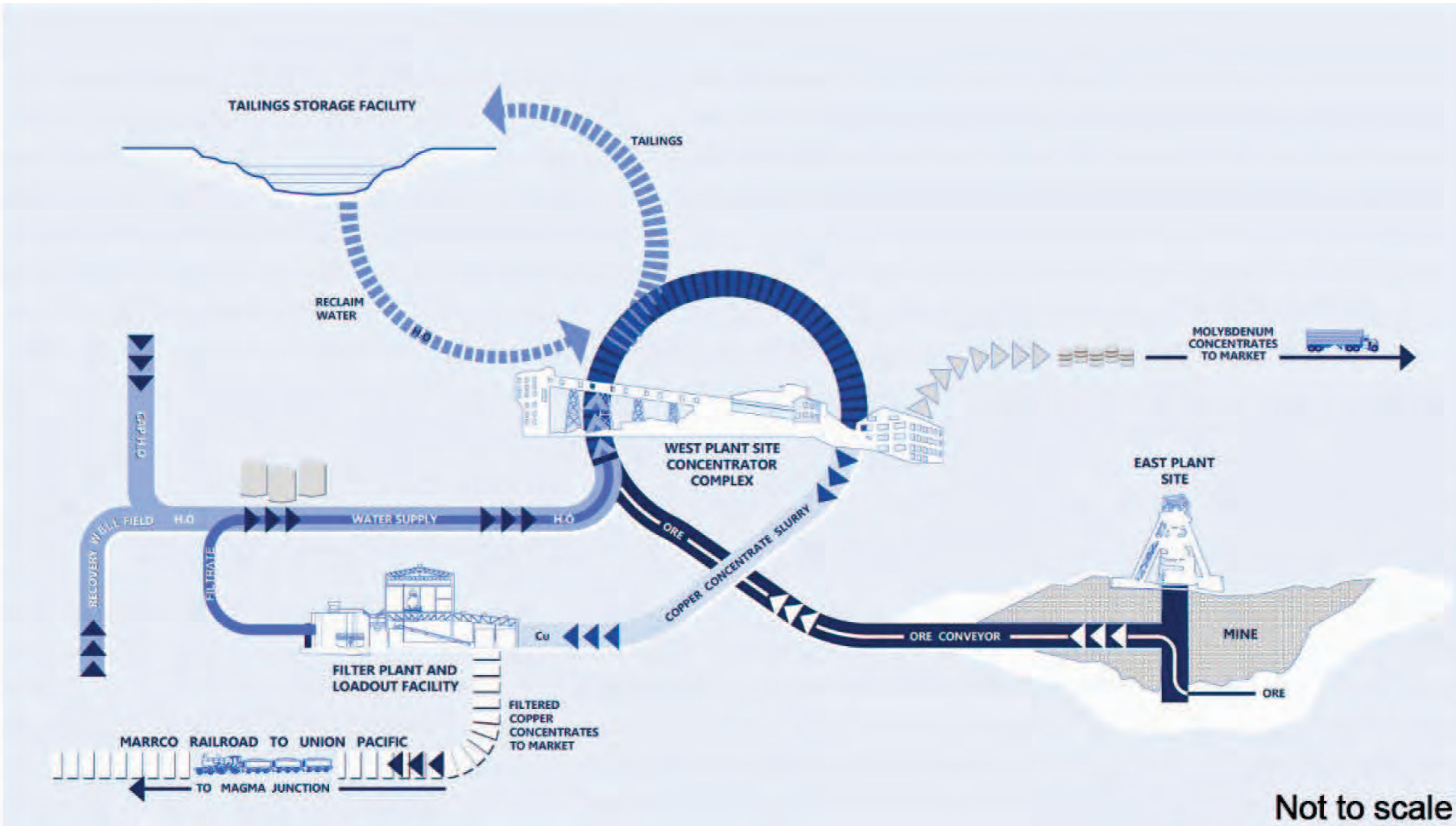


Figure 2.2.2-4. Overview of the mining process at full operation

potentially acid generating, or PAG tailings. These tailings contain much of the sulfides from the ore. The remaining 84 percent of the tailings are classified as non-potentially acid generating, or NPAG tailings.

The PAG tailings and NPAG tailings would arrive at the tailings storage facility separately. The PAG tailings would be deposited in such a way that they are kept submerged beneath water (known as "subaqueous deposition"). This limits oxygen from interacting with the concentration of sulfides in the PAG tailings, minimizing and preventing water quality problems (acid rock drainage). The NPAG are less reactive and would be deposited in a way that would eventually encapsulate the PAG tailings.

UNDERGROUND MINING

Resolution Copper proposes to mine the copper deposit under the Oak Flat Federal Parcel using a method known as panel caving. Panel caving would be the mining method used under all action alternatives. Other mining methods were considered but not analyzed in detail; for additional information, see appendix F. The following sections describe the panel caving method and the various other activities that would occur at the underground mine.

Panel Caving Overview

The type of copper deposit that would be mined at the East Plant Site is a porphyry deposit located between approximately 4,500 and 7,000 feet below the Oak Flat Federal Parcel. The copper deposit that Resolution Copper proposes to mine averages 1.54 percent copper (i.e., every ton of ore would on average contain 31 pounds of copper). The proposed action would use panel cave technology, a type of block caving that is a large-scale mining method.

In general, the panel caving mining system divides the ore into large sections or panels and depends on gravity and internal geological stresses to extract ore from underneath the ore body. After accessing the area below the copper deposit through the construction of vertical shafts, a network of tunnels (vertical shafts and horizontal drifts) is excavated under the copper deposit. The tunnels would be created by standard underground techniques, including drilling, blasting, and removing the blasted rock. The network of tunnels would have four levels, each with different functions, as described in table 2.2.2-2.

Table 2.2.2-2. Description of underground tunnel levels

Level	Function	Components
Undercut blasting	Blast ore body directly overlying the undercut blasting level	Drifts, shafts, and mechanical support
Extraction	Collect blasted ore	Drifts, shafts, mechanical support, drawbells, load-haul-dump vehicles, and ore passes and chutes
Exhaust	Circulate cool air from refrigeration system throughout underground mine operations	Drifts, shafts, ductwork, and variable-speed fans
Rail haulage and crushing	Transport ore from drawbells to underground crushing facility and then convey to production shafts	Drifts, shafts, crushing facility, mechanical support, haul trucks, and/or rail cars and rail system

Once the tunnels are built below the copper deposit, the ore above is blasted to fracture it. The ore then collapses downward through funnel points known as drawbells.

From the drawbells, the collapsed ore in the extraction level would be transported through the tunnel system to a crushing facility underneath the haulage level, where the ore would be crushed by one of three gyratory crushers. Once crushed, the ore would be conveyed to a production shaft where it would be hoisted approximately halfway to the surface (approximately 3,500 feet below surface) and sent from a loadout facility to the West Plant Site via the inclined underground to surface conveyor system.

After the ore has been blasted and collapsed into the drawbells, an expansion void (or cave) within the ore body would form. Additional fracturing and ore collapsing would occur at the expansion void as a result of internal geological stresses caused by the cave, at times aided by additional blasting. The continued process of collapsing and excavating the ore would be repeated until the copper deposit is exhausted or the grade of the collapsed ore is no longer economically viable. Over the 40-year operations phase, this process would be applied at six panels adjacent to one another under the Oak Flat Federal Parcel (figure 2.2.2-5). The mining sequence would begin away from Apache Leap in Panel 2; subsequently mined panels would be Panels 3, 1, 4, 5, and 6, as shown in figure 2.2.2-5.

In total, about 600 pieces of mobile equipment would be used at the underground mining operations. This equipment is identified in table 2.2.2-3.

Refrigeration and Ventilation Systems

Heat in the underground mining operations would be generated by numerous man-made and natural thermal sources. The geological formation is naturally hot at the depth of mining, and in addition to this heat, other sources of underground heat and exhaust would be generated by vehicles and mobile equipment (both electric and diesel driven), workshops, warehouses, pump stations, the refrigeration plant, conveyors, the crusher station, and electrical substations. A refrigeration and ventilation system would be constructed at the surface at the East Plant Site to maintain appropriate temperatures in the underground mining operations and protect the health and safety of workers from excessive heat, equipment exhaust, gases, radon, respirable dust, and fibers. At full production, Shafts 11, 12, and 13 would be used as downcast fresh-air intake shafts, while Shafts 9, 10, and 14 would be used as upcast ventilation exhaust shafts, along with the conveyor/infrastructure tunnel exhaust raise. Mine shaft locations are shown in figure 2.2.2-7.

Underground Mine Auxiliary Facilities

Construction of auxiliary facilities within the underground mine workings would support the operations, including the following:

Table 2.2.2-3. Underground mobile equipment

Drilling and Blasting	
	Drilling Jumbos
	Production drills
	Explosives loader unit
Production and Haulage	
	LHD (Load, Haul, Dump Machines)
	LHD generator trucks
	Underground haul trucks
	Railroad locomotives
	Rail bottom dump cars
Secondary breaking fleet	
	Medium reach rigs
	Robust rigs
	Mobile rock breakers
Miscellaneous maintenance and service vehicles	
	Rock and cable bolters
	Shotcrete sprayer and trucks
	Scissor lifts
	Support trucks: fuel/lube, crane, water, shotcrete, Flat Deck, and service
	Graders
	Personnel vans and other vehicles

- Electrical substations, along with transmission and distribution systems, to provide power to the underground facilities and equipment.
- An underground workshop, warehouses, a batch plant, and fuel/tire storage to support mine operations.

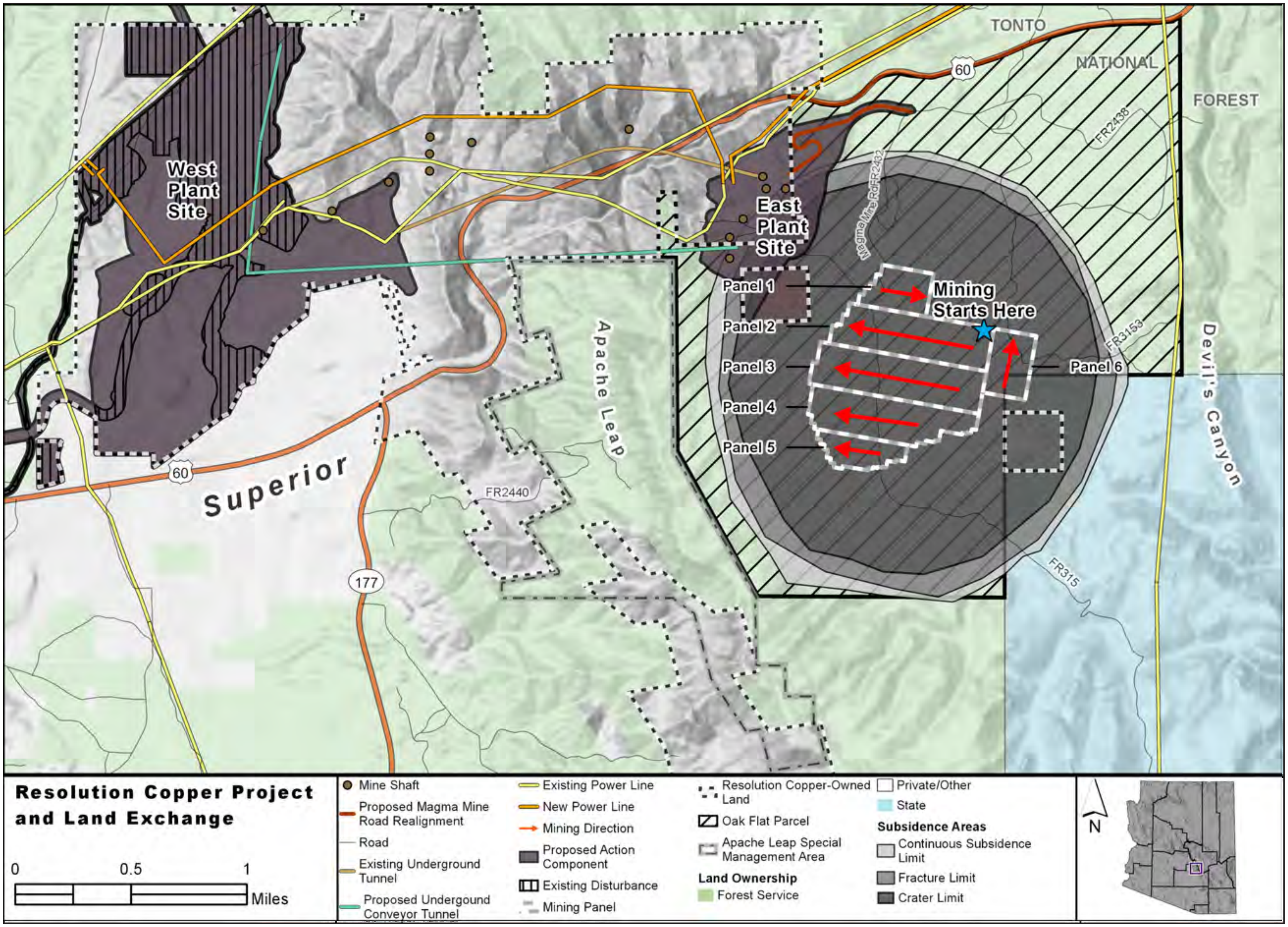


Figure 2.2.2-5. Predicted mining subsidence areas and the East Plant Site area

- Various pump stations, pipelines, and infrastructure necessary for dewatering water from underground mine workings and the transfer of process and cooling water in the mining circuit.

Predicted Subsidence Area

As the panel caving process is repeated, the volume of ore extracted from the underground mine is expected to cause the surface of the Oak Flat Federal Parcel to collapse or subside. The size and depth of the land surface depression is primarily affected by the depth and footprint of the mine.

The analysis of the environmental effects of mining is contained in chapter 3, including a detailed discussion of subsidence. However, the collapse of rock downward is also a fundamental aspect of how the panel caving technique works; therefore, subsidence is described briefly here as part of the proposed action.

Resolution Copper has conducted simulations and modeling to predict the potential area that would subside. The overall subsidence would consist of three areas: (1) the crater limit, (2) the fracture limit, and (3) the continuous subsidence limit. Table 2.2.2-4 identifies the characteristics of each of the three subsidence areas, as well as the acreages of each area that are predicted to occur under the proposed action.

Under the proposed action, mining would not occur within some sections of the 1 percent copper deposit shell nearest Apache Leap to minimize risk of subsidence at Apache Leap. Figure 2.2.2-5 shows a map of the predicted mining subsidence areas, and figure 2.2.2-6 shows a cross section and aerial views of the predicted subsidence areas.

Table 2.2.2-4. Characteristics and acreages of subsidence subareas

Subsidence Subarea	Characteristics	Predicted Acreage of Each Area
Crater limit	Large, visible crater with cave angles of 70 to 78 degrees and with a depth between approximately 800 and 1,115 feet at the end of mine life	1,329
Fracture limit	Visible deformation in a conical form between the surface and cave zone; characterized by rotational failures, tension and dislocation cracks, benching, fractured surfaces, and toppling	250
Subsidence limit	Extremely small rock deformations that can only be detected by high-resolution monitoring equipment (would not be visible in the soil or on the ground)	172
Total Area of Subsidence		**1,751**

Source: Garza-Cruz and Pierce (2017)

East Plant Site

The East Plant Site includes the surface support facilities for underground mining activities, including the access shafts (figure 2.2.2-7). The East Plant Site would expand from its current size of 39 acres to 189 acres. At present, 4 acres of the existing East Plant Site and 144 acres of the proposed East Plant Site are NFS lands; following the land exchange, all of the East Plant Site would be private. The 4 acres of the existing East Plant Site has been previously disturbed. These acreages do not include several other aspects of the East Plant Site, including the underground infrastructure for the panel caving, the mined panels themselves, or the surface subsidence area.

Details of existing East Plant Site facilities, new East Plant Site facilities, and materials used at the East Plant Site are summarized in appendix G.

Ore Conveyor/Infrastructure Corridor

Partially crushed ore from the East Plant Site underground mine operations would be transported to the West Plant Site concentrator complex via an inclined underground to surface conveyor system (see figure 2.2.2-7). The underground conveyance system would

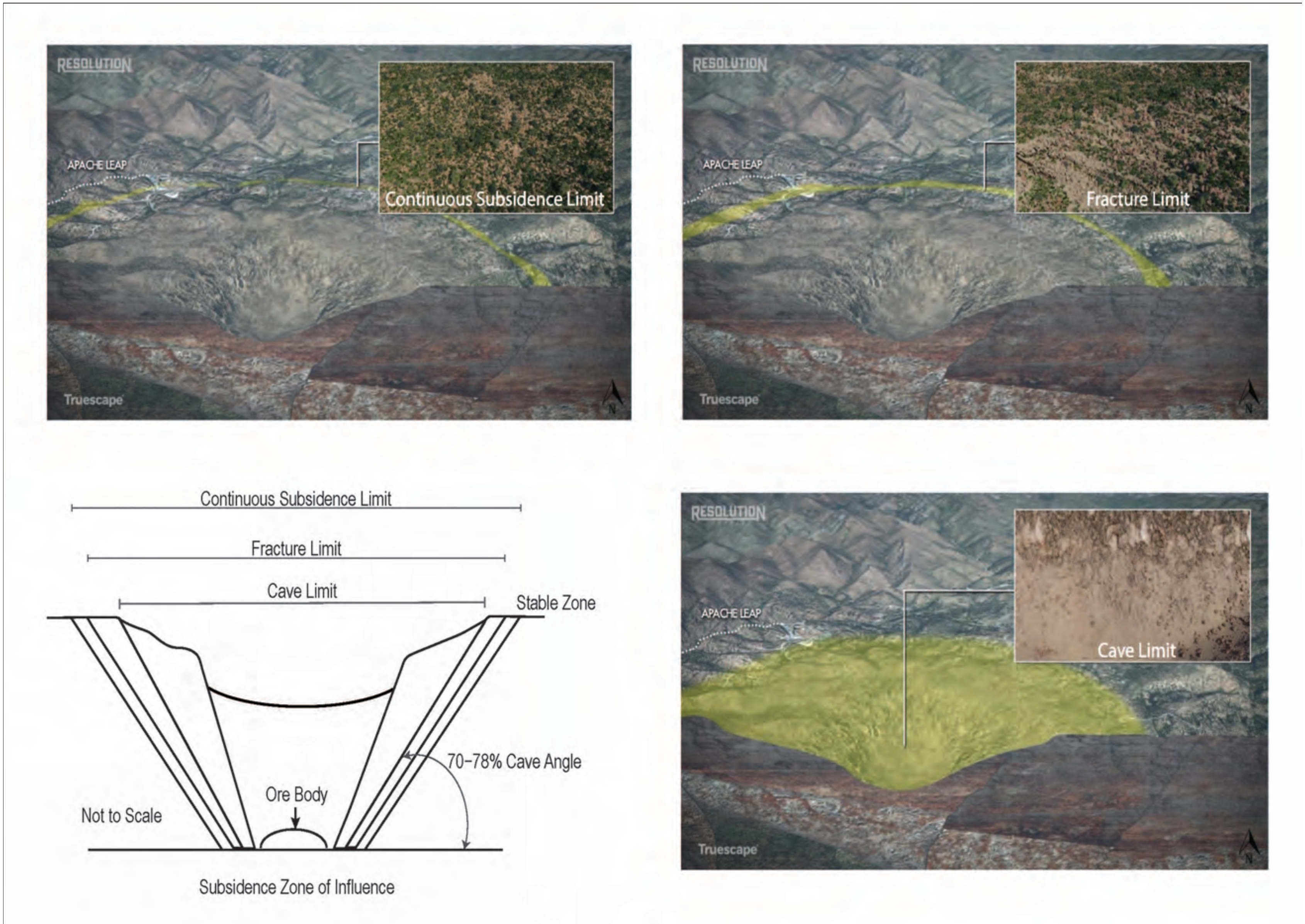


Figure 2.2.2-6. Cross section and aerial photograph simulations of the predicted subsidence areas

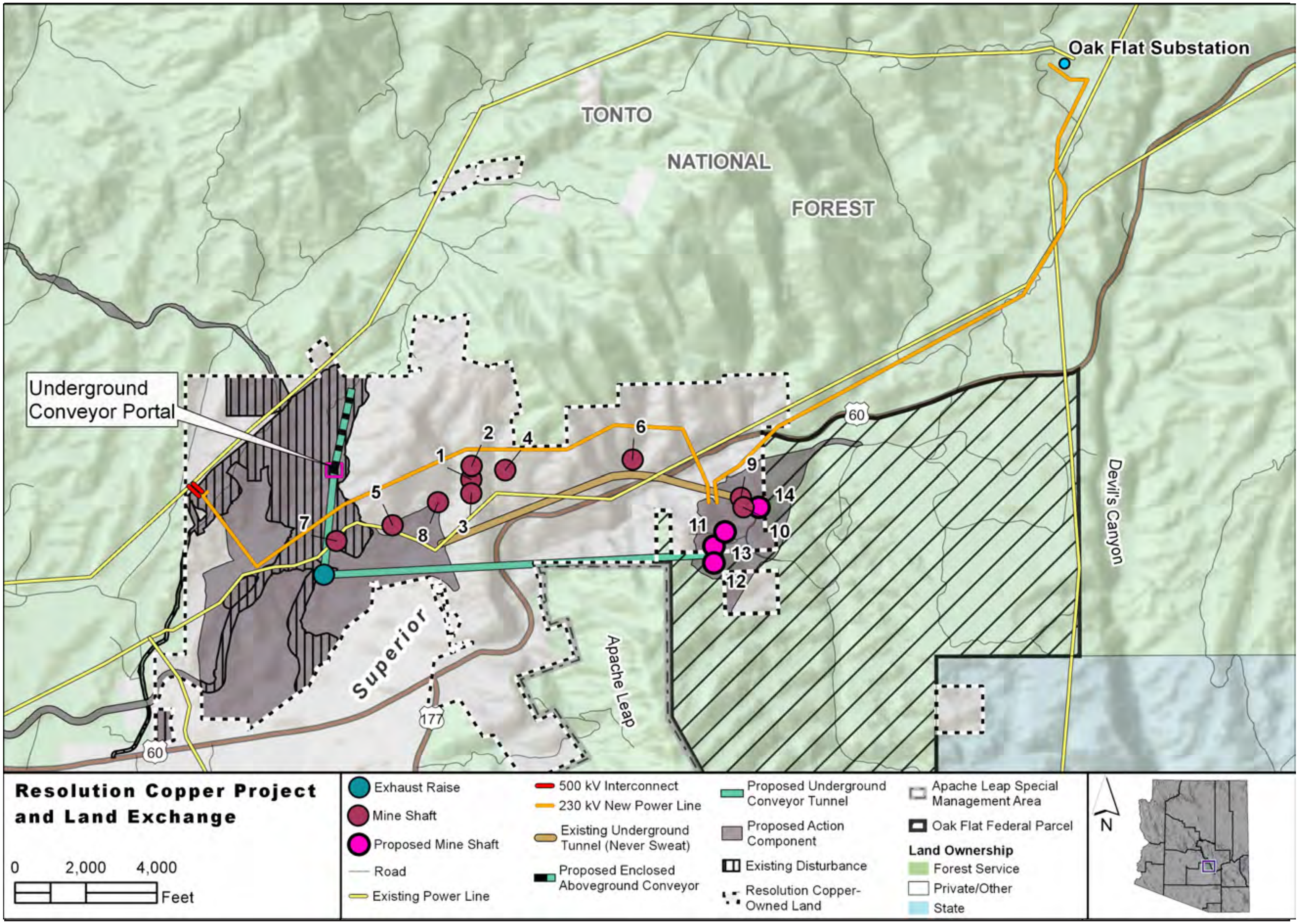


Figure 2.2.2-7. East Plant Site detailed facilities layout

be composed of an underground tunnel with two conveyors that are inclined at approximately 10 degrees for more than 2.5 miles. The alignment of the conveyance system would be under a combination of unpatented mining claims and private lands owned by Resolution Copper. Surface disturbance from the inclined underground to surface conveyor system would be limited generally to the shafts above the conveyor feed at the East Plant Site, an exhaust raise (and ventilation fans) along the conveyor tunnel alignment for ventilation, the tunnel portal at the West Plant Site, and the overland portion of the conveyor at the West Plant Site, all of which would be located on private land owned by Resolution Copper.

West Plant Site

In general, the West Plant Site would be the location where crushed ore material arriving from the East Plant Site would be processed into copper and molybdenum concentrates. The West Plant Site consists of three main facilities: (1) the stockpile, which includes the development rock and intermediate rock stockpiles; (2) the concentrator complex, which includes the process water pond, ore stockpile facility, tailings thickeners, copper molybdenum and copper concentrator thickeners (thickeners), and the molybdenum plant; and (3) the auxiliary facilities, which include the administration building, contractor and warehouse laydown yards, and construction and employee parking (figure 2.2.2-8).

The total footprint of the West Plant Site would be on private lands owned by Resolution Copper; 12 acres of the site are currently disturbed. The GPO had described a process pond on NFS land north of the West Plant Site, but it was determined that moving the process pond onto Resolution Copper private property directly to the west of the current West Plant Site would reduce impacts on NFS resources (see section 2.2.8.1 and figure 2.2.8-1).

Access to the West Plant Site would be via Silver King Mine Road (NFS Road 229), which is on both private and NFS lands. Portions of NFS Road 229 across private land would be reconstructed to Mine Safety and Health Administration (MSHA) specifications and maintained by Resolution Copper. This road would be used as an alternate road to transport mine personnel, equipment, supplies, and molybdenum and other mine products, to and/or from the West Plant Site. The alignment would generally follow the existing Silver King Mine Road with changes at drainage crossings and tight corners (see figure 2.2.2-8). Public access on NFS Road 229 would be controlled at a security gate where the road crosses private land. Alternative public access to areas north of the West Plant Site can occur on NFS Road 8 and NFS Road 3152 that would reconnect to NFS Road 229 north of the private land.

Details of existing West Plant Site facilities, proposed new West Plant Site facilities, and materials used at the West Plant Site are summarized in appendix G and shown in figure 2.2.2-9.

Tailings Storage Facility and Tailings Pipeline Corridor

Approximately 1.37 billion tons of tailings produced by the mining operation would need to be stored in perpetuity. The tailings corridors have been designed to follow existing roads or disturbance where possible. The proposed action and all alternatives would transport tailings within a corridor that would include multiple pipelines, an access road, and power and communication lines.

All action alternatives handle tailings in separate split streams based on the ore processing at the West Plant Site. PAG and NPAG tailings are transported in separate pipelines as they are split during the ore processing. The pipelines are designed for optimum performance during each mine phase to match flow characteristics of materials and velocity and vary between 10-inch, 22-inch, or 34-inch diameter. Recycled water would be transported back to the West Plant Site from the tailings storage facility via a 16-inch pipeline. The solids content of the tailings streams varies between alternatives; see figure 2.2.2-10 for ranges of tailings types at deposition.

The tailings conveyance corridors used to transport the tailings to the facility and reclaimed water back to the West Plant Site are designed with similar pipeline dimensions. Pipeline installation, spill containment necessary based on pipeline installation method, and access and bypass

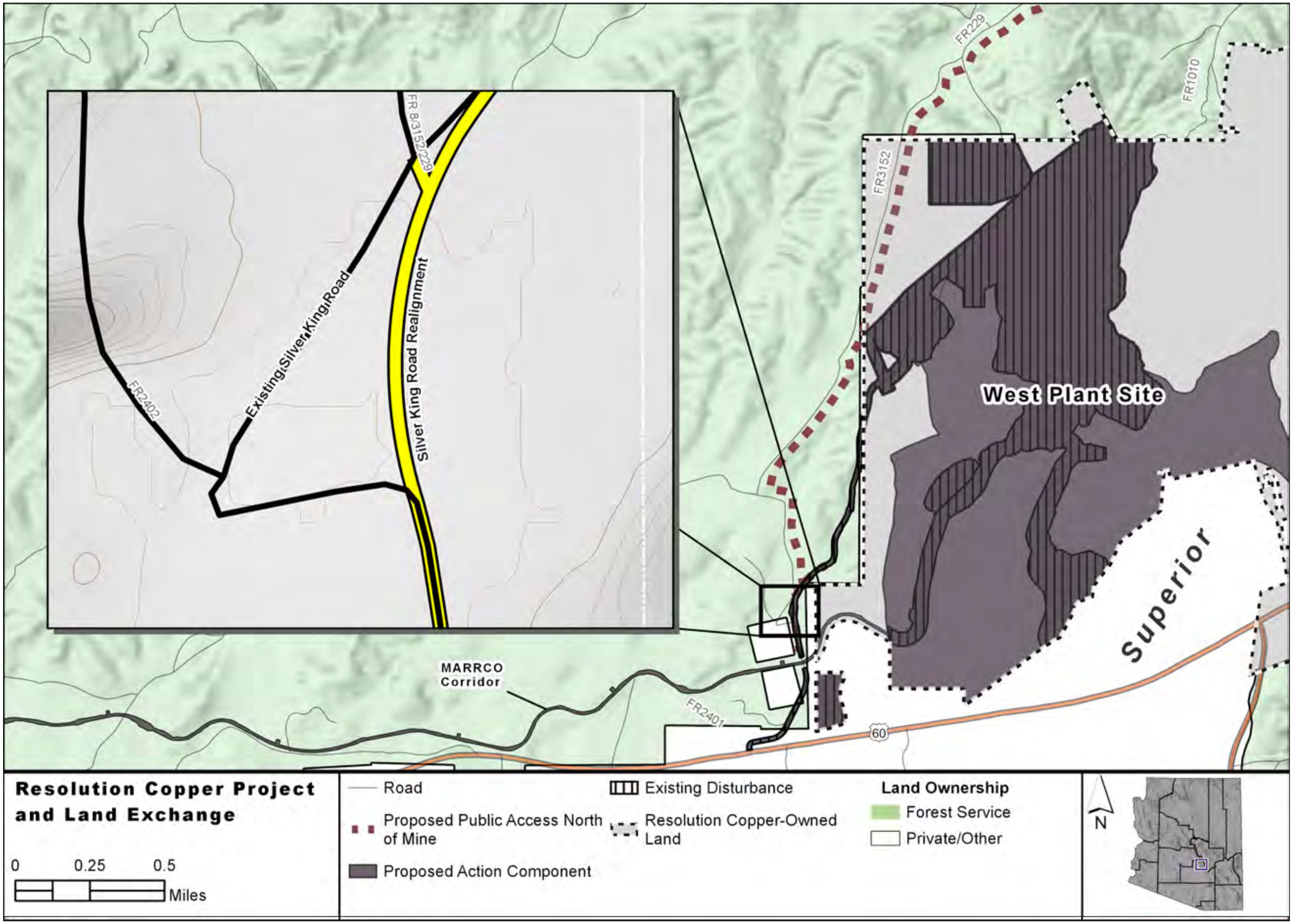


Figure 2.2.2-8. Redesign and/or improvement of vehicle access to and from the West Plant Site

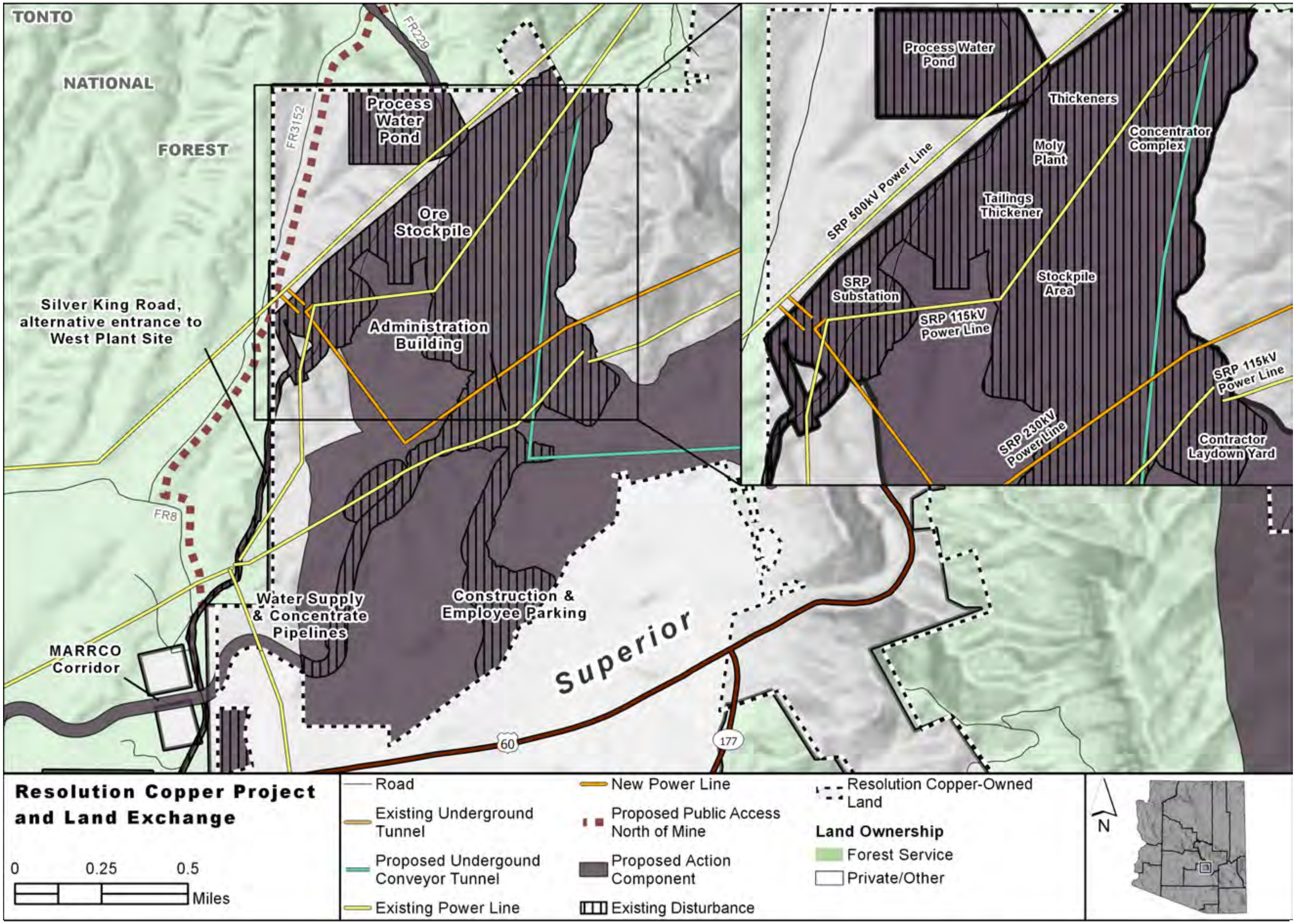


Figure 2.2.2-9. West Plant Site facilities overview

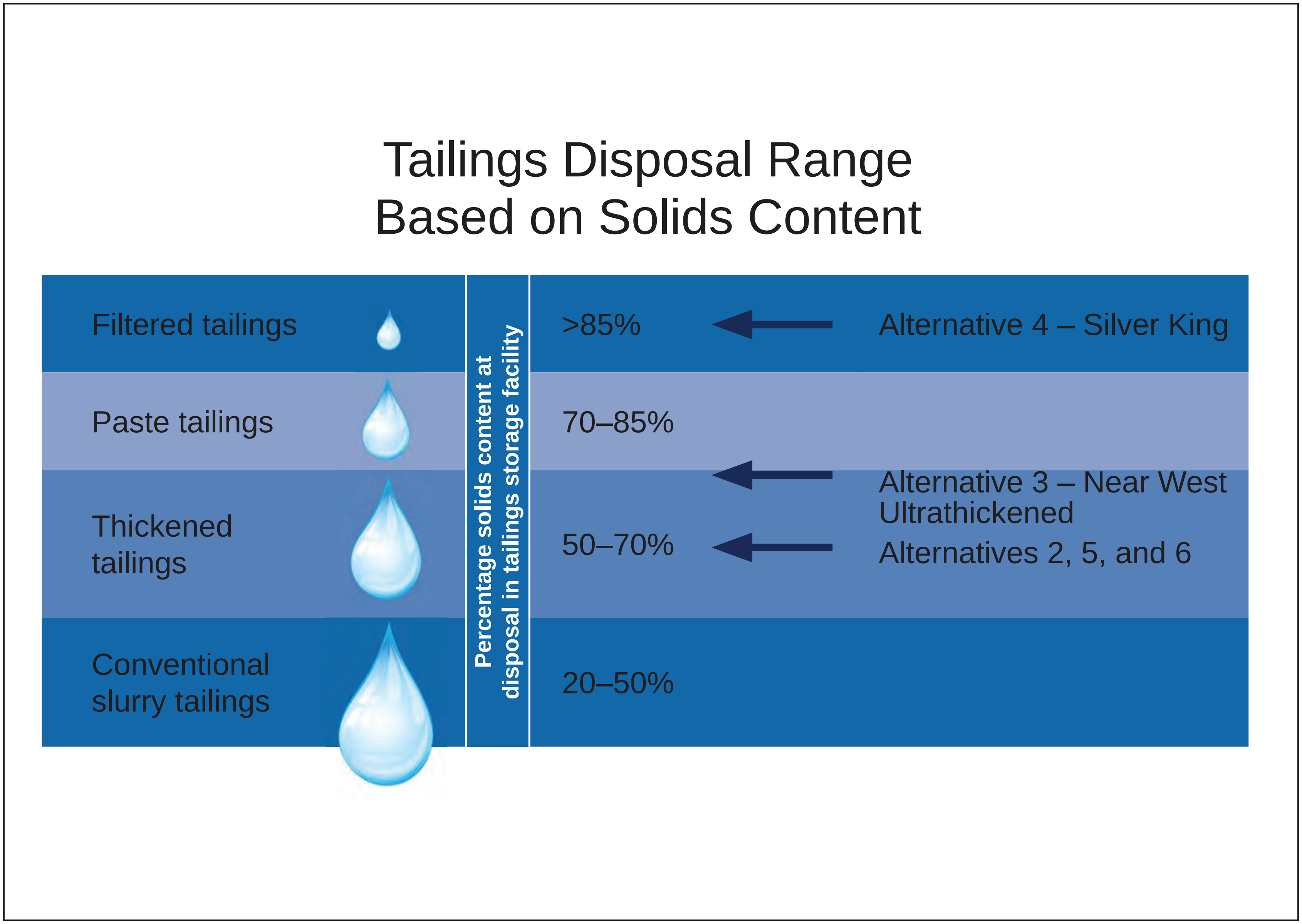


Figure 2.2.2-10. Range of tailings types based on solids content

roads necessary would vary by topography and alternative routing option selected. The pipeline design could include buried, overland secured, horizontal directional drilling (HDD) or micro-tunneling, surface run, cable-stayed bridge or through-truss bridge layouts. The installation designs would vary based on topography throughout each corridor segment and general design configurations are shown in figure 2.2.2-11.

The tailings conveyance corridor averages 110 to 230 feet wide, with the majority of the pipeline buried. In very steep sections of terrain, the corridor could be as wide as 1,000 feet. The pipeline would be equipped with a leak detection system and a modern control system permitting operation of the entire pipeline from a central control room. An access road that followed the pipelines would be used for construction, and maintenance during operations. Where necessary based on topography, other techniques could be used for pipeline construction, such as secured at the surface on overland secured placement, or through HDD or micro-tunneling at water crossings or through high mountain peaks. The pipeline can also span canyons, roadways, or trails such as the Arizona National Scenic Trail with cable-stayed or through-truss bridges. Booster pumps are required if unable to gravity-feed to the tailings storage facility; if necessary for design, the booster pumps would be located at the West Plant Site.

MARRCO corridor

The 30-mile-long MARRCO corridor is a railroad and utility corridor running roughly east-west from Superior to Magma Junction. Hewitt Canyon Road (NFS Road 357) provides access to the MARRCO corridor, which crosses private lands as well as lands administered by the Tonto National Forest and ASLD (figures 2.2.2-12 and 2.2.2-13). Resolution Copper currently owns the MARRCO corridor right-of-way. The corridor generally is 200 feet wide and private parcels along the MARRCO corridor have been developed, particularly east of Queen Station and near Magma Junction. The corridor currently contains multiple utility lines and water pipelines and infrastructure. The existing infrastructure within the corridor includes the following: a buried fiber-optic line, an overhead transmission line and telephone line, buried natural gas pipelines, Arizona Water Supply pipelines and infrastructure providing water supply to the Town of Superior, and an 18-inch dewatering line transporting water being dewatered from the East Plant Site to the New Magma Irrigation and Drainage District (NMIDD). New corridor facilities would include additional water pipelines, water pumps and recovery wells, and copper concentrate pipelines to transport ore concentrate to the filter plant and loadout facility.

Details of existing and new MARRCO corridor facilities are summarized in Appendix G, Further Details of East Plant Site, West Plant Site, MARRCO Corridor, and Filter Plant and Loadout Facility Infrastructure.

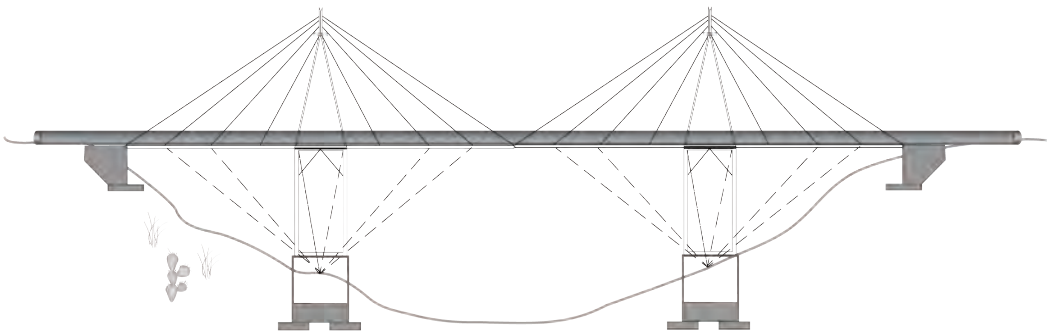
Filter Plant and Loadout Facility

A pipeline within the MARRCO corridor would transport copper concentrate slurry from the concentrator complex at the West Plant Site to the filter plant and loadout facility. The filter plant's primary function would be to filter the copper concentrate to a state that is ready for transportation. The loadout facility's primary function would be to remove water from the copper concentrate to prepare the concentrate for delivery to an off-site smelter and recycle water to be reused in the concentrator. The filter plant and loadout facility would be located on 553 acres of private lands controlled by Resolution Copper near San Tan Valley, Arizona (see figure 2.2.2-14).

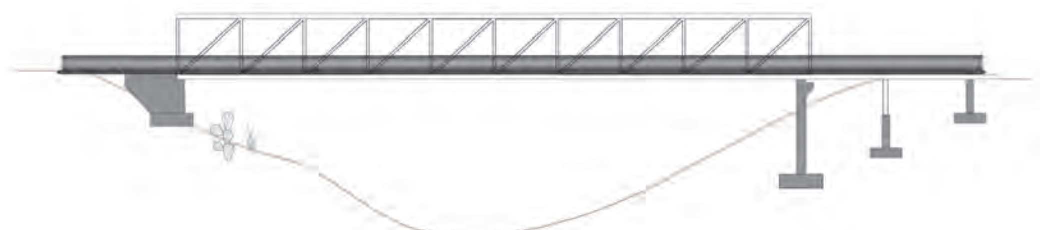
Carbon Steel Pipe Specifications and Use during Mine Life

Year of Operation	10-in. Diameter 0.375-in. Wall	22-in. Diameter 0.375-in. Wall 0.5-in. HDPE* liner	34-in. Diameter 1.25-in. Wall	16-in. Diameter 0.375-in. Wall
1–5 (ramp-up)	PAG	NPAG	–	Reclaim water
6 (ramp up)	PAG	–	NPAG	Reclaim water
7–41 (steady state)	–	PAG	NPAG	Reclaim water

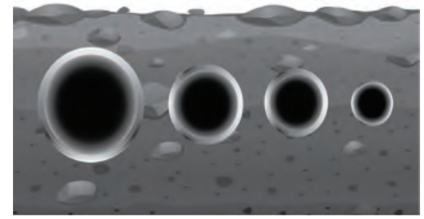
* HDPE:



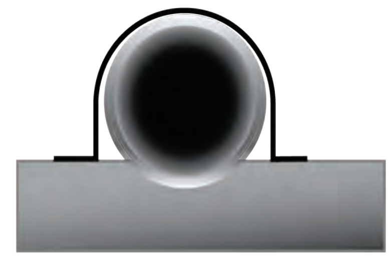
General arrangement of cable-stayed bridge – used for spanning canyons



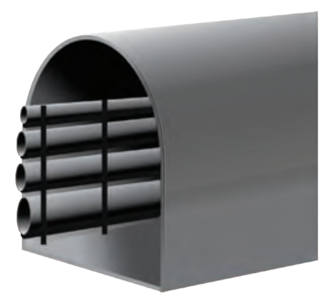
General arrangement of a through-truss bridge – used for spanning smaller channels



General arrangement of buried pipelines



Overland secured pipelines where construction is difficult due to bedrock



Horizontal directional drilling and/or micro tunneling will be used to undercut roads, waterways, or for high-point mountain passes

Figure 2.2.2-11. Graphical display of pipeline arrangements used in tailings conveyance corridor design

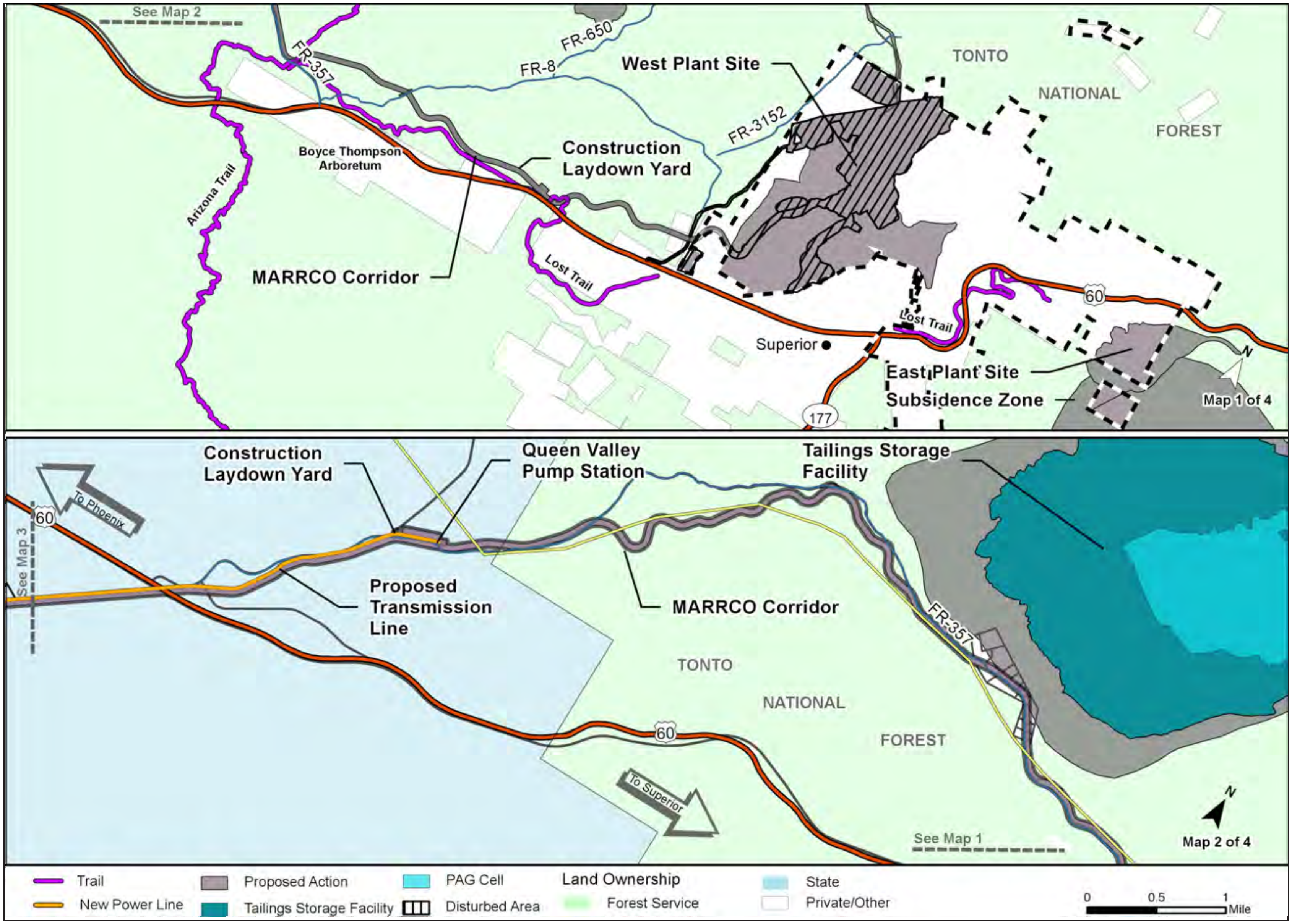


Figure 2.2.2-12. MARRCO corridor facility layout (1 of 2)

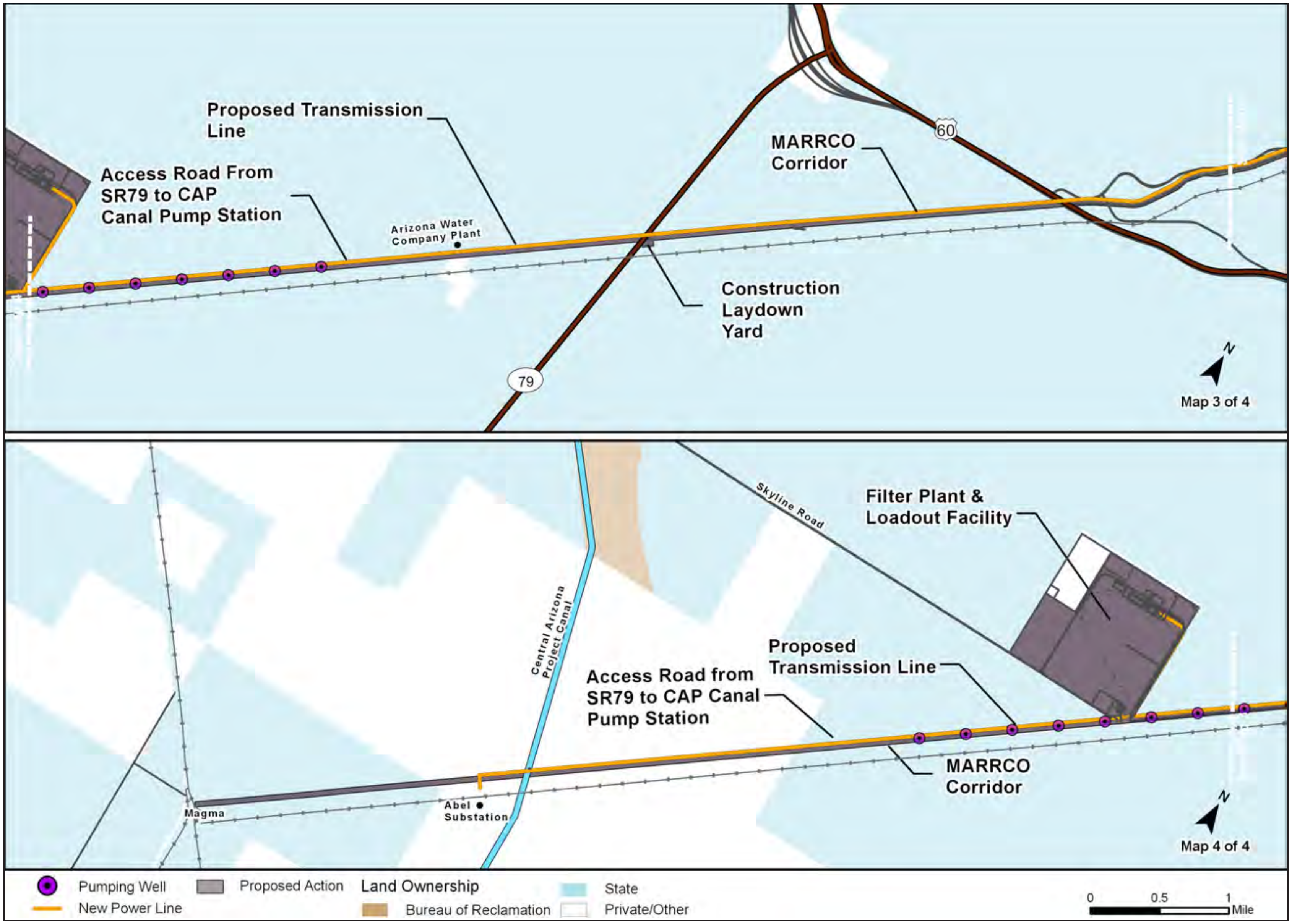


Figure 2.2.2-13. MARRCO corridor facility layout (2 of 2)

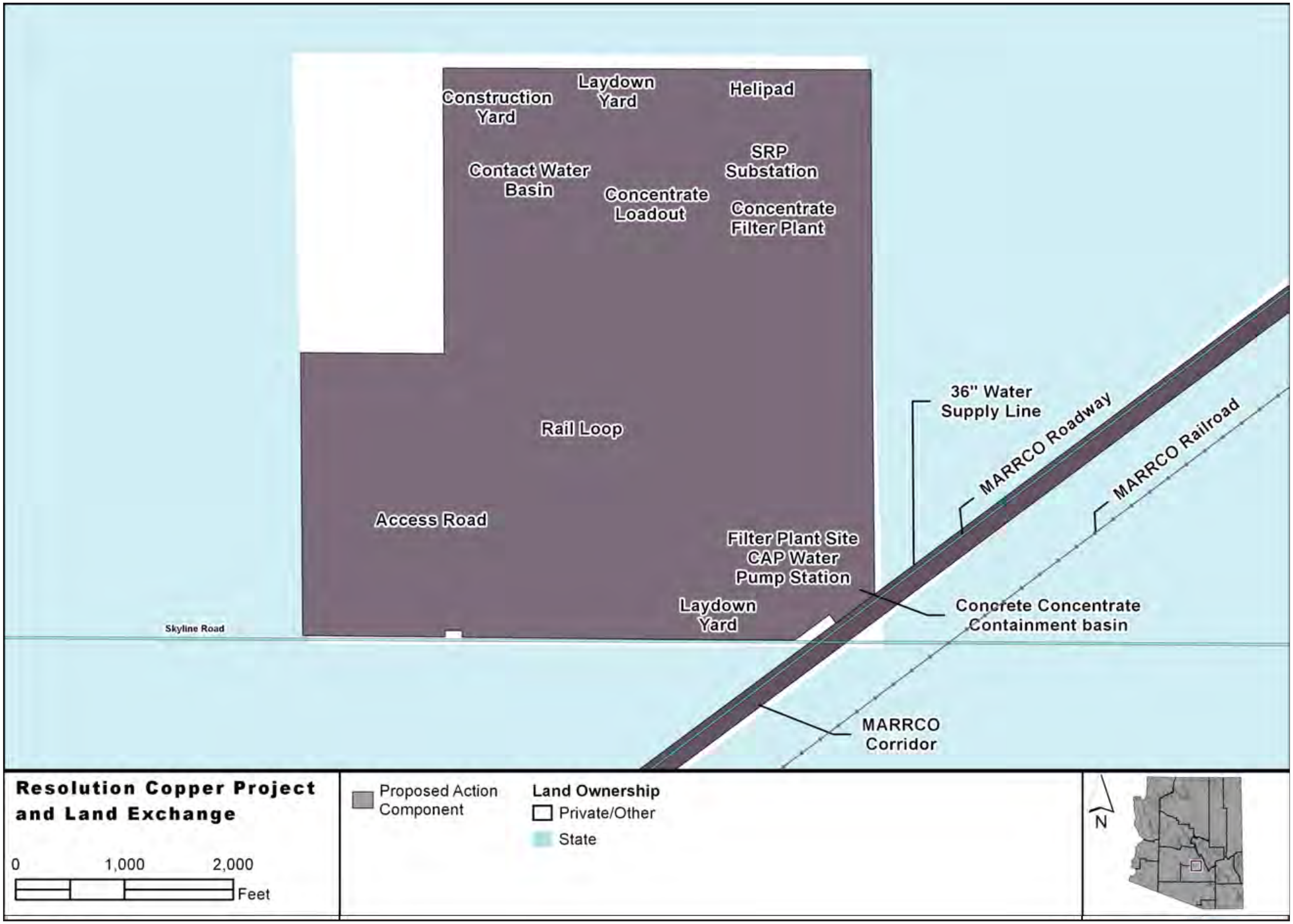


Figure 2.2.2-14. Filter plant and loadout facility detailed layout

Further details of East Plant Site, West Plant Site, MARRCO corridor, and filter plant and loadout facility infrastructure are summarized in appendix G.

Operations Processes and Activities

TRANSPORTATION

Each mine facility would have distinct access routes and traffic volumes during the construction, operations, and reclamation and closure phases. For detailed calculations of predicted traffic volumes that would be generated by the mine, including employee traffic, see the “Transportation and Access” resource section in chapter 3. Table 2.2.2-5 summarizes the access roads that would be used for each of the four main facilities and the materials and equipment deliveries that would occur during the construction and operation phases.

ELECTRICITY SUPPLY AND TRANSMISSION LINES

Electricity is currently supplied to the East Plant Site by an existing 115-kilovolt (kV) SRP transmission line and to the West Plant Site by an existing 500-kV SRP transmission line to existing facility substations. Construction and operation of the proposed mine would require electrical transmission lines between these main facilities to accommodate greater power needs, as well as new transmission lines to power the new tailings storage facility, new filter plant, and loadout facility. Substations also would need to be upgraded and/or new 230-kV substations would need to be constructed to accommodate electricity from the upgraded lines and distribute the electricity throughout the site (see East Plant Site, West Plant Site, tailings storage facilities, and filter plant and loadout facilities descriptions earlier in this chapter for upgraded/new substation descriptions).

Power use by the mine has been estimated (Garrett 2019b) Power use ramps up over time and varies slightly by tailings alternative, but during full operations is estimated to be approximately 250 to 280 megawatts. The primary electricity consumers at the mine site would be as follows:

1. The hoist motors at the East Plant Site that raise the ore out of the mine (roughly 20 to 25 percent of total power use), and underground ore flow (roughly 10 to 15 percent of total power use).
2. The ventilation and cooling systems at the East Plant Site for the underground mine (roughly 10 to 15 percent of total power use).
3. The operation of the grinding and flotation machinery at the concentrator complex at the West Plant Site (roughly 40 to 50 percent of total power use).
4. For Alternatives 5 and 6, pumping of tailings to the tailings storage facility (roughly 5 to 10 percent of total power use). Note that Alternatives 2 and 3 use gravity flow to deliver the tailings to the tailings storage facility, and do not require substantial power for tailings pumping.
5. For Alternative 4, filtering of tailings prior to placement (roughly 5 to 10 percent of total power use).

SRP would provide all electricity used at the mine facilities through the upgraded and new transmission lines. Figure 2.2.2-15 shows the proposed upgraded and new SRP transmission lines that would supply the main facilities with electricity. The Tonto National Forest would use analysis in this EIS to approve any rights-of-way and special use permits needed to construct the upgraded and new power lines.

Easements for the transmission lines would vary between 50 and 100 feet, depending on the size of the line and the requirements for construction, maintenance, and electrical clearances. Transmission lines would be either lattice steel towers or tubular steel poles. The foundations for the transmission line structures would be auger-drilled reinforced concrete piers. A lattice tower typically has four legs, each attached to a concrete foundation set into the ground. Steel pole structure footings are typically composed of a steel-reinforced concrete foundation referred to as an “anchor-bolt foundation,” onto which the steel pole is bolted.

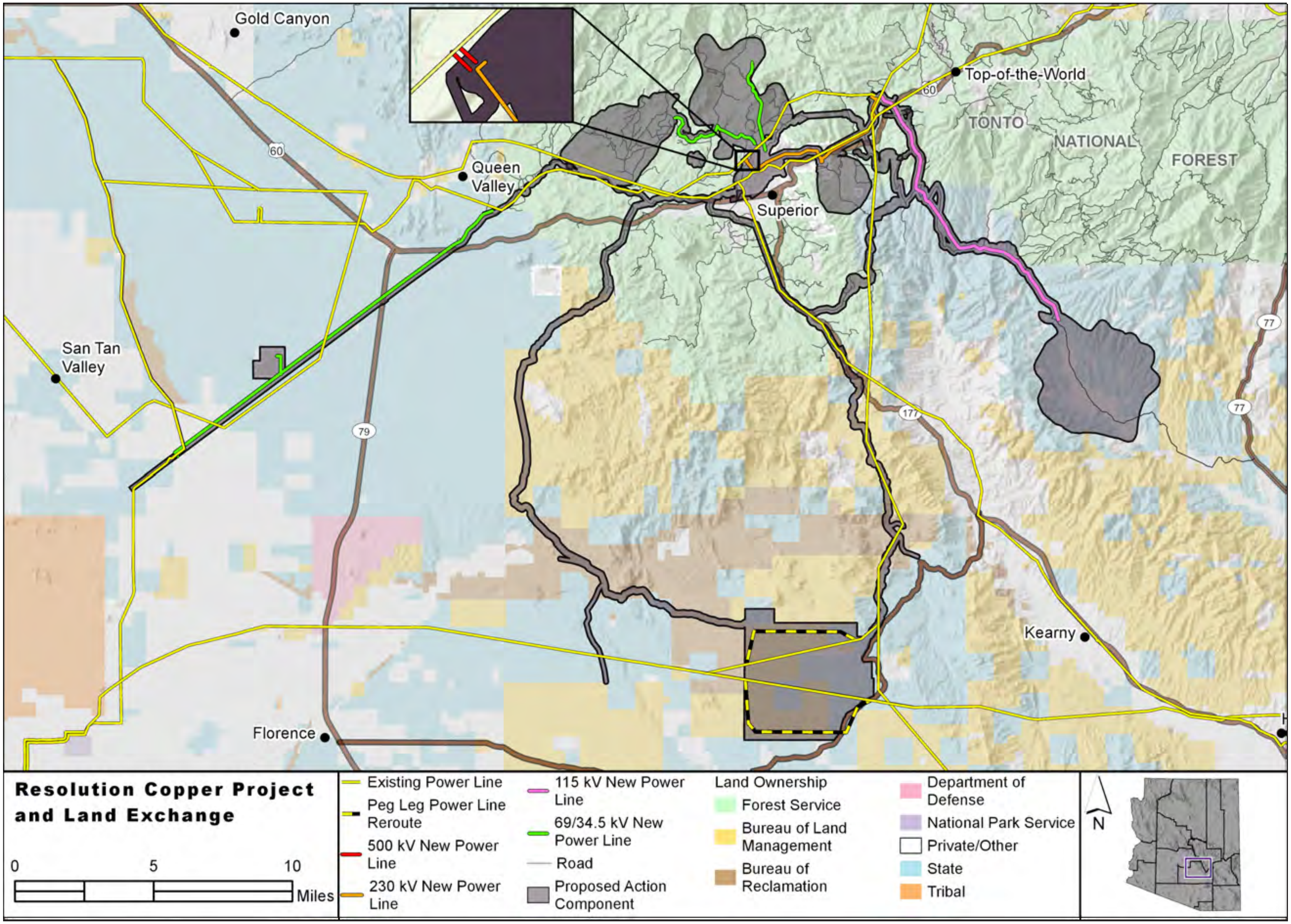


Figure 2.2.2-15. Proposed new and upgraded transmission lines

Table 2.2.2-5. Existing and proposed mine access roads and traffic

Facility	Access Routes	Construction Phase Materials and Equipment Traffic	Operation Phase Materials and Equipment Traffic	Closure and Post-closure Materials and Equipment Traffic
East Plant Site	Magma Mine Road from U.S. Route 60 (U.S. 60)	Materials deliveries would consist of fuel, underground concrete, underground production consumables, construction steel, other construction materials, and construction concrete. Major process equipment would be delivered over a 4-year period during the construction phase and would consist of crushers, conveyors, rail dump station, locomotives and railcars, ventilation equipment, hoisting equipment, dewatering equipment, and batch plants.	Materials deliveries would consist of fuel, underground concrete, and underground production consumables.	Salvageable equipment, unused chemical reagents, instrumentation, or other salvageable materials would be removed from site. Structures and other facilities would be demolished and/or dismantled and removed from site. Any contamination would be disposed of as appropriate. Replacement of growth media for revegetation would be delivered if not enough found within the footprint or stockpile.
West Plant Site	Main entrance: Rerouted Silver King Mine Road (NFS Road 229) from U.S. 60 Existing entrance: Magma Avenue from U.S. 60	Materials deliveries would consist of concrete, rebar, structural steel, handrails/stairs, prefabricated buildings, chutes/launders, tanks, pipe, electrical equipment, overhead transmission line, semi-autogenous grinding mills, ball mills, and flotation cells. These shipments would occur during a 3-year period within the construction phase.	Materials deliveries would consist of semi-autogenous mill balls, ball mill balls, regrind mill balls, lime, sodium hydrosulfide, and miscellaneous reagents. Molybdenum concentrate shipments would leave the site daily from the concentrator complex.	Same as East Plant Site
Tailings storage facility	From U.S. 60 at three locations: service road adjacent to tailings pipeline corridors, Hewitt Canyon Road (NFS Road 357), and NFS Road 8	Materials and equipment deliveries would consist of pipe, valves, concrete, asphalt, and structural steel. These shipments would occur during a 3-year period within the construction phase.	Material deliveries would primarily consist of equipment and replacement equipment to operate spigots, recycle barges and pumps, and seepage collection systems.	Same as East Plant Site
Filter plant and loadout facility	East Skyline Road; rail via MARRCO corridor	Materials and equipment deliveries would consist of pipe, valves, concrete, asphalt, and structural steel. These shipments would occur during a 3-year period within the construction phase.	Filtered copper concentrate would be loaded and shipped 7 miles along the MARRCO corridor by rail car to Magma Junction where the rail line meets the Union Pacific Railroad. Final smelter destination is unknown at this time.	Same as East Plant Site

Table 2.2.2-6. Proposed new and upgraded transmission line summary

Facility	Transmission Line Route	New Alignment or Upgrade	Approximate Distance
East Plant Site	230-kV line from Silver King substation to Oak Flat substation	Upgrade	3.6 miles
West Plant Site	230-kV line from West Plant Site substation to Oak Flat substation	New	3.5 miles
West Plant Site	Double-circuit 230-kV connection from West Plant Site substation to the existing 500-kV and 230-kV lines at the West Plant Site	New	0.5 mile
West Plant Site	500-kV line to West Plant Site substation	No change	N/A
Tailings storage facility	35-kV line from West Plant Site substation to tailings substation	New	5.6 miles
Filter plant and loadout facility	Two 69-kV power lines and one 12-kV power line from Abel substation (near CAP canal crossing of MARRCO corridor)	New (adjacent to MARRCO corridor)	4.7 miles

Table 2.2.2-6 identifies the main transmission lines that would provide power to each mining facility.

Wherever possible, existing roads would be used to construct the transmission facilities. In some areas, access roads would be cleared on an as-required basis to ensure adequate access for construction and maintenance activities. Staging areas immediately surrounding line structures would be necessary, depending on specific site access. Permanent access roads would be constructed along the transmission line alignments that are located in drivable terrain.

WATER USE

Recycling and reuse happen extensively throughout the mine operations, but there are generally three major external sources of water: dewatering from the East Plant Site, direct use of CAP water, and recovery of banked CAP water and/or groundwater from wells located along the MARRCO corridor.

The estimated total quantity of external water needed for the life of the mine (construction through closure and reclamation) varies between alternatives. Resolution Copper proposes to use water either directly from the CAP canal or through wells along the MARRCO corridor in the East Salt River Valley. The water pumped is either considered banked CAP water, or water authorized by the State of Arizona to be pumped under a mineral extraction withdrawal permit, or a Type II non-irrigation grandfathered right. Regardless of the authority for obtaining the water, the water is pumped from the same wells. Currently, Resolution Copper has acquired approximately 313,000 acre-feet of renewable long-term storage credits within the Phoenix and Pinal Active Management Areas (AMAs). These include credits for CAP water banked at the NMIDD, Hohokam Irrigation Drainage District, and Roosevelt Water Conservation District groundwater savings facilities, credits for CAP water directly recharged at the Tonopah Desert Recharge Project, and purchase of renewable long-term storage credits from the Gila River Water Storage LLC. Resolution Copper has also applied for an additional 2,238 acre-feet per year allocation of CAP Non-Indian Agricultural water from the U.S. Department of the Interior Bureau of Reclamation; this application is not yet approved.

Figure 2.2.2-16 shows the general water supply and water use for each of the main facilities during operations of Alternative 2 – Near West Proposed Action. The water balance for the various mine facilities is complicated and varies by alternative. Further detail is included in Appendix H, Further Details of Mine Water Balance and Use.

In order to construct mine infrastructure, Resolution Copper currently removes groundwater from sumps in Shafts 9 and 10, effectively dewatering the deep groundwater system (the bottom of Shaft #10 is

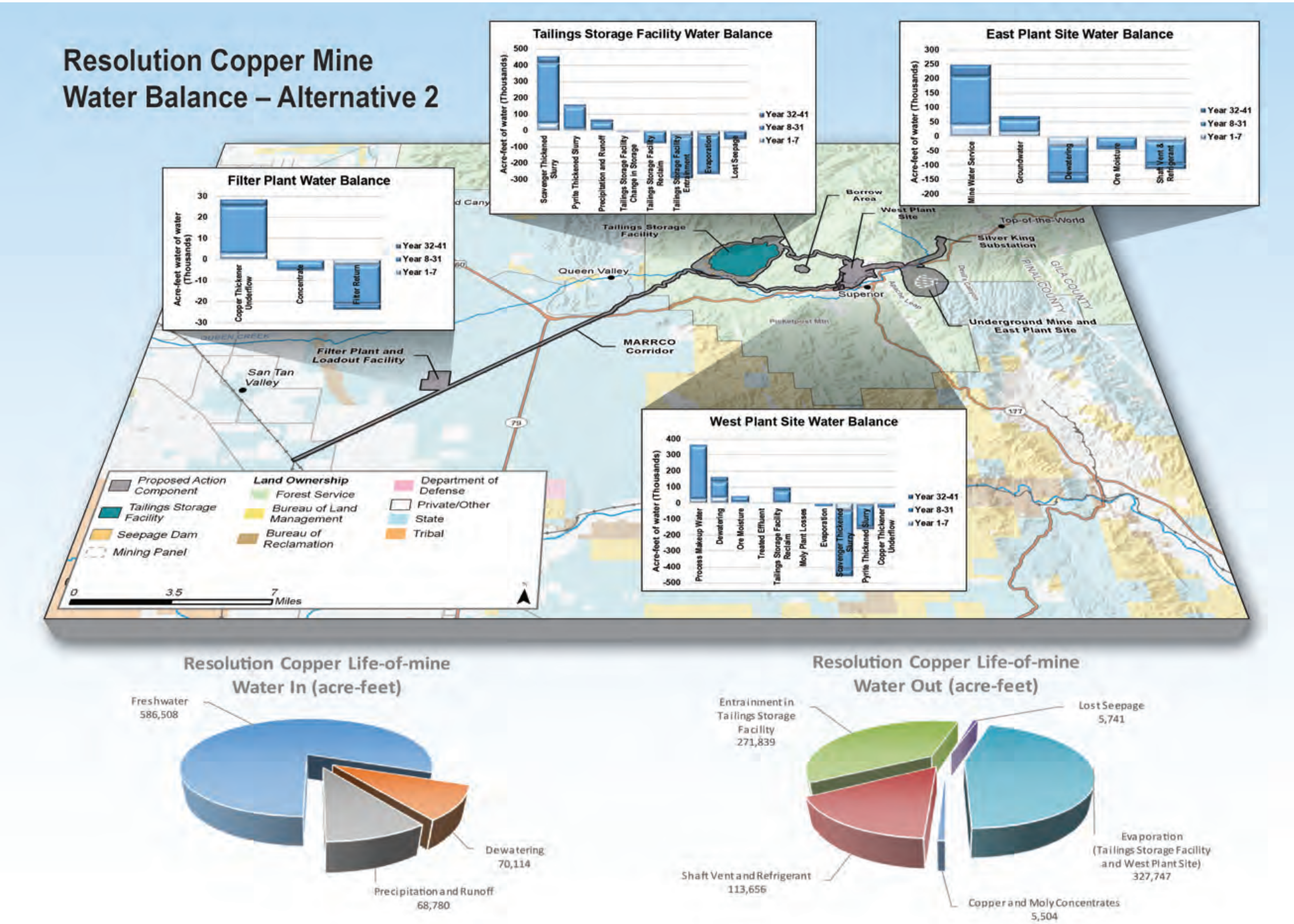


Figure 2.2.2-16. Alternative 2 – Near West Proposed Action water supply and water use diagram

about 7,000 feet below ground level). This dewatering started in 2009 and would continue throughout the mine life. When the mining begins, the block-cave zone would propagate toward the surface and effectively allow the effects of this dewatering to extend to more shallow aquifers as well.

SANITARY AND SOLID WASTE MANAGEMENT

New wastewater treatment plants would be constructed at both the East Plant Site and West Plant Site. Effluent from the East Plant Site wastewater treatment plant would be combined with the mine dewatering system, which would be delivered to the concentrator supply water pipeline for use in the concentrator.

Wastewater from the filter plant and loadout facility would be routed to an on-site septic tank and leach field. Septic solids would be removed and disposed of off-site as needed and in accordance with State laws.

Non-hazardous solid waste and special wastes (e.g., petroleum-contaminated soils) generated by any activities at the mine facilities would be disposed of in a manner consistent with applicable local, State, and Federal regulations. Resolution Copper drafted an environmental materials management plan that identifies the disposal method for each anticipated waste (Resolution Copper 2016b). Recycling programs currently used at the East Plant Site and West Plant Site would continue in an effort to reduce waste.

Waste is currently being disposed of and would continue to be disposed of in the following ways:

- Asbestos- and petroleum-contaminated soils waste streams would be managed in accordance with waste-handling protocols and disposed of at an approved waste facility.
- All trash and garbage would be hauled to State-approved landfills. Trash and garbage would be collected on-site in containers before being removed for disposal at permitted landfills. No open burning of garbage and refuse would occur at the project site.
- Wood and inert wastes such as concrete would be buried on-site as part of final closure and reclamation in selected areas in accordance with applicable county, State, and Federal regulations.

Closure and Reclamation

The closure and reclamation phase would occur after the 40-year operations phase and would have a duration of approximately 5 to 10 years.[16] A specific time frame for the closure and reclamation phase would not be known until after a final GPO is submitted to the Tonto National Forest and approved. The GPO describes the preliminary closure and reclamation plans that would occur at each of the main facilities and the linear features that connect them, as summarized in this section and within the GPO. The primary goals of reclamation are to

- stabilize areas of surface disturbance;
- prepare those areas for a post-mining land use that is compatible with surrounding uses; and
- ensure long-term protection of the surrounding land, water, and air resources

General Reclamation Procedures and Schedule

Although closure and reclamation would be a distinct phase after the operations phase during which the majority of the reclamation efforts would occur, the proposed action would employ three schedules of

16. Note that the time required for reclamation is heavily dependent on the methods used to construct and manage the tailings storage facility, and therefore reclamation timing varies substantially between alternatives.

reclamation throughout the life of the mine: interim, concurrent, and final reclamation.

INTERIM RECLAMATION

Interim reclamation would be completed on disturbed areas that are not needed, at the time, for active operations. The three main periods of interim reclamation are as follows: after construction, following startup, and during operations. The principal focus of interim reclamation would be to reduce erosion and sedimentation. Interim reclamation would include activities like the reclamation of road or pad cuts and fills and tailings surfaces (e.g., temporary covers, vegetation, or polymers to control wind and water erosion, thus limiting dust). Interim reclamation would allow temporary stabilization of certain sites, such as the tailings storage facilities during operations, for temporary dust control.

Other areas that would be subject to interim reclamation would include construction laydown areas, growth media stockpiles, development rock stockpiles designated for processing through the concentrator, and development rock stockpiles salvaged for beneficial use. Areas would also include access roads used for construction but no longer needed during operations. Additionally, the slope of the tailings storage facility might receive temporary reclamation for dust control measures in advance of concurrent reclamation.

Interim shutdown would include the suspension of mining, production, or other operations, or placing the facility into standby status. Interim shutdown is not anticipated based on the mining method used with all alternatives analyzed in the DEIS. It is unlikely Resolution Copper would have to suspend operations for purely economic reasons during the 10-year ramp-up period or the following 20 years of full production, since the project incurs most capital costs prior to mining and during construction and ramp-up of operations. If interim shutdown were to occur, personnel and processes to ensure compliance with permits and regulations, along with protecting infrastructure, would continue.

In the event of a shutdown, the following activities would still occur:

- Measures to stabilize excavations and workings with inspections and maintenance,
- Measures to maintain the general project area in a safe condition in compliance with MSHA safety regulations,
- Measures to manage regulated materials (hazardous materials) in accordance with applicable requirements,
- Measures to maintain access and utilities would continue to function, and
- Plans for managing water systems and maintaining facilities as required by the Stormwater Pollution Prevention Plan (SWPPP), Aquifer Protection Permit (APP), and Arizona Pollutant Discharge Elimination System (AZPDES). Dewatering and treatment of water from the mine infrastructure would continue, and the water would be discharged.

CONCURRENT RECLAMATION

Reclamation completed during operations is termed concurrent reclamation. Concurrent reclamation differs from interim reclamation in that this reclamation is designed to provide permanent achievement of reclamation goals and performance standards. Resolution Copper would implement concurrent reclamation of the outer slopes of the tailings storage facility, where practicable, as the operation progresses.

FINAL RECLAMATION

Final reclamation efforts would occur for a duration of 5 to 10 years after the operations phase. The general steps to be used in reclaiming disturbed areas at the mine are

- decommissioning facilities,
- removing and/or closing structures and facilities,
- recontouring and regrading,

- replacing growth media (i.e., store and release cover design for tailings), and
- seeding and/or direct seedling plantings where appropriate.

The final reclamation efforts that would occur at each of the main facilities are described in the following text.

EAST PLANT SITE CLOSURE AND RECLAMATION

Reclamation at the East Plant Site would consist of salvaging and demolishing all buildings, except for the headframes and hoists, which would be used for post-closure groundwater monitoring. All salvageable and non-salvageable materials would be disposed of off-site. All disturbed surfaces except those needed for long-term monitoring, including paved and graveled areas, would be regraded and reseeded with appropriate local seed mixes. Contact water basins would be closed in accordance with APP requirements. Shaft collars and subcollars would be permanently sealed by an engineered seal.

Reclamation activities would not occur within the subsidence area. There would be a berm and/or fence constructed around the perimeter of the continuous subsidence area. To the extent practicable, surface water diversions would be constructed to divert stormwater away from the subsidence area and into natural drainages.

During operations, the potential for adverse water quality in the panel caving area involves many factors, due to the potential exposure of mine rock to both oxygen and water; water quality concerns during operations are explored in section 3.7.2. After completion of mining, the underground panel caving area would not be expected to be a continuing source of adverse groundwater quality. There would be a thick overlying layer of rock above the panel caving area, and this rock is generally inert or acid neutralizing (over 80 percent of the samples analyzed of Apache Leap Tuff are non-acid generating; see section 3.7.2). Water percolating through the overlying rock would help neutralize acidity in remaining non-economic rock in the panel caving area. Rising groundwater levels would eventually flood the panel caving area completely, isolating it from oxygen and controlling further chemical weathering.

WEST PLANT SITE CLOSURE AND RECLAMATION

The West Plant Site facilities would be decommissioned, and the land surfaces would be contoured and graded as necessary to blend into the surrounding topography and terrain and reseeded with appropriate local species seed mixes. The post-closure grading plans for the West Plant Site include the following:

- All fill slopes would be laid back to a maximum of 2.5:1.
- The West Diversion Channel, the East Stormwater Channel, and an on-site channel would remain in place to route flow through a new diversion channel to the Apex Tunnel to existing drainages (e.g., Silver King Wash).
- The process water pond located at the western portion of the West Plant Site would be closed in accordance with APP conditions.
- Contact water basins would be closed in accordance with APP requirements.
- The emergency overflow ditch from Contact Water Basin W1 would remain in place.
- Non-contact water basins would be graded to drain.

Roads that are necessary to support the reclamation and closure efforts would remain to provide access to monitoring stations and remediation areas. All other roads would be reclaimed. All buildings would be salvaged or demolished, and all materials would be disposed of off-site. All portals, ventilation shafts, and tunnel entrances would be decommissioned, capped, and reclaimed at the surface.

TAILINGS STORAGE FACILITY CLOSURE AND RECLAMATION

Closure details differ for each tailings alternative primarily with respect to the length of time needed for closure and with respect to the method for long-term management of seepage. The overall closure process is similar for all tailings facilities. The recycled water ponds on the slurry tailings facilities would gradually be reduced in size as closure occurs, and the PAG tailings would be covered with a layer of NPAG tailings with timing dependent on the surface being dry enough to allow equipment access for reclamation. The seepage and runoff collection ponds generally would remain in place and would not be decommissioned until seepage water quality meets standards for release. Until that time, the ponds primarily would be used to evaporate seepage. Any excess draindown not evaporated from the seepage ponds would require active management. Active management could include pumping to another location, increasing evaporation using spray evaporators, or releasing water to the environment after appropriate treatment. The final method of post-closure management for seepage collection water would be determined as the project progresses through the NEPA process and engineering design. The final post-closure management plan would be based on overall expected volumes, anticipated seepage rates, and duration, in combination with the water chemistry assessment.

Additional final reclamation activities at the tailings would include contouring the tailings, installing riprap and erosion controls, covering the tailings with a combined armor protection (rock) and growth medium as an exterior shell, and revegetating the embankments and top of the covered tailings with a Forest Service–approved seed mix. The minimum depth of the exterior shell on the embankments would be 1.5 feet and would be thicker in areas where erosion protection would be required. Materials used for the exterior shell would be sourced from borrow pits and salvaged soil. The area within the tailing storage facility footprint would be used as a source, as well as an approximately 90-acre parcel 1 mile east of the tailings storage facility and 1.5 miles west of the West Plant Site. Any borrow area not underneath the tailings storage facility that is used for the shell would ultimately be recontoured and revegetated using a Forest Service–approved seed mix.

A perimeter fence or berm would be constructed around the tailings storage facility to prevent access. Some surface water diversion structures would be revegetated to control water and wind erosion, while others would be reconfigured to carry water along topography through and off the site. The diversion structures that would stay in perpetuity would be reconstructed with riprap to minimize erosion. All buildings, including foundations, at the tailings storage facility would be salvaged or demolished, and all salvage materials and demolition debris would be disposed of properly off-site. Roads that would not be required for closure and reclamation activities would be decommissioned, recontoured, and revegetated. All piping and electrical infrastructure connecting the tailings storage facility to the West Plant Site would be removed, leaving only the road and berms.

FILTER PLANT AND LOADOUT FACILITY AND MARRCO CORRIDOR CLOSURE AND RECLAMATION

All buildings, including building foundations, at the filter plant and loadout facility would be salvaged or demolished, and the salvaged material and demolition debris would be disposed of properly off-site. Tanks and ponds would be closed and reclaimed in accordance with APP and AZPDES permit requirements. All disturbed areas would be regraded with the exception of the diversion channel on the north side of the facility that routes surface water flows around the site to existing drainages.

The closure and reclamation of the MARRCO line is undetermined because the intended post-closure use of the railroad and utility lines is not known. Resolution Copper does not foresee a use of the railroad or utility lines for project reclamation or post-closure use, but another entity might buy the facilities and continue use. The concentrate lines, however, would be removed from the MARRCO corridor, and direct surface disturbance areas would be recontoured and revegetated to the extent possible with adjacent utilities. Bridge structures would be assessed and either removed or upgraded.

WATER SUPPLY FACILITIES AND PIPELINES CLOSURE AND RECLAMATION

Facilities associated with fresh water supply and distribution, such as pipelines, pump stations, and water tanks, may have a post-mining use and may be transferred to a third-party utility or community to provide water transport to the Superior Basin. No closure or reclamation activities would occur at these facilities if they were to be transferred to a third party.

Facilities that would not have a post-mining use include the tailings slurry lines, concentrate pipelines, and associated pump station with electrical power. These facilities would all be decommissioned and removed. Buried and aboveground pipelines would be removed and scrapped or salvaged. All disturbed areas would be recontoured and reseeded.

POWER TRANSMISSION FACILITIES CLOSURE AND RECLAMATION

Power transmission facilities, which include electrical substations, transmission lines, and power centers, may be removed as part of the reclamation program, unless a post-mining use is identified. SRP would continue to own the power lines and may have a post-mining use for ongoing power transmission in the area.

RECLAMATION FINANCIAL ASSURANCE

Resolution Copper would be required to establish and maintain sufficient financial assurance in accordance with requirements from the Forest Service, ASLD, BLM, the APP program, and the Arizona Mined Land Reclamation Act. The purpose of financial assurance is to ensure that responsible agencies would be able to continue any remaining reclamation activities if Resolution Copper becomes unable to meet reclamation and closure and post-closure obligations under the terms and conditions of the applicable permits and approvals. Under the Arizona Mined Land Reclamation Act, the Arizona State Mine Inspector would receive financial assurance for reclamation and closure activities required on private lands, the Forest Service would receive financial assurance for reclamation and closure activities on lands managed by the Forest Service previously described in section 1.5.5, and BLM would receive financial assurance for reclamation and closure activities on BLM-managed lands. The APP program would receive financial assurance for reclamation and closure activities for facilities that have the potential to discharge water into the groundwater (tailings storage facility, process ponds, and stormwater ponds), regardless of the facility's location on private or NFS lands.

The cost estimates for the reclamation financial assurances are based on the final design of the facility, would be developed after the NEPA process, and would not be finalized until the final GPO is approved.

The release of all or a part of the reclamation performance bond would only be made by the appropriate agencies after Resolution Copper's request has been reviewed for completeness and on-the-ground compliance with the predetermined release criteria and monitoring data, and after representatives of the agencies have conducted field and data examinations to ensure that reclamation activities have been implemented. Additional information on post-closure financial assurances can be found in section 1.5.5 and in several resource sections of chapter 3, including sections 3.3 (Soils and Vegetation), 3.7.2 (Groundwater and Surface Water Quality), and 3.10.1 (Tailings and Pipeline Safety).

2.2.3 Alternative 1 – No Action Alternative

Under the no action alternative, current management plans would continue to guide management of the project area. The Forest Service would not approve the GPO, none of the activities in the final GPO would be implemented on NFS lands, and the mineral deposit would not be developed. However, note that certain activities are currently taking place on Resolution Copper private property, such as reclamation of the historic Magma Mine; exploration; monitoring of historic mining facilities such as tailings under existing State programs and permits; maintenance of existing shaft infrastructure, including dewatering;

and water treatment and piping of treated water along the MARRCO corridor to farmers for beneficial use. These types of activities would be expected to continue, regardless of approval of the GPO. These activities are therefore assumed to occur in the no action alternative (Garrett 2018c).

This alternative is required by regulation (40 CFR 1502.14(d)). The nature of the no action alternative was described in the NOI issued for the project in March 2016. The NOI also indicated this alternative cannot be selected by the Forest Service but serves as a point of comparison for the proposed action and action alternatives.

The no action alternative includes the following:

- The final GPO would not be approved, thus, none of the activities in the final GPO would be implemented, and the mineral deposit would not be developed;
- The land exchange would not take place;
- Certain ongoing activities on Resolution Copper private land, such as reclamation of the historic Magma Mine, exploration, monitoring of historic mining facilities such as tailings under existing State programs and permits, maintenance of existing shaft infrastructure, including dewatering, and water treatment and piping of treated water along the MARRCO corridor to farmers for beneficial use, would continue regardless of GPO approval;
- Ongoing trends not related to the proposed project would continue, such as population growth, ongoing impacts on air quality from fugitive dust and vehicle emissions, human-caused fires from recreation, ranching, and a corresponding increase in use of public lands; and
- No agency land and resource management plans would be amended for this project.

2.2.3.1 Need for Inclusion of Land Exchange in Document

Section 3003 of the NDAA directs the Forest Service to prepare a single EIS prior to the final execution of the land exchange to serve as the basis for all Federal decisions related to the proposed mine. The proposed action and action alternatives analyzed in detail in chapter 3 therefore assume that the land exchange would occur as directed by Congress; for this reason, it is included as a component common to all action alternatives (see section 2.2.2.1).

However, even though directed by Congress, the land exchange remains a discretionary decision on the part of Resolution Copper, which may or may not choose to undertake the exchange after receipt of the appraised value. It is possible that mining under the proposed action or action alternatives could also take place without the land exchange occurring. The single EIS must therefore allow for a comparison of potential impacts of mining that occurs on land remaining in Federal ownership with potential impacts that would occur following the land exchange. Whether the land exchange occurs or not, the mine would be developed in accordance with the Federal, State, and local laws governing mining operations. However, these laws could differ, depending on whether or not a land exchange occurred.

The no action alternative provides one baseline against which the proposed action and action alternatives may be compared. The no action alternative assumes no land exchange and no Forest Service approval of a GPO. This baseline allows a direct comparison of the effects of most of the mining impacts that would occur from the proposed action and action alternatives. However, the no action alternative is not sufficient to fully analyze the effects of the exchange of the selected lands.

Two other combinations of no action were considered during analysis:

- A fully executed land exchange, but no approval of the GPO; or

- The land exchange would not occur, Oak Flat would stay in Federal management, and the GPO would be approved with the mining taking place on public land.

The first combination was not carried forward as the Forest Service is unable to refuse approval of the GPO within their regulations and guidance. The second combination was considered because the land exchange is a discretionary action on the part of Resolution Copper. Therefore, an analysis was completed that compared the regulatory framework of mining activity on lands remaining in Federal ownership with the regulatory framework on lands being transferred to private ownership (appendix I). This provides the comparison of no land exchange, but approval of the mining plan of operations. See section 2.4 for more details. The effects of the land exchange are also assessed individually in each resource section of chapter 3.

2.2.4 Alternative 2 – Near West Proposed Action – Mine Plan Components

Alternative 2 – Near West Proposed Action would include approximately 9,789 acres of disturbance, of which 7,195 acres is NFS, 314 acres is ASLD managed, and 2,280 acres is private land.

Based on comments heard in scoping, in February 2018, Resolution Copper formally notified the Tonto National Forest that the company was revising its proposed action in the May 2016 version of the GPO and replacing the plan for an upstream-type tailings embankment at the GPO location with a modified centerline design, which would provide greater overall stability and a more robust design. This change was in response to public scoping comments and supported by internal engineering discussions at Resolution Copper. The revised centerline tailings embankment configuration is described in greater detail in section 2.2.4.2.

This followed Resolution Copper's July 2017 decision to relocate the process pond. The process pond was moved from NFS lands to private property at the West Plant Site to minimize adverse impacts on NFS surface resources. The process pond is further described in Appendix G, Further Details of East Plant Site, West Plant Site, MARRCO Corridor, and Filter Plant and Loadout Facility Infrastructure.

2.2.4.1 Water Use

This alternative is estimated to need about 590,000 acre-feet of groundwater pumped from the Desert Wellfield through the life of the mine (see appendix H).

2.2.4.2 Tailings Storage Facility and Tailings Pipeline Corridor

Approximately 1.37 billion tons of tailings produced by the mining operation would require storage in perpetuity. The proposed tailings storage facility location, as identified in the GPO, is on lands managed by the Tonto National Forest. The facility would be approximately 3 miles west of the West Plant Site (figure 2.2.4-1).

The GPO proposes a thickened tailings process. Thickening tailings involves the mechanical process of removing some water from the tailings slurry. Thickened tailings can have a solid content ranging from 50 to 70 percent, depending on the degree of thickening. Thickened tailings can be piped to a tailings storage facility and, because they are still a liquid, require storage in an impoundment contained by an embankment. The GPO indicates that the tailings slurry would be thickened to a solids content of approximately 50 to 65 percent for deposition in the impoundment. Overtime the tailings within the impoundment would settle and consolidate to a greater solids content.

NPAG and PAG tailings would be transported in the form of a thickened slurry from the concentrator complex at the West Plant Site to the tailings storage facility via two separate pipelines. To reduce potential water quality issues, PAG tailings would be placed using subaqueous deposition in such a way that they are kept saturated. This limits oxygen from interacting with the sulfides in the PAG tailings, minimizing and preventing water quality problems (e.g., acid rock drainage). The NPAG

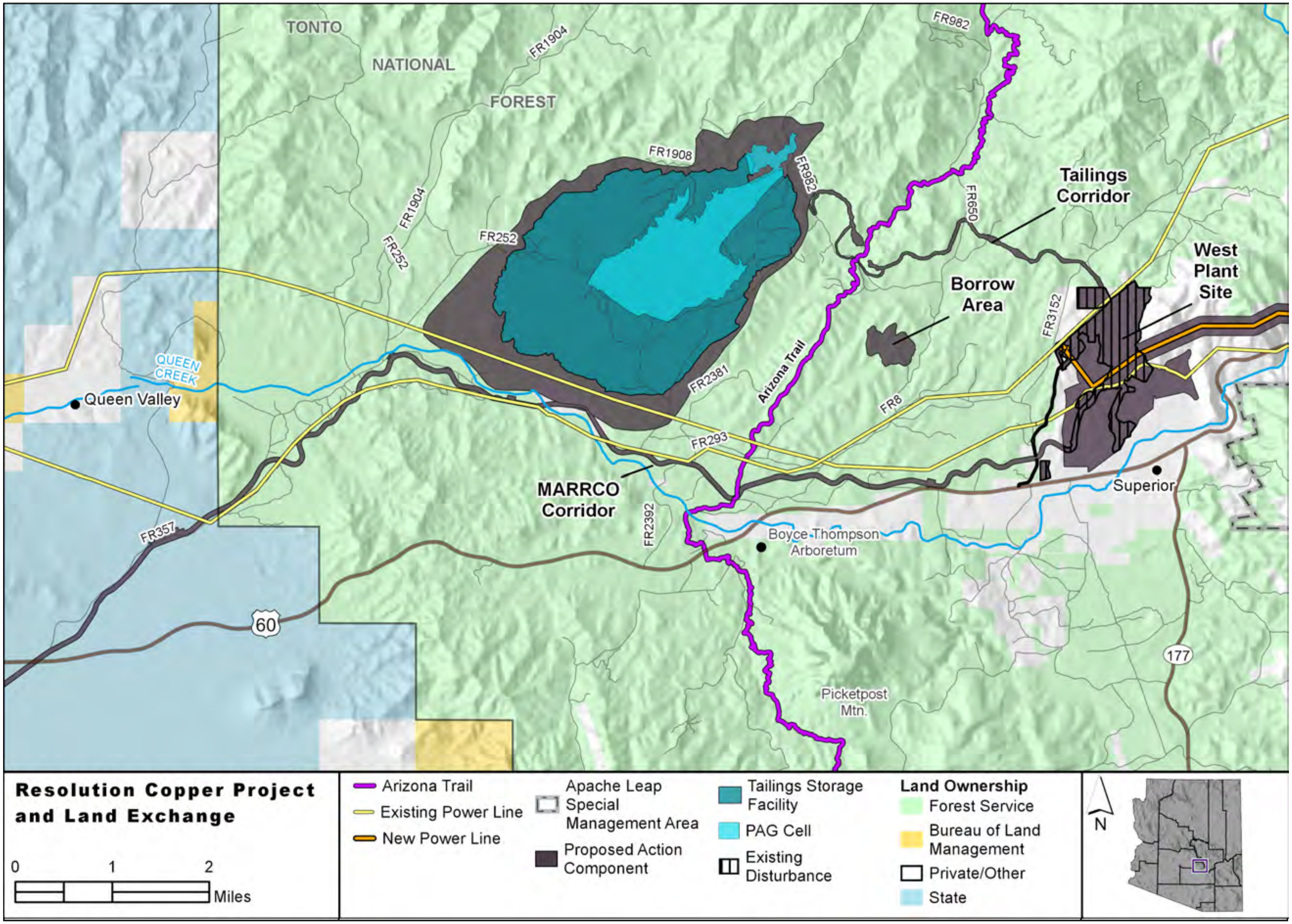


Figure 2.2.4-1. Overview of Alternative 2 – Near West Proposed Action tailings storage facility

would be deposited in a way that would eventually encapsulate the PAG tailings, allowing NPAG tailings to act as a buffer between PAG tailings and areas outside the tailings storage facility.

The modified proposed action tailings facility, Alternative 2 – Near West Proposed Action, would be constructed using a modified centerline embankment design rather than an upstream embankment, as Resolution Copper originally proposed in its GPO submitted to the Tonto National Forest on May 9, 2016. The GPO as amended responds to issues of public health and safety, as a modified centerline type embankment is considered more resilient than an upstream embankment, with less risk of failure. The modified centerline embankment would be constructed from compacted and free-draining cyclone tailings sand and earthen fill. NPAG tailings are processed through hydrocyclones[17] to produce a coarse particle tailings stream (cyclone sand used for construction) and a finer particle tailings stream. The larger tailings particles would drain water freely and would be mechanically compacted during embankment construction to further increase the stability of the embankment. The finer materials would be deposited into the interior of the tailings facility, where they would provide a low-permeability zone between the PAG tailings and the higher permeability perimeter embankment. As the tailings storage facility grows over time, the embankment would progressively be elevated to contain the tailings. A general schematic of the modified centerline design is shown in figure 2.2.4-2. Resolution Copper currently is proposing an overall 4H:1V slope design for the embankment.

Portions of the embankment may be modified to a 3H:1V design to

- reduce the overall amount of cycloned sands required, and
- facilitate an earlier start to concurrent reclamation activities on the embankment (at approximately mine life year 22 vs. year 28 for the 4H:1V design).[18]

Auxiliary facilities within the tailings storage facility would include a perimeter fence, private roads, borrow areas, soil stockpile areas, seepage control facilities, diversion channels and seepage containment ponds, groundwater monitoring wells, an office, and an equipment maintenance facility (figure 2.2.4-3).

The tailings facility would include a recycling system and a seepage containment system and stormwater diversions to control tailings seepage and surface runoff. All slurry tailings facilities have a pond on the surface known as the “recycled water pond.” The water collected in the recycled water pond would be recycled and pumped to the mill for reuse in ore processing via an aboveground pipe within the tailings conveyance corridor.

While water is recycled through the recycled water pond, some water also remains within the tailings void space and most of this water would eventually either drain downward or remain entrained within the tailings. The seepage and stormwater containment system would consist of engineered low-permeability layers, cutoff walls, grout curtains, diversion channels, and internal drains directing seepage and runoff to 11 planned downstream collection ponds. The NPAG embankment would contain an underdrain system comprising sand and gravel blanket and finger drains (primarily along main drainages, with some extended beneath the tailings beach) to maintain a low water level in the tailings embankment and to intercept and direct seepage from the impoundment to the downstream seepage collection system ponds.

During facility development, a PAG tailings starter cell would be constructed to maintain pyrite tailings saturation throughout the process and to limit seepage. This would include construction of a separate, earthfill starter dam to contain the initial PAG deposits; this starter dam would be constructed for the first 9 years of PAG tailings and would be lined with an engineered low-permeability layer. A combination of additional seepage collection design features would be implemented

17. Hydrocyclone is a device to classify, separate, or sort particles in a liquid suspension based on particle size and particle density.

18. The specific preferred design may be determined during the NEPA process or may be optimized if and when Alternative 2 becomes the selected alternative in the ROD.

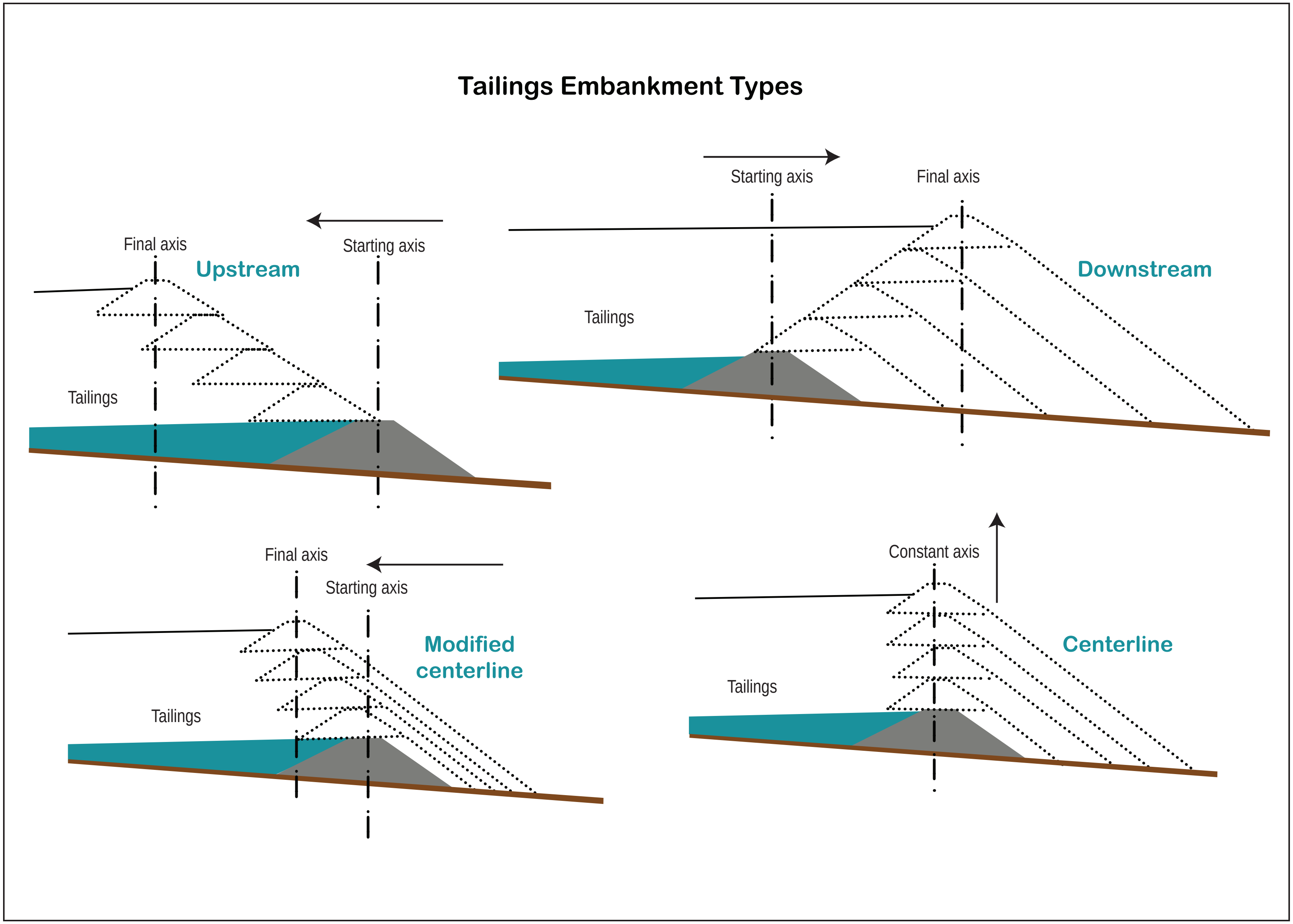


Figure 2.2.4-2. Diagram illustrating various embankment designs

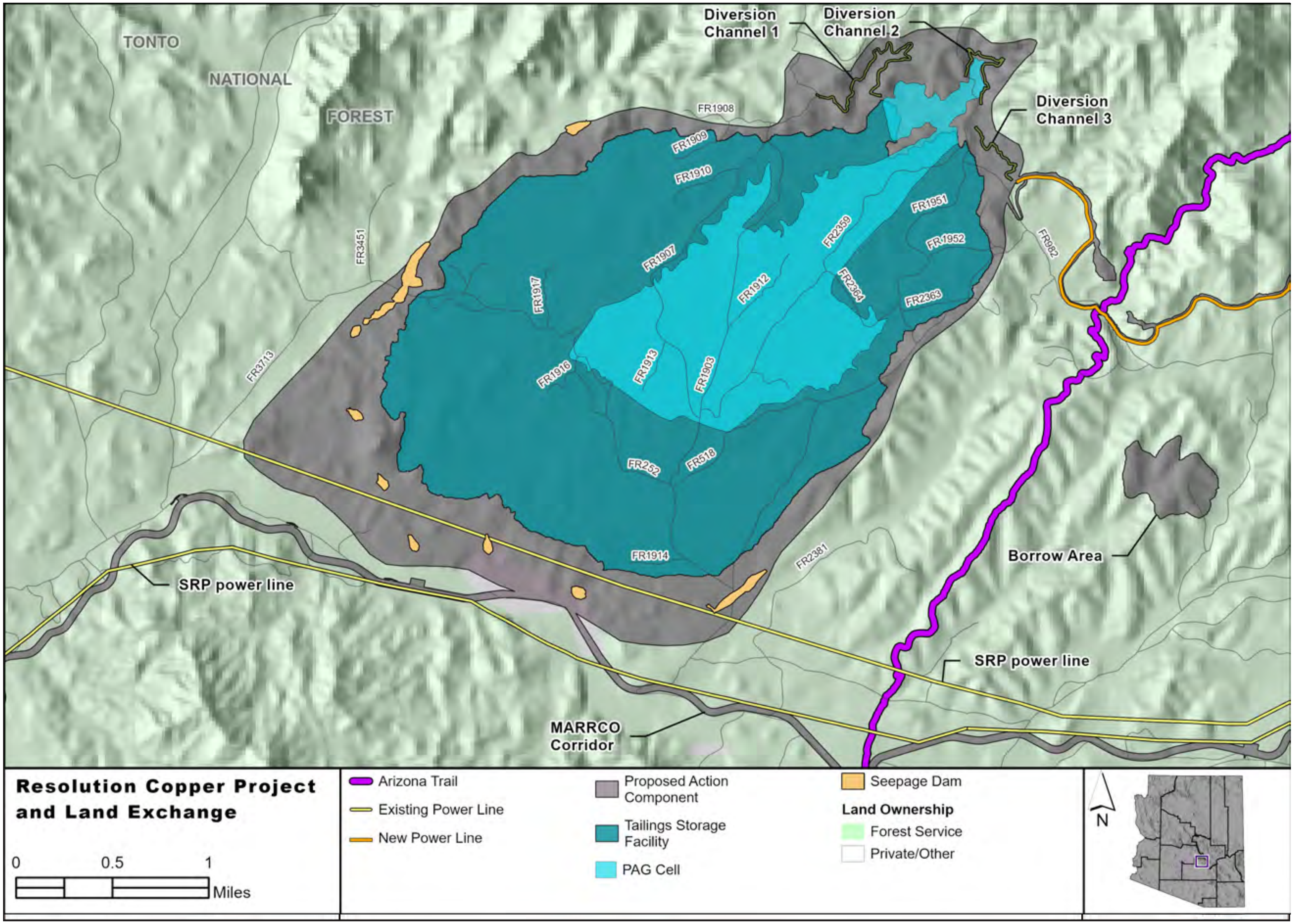


Figure 2.2.4-3. Alternative 2 – Near West Proposed Action tailings storage facility detailed layout

to limit seepage; these may include additional selective placement of engineered low-permeability layers, additional seepage collection dams, lined seepage collection ponds, pumpback systems, and refined stormwater control systems. The exact selection and placement of these features is, at present, still being optimized and would be finalized toward the end of the environmental impact assessment process.[19]

A 34.5-kV tailings substation would be constructed near the offices and maintenance facilities and would receive electricity via a 34.5-kV transmission line from the West Plant Site substation.

The GPO identified four borrow areas, all located on NFS lands, that have been targeted for different borrow requirements (i.e., earthfill material for the starter dams and embankments, gravel for blanket underdrains, riprap for erosion control, and soil cover for reclamation). Three of these borrow areas were within the tailings storage facility, and one is located outside the tailings storage facility footprint (see figure 2.2.4-1). However, Resolution Copper recently determined that borrow areas within the proposed tailings footprint would provide adequate volumes of earthfill material.

If needed, material processing plants would be mobile and move to locations within the tailings footprint where borrow material is needed. Borrow material would be used for concurrent reclamation of the tailings storage facility.

The tailings storage facility would be accessible at three locations:

- via a service road adjacent to the tailings pipeline corridor,
- from Hewitt Canyon Road (NFS Road 357), and
- from NFS Road 8.

During tailings storage facility construction, Hewitt Canyon Road and NFS Road 8 would be used by mine construction vehicles/equipment and provide emergency access. Several existing NFS roads within the proposed tailings storage facility would be removed from public access (see the "Transportation and Access" resource section in chapter 3). Several of these NFS roads would be reconstructed to provide access for mine equipment. A separate service road would be constructed around the periphery of the tailings storage facility for access to power distribution, seepage collection ponds, and pumps.

Throughout construction of the tailings facilities, sand and gravels at the tailings site facility would be salvaged and stored at a soil salvage yard for use during construction of the tailings facility and reclamation of the tailings facilities. Upon closure in mine year 46, the total footprint of the tailings storage facility would be approximately 4,909 acres. The tailings structure would be a four-sided perimeter embankment dam with an ultimate crest elevation of 2,751 feet above mean sea level (amsl). Maximum embankment height would be on the southern embankment at approximately 520 feet, with a 4:1 exterior slope angle.

Table 2.2.4-1 summarizes the components of the proposed action tailings storage facility.

2.2.4.3 Closure and Reclamation

The closure and reclamation phase would occur after the 40-year operations phase and would have a duration of approximately 5 to 10

19. The technical documents prepared by Resolution Copper describe a phased approach to seepage control. Level 1 seepage control consists of foundation treatments and barrier layers built into the facility and the 11 initial seepage collection ponds downstream. Level 1 seepage controls would be installed as part of the initial construction. Level 2, 3, and 4 seepage controls were considered in the design to further control seepage. Some of these controls would have to be built into the facility from the start (such as any low-permeability liners), while others would be implemented if real-world observations during operations indicate that seepage controls are not operating as anticipated. The seepage analysis in section 3.7.2 contains further descriptions of these controls and how they were incorporated into the analysis (Klohn Crippen Berger Ltd. 2019d).

Table 2.2.4-1. Summary of Alternative 2 – Near West Proposed Action tailings storage facility

Tailings Storage Facility	Description
Location	3 miles west of the West Plant Site, north of Hewitt Canyon Road (NFS Road 357)
Land ownership	Forest Service
Distance from West Plant Site	3 miles
Tailings type and disposal	Thickened slurry tailings placed subaqueously for PAG tailings from barge, NPAG placed hydraulically from perimeter At disposal, PAG tailings would be 50% solids content; thickened cyclone overflow (NPAG) would be 50% solids content; and NPAG sent directly from the mill would be 65% solids content. See figure 2.2.2-10 for more information on tailings solids content range.
Tailings embankment	Cycloned tailings and earthen starter dam, raised with compacted cyclone sand in a modified centerline construction approach with a 4H:1V slope
Lining and other seepage controls	Engineered, low-permeability layers would be installed prior to start-up. These would be located within the PAG cell starter dam facility and in areas where the foundation may have high permeability. Seepage from the tailings would be recovered in 11 seepage collection ponds downstream of the embankment. The seepage and stormwater collected at the collection ponds would be managed during operations for use in the process water system. Finger and blanket drains would underlie the embankment and part of the NPAG tailings.
Approximate size at fence line of tailings storage facility	4,909 acres
Approximate embankment height	521 feet
Tailings pipelines / conveyance	Thickened slurry pumped in two streams (PAG and NPAG) to the tailings storage facility and recycled water pipeline to return water to processing loop at West Plant Site 5.33 miles of corridor from West Plant Site to tailings storage facility
Auxiliary facilities	Two clusters of 26 cyclones, two high-density thickeners Upstream surface water north, west, and east of the tailings storage facility would be diverted to the extent possible around the facility through constructed diversion channels. This non-contact water would be diverted downstream to Queen Creek.
Other design considerations	The Arizona National Scenic Trail would need to be crossed by the slurry pipeline corridor and associated access road, but not rerouted. 8 miles of NFS roads are expected to be decommissioned or lost.
Closure and reclamation	Concurrent reclamation of tailings facility beginning approximately at mine year 22 or at mine year 28, depending on final slope design, would occur on the modified centerline tailings embankment. Closure of the tailings recycled water pond is estimated to take up to 25 years after the end of operations. Until that time, excess seepage in seepage ponds would be pumped back to the recycled water pond, and reclamation would take place on the embankment and tailings beaches. After the recycled water pond is closed, seepage ponds would be enlarged to allow adequate evaporation of seepage, and the remaining reclamation of the tailings would occur.

years.[20] A specific time frame for the closure and reclamation phase would not be known until after a final GPO is submitted to the Tonto National Forest and approved. The GPO describes the preliminary closure and reclamation plans that would occur at each of the main facilities and the linear features that connect them, as summarized in this chapter. The primary goals of reclamation are to

- stabilize areas of surface disturbance;
- prepare those areas for a post-mining land use that is compatible with surrounding uses; and
- ensure long-term protection of the surrounding land, water, and air resources.

General Reclamation Procedures and Schedule

Although closure and reclamation would be a distinct phase after the operations phase during which the majority of the reclamation efforts would occur, the proposed action would employ three schedules of reclamation throughout the life of the mine: interim, concurrent, and final reclamation. Interim and concurrent would be the same as described in Section 2.2.2.2, General Plan of Operations Components.

FINAL RECLAMATION

Final reclamation efforts would occur for a duration of 5 to 10 years after the operations phase as described in Section 2.2.2.2, General Plan of Operations Components.

The final reclamation efforts that would occur at each of the main facilities are described next.

TAILINGS STORAGE FACILITY CLOSURE AND RECLAMATION

In the final years of operations, tailings would be deposited to promote surface water runoff to the north, where runoff would be directed downstream, diverting around the seepage collection ponds, and surfaces throughout the facility would be reshaped as necessary to eliminate any potential for standing water.

A layer of NPAG tailings would be deposited over the PAG tailings as the recycled water pond disappears, in order to continue to isolate the PAG tailings from oxygen. During this time, the embankment and dry tailings beach areas would be reclaimed, with the PAG tailings with the NPAG cover being reclaimed last and covered by a 1- to 2-foot layer of low-permeability, erosion-resistant soil (e.g., Gila conglomerate or equivalent soil, sand, and gravel mix) and revegetated. The timing of reclamation is dependent on the surface being dry enough to allow equipment access for reclamation.

Estimated seepage rates suggest passive closure of the tailings facility may be difficult, and active management may be required up to 100 years after the end of operations. Up to 25 years after closure, excess seepage would be pumped back to the recycled water pond. After 25 years, the recycled water pond is closed, and the seepage ponds would be enlarged to allow for more evaporation. Any excess seepage beyond the evaporation capacity of the seepage collection ponds would need to be actively treated. The sludge containing concentrated metals and salts from evaporation would require cleanup and handling as a solid or hazardous waste.

20. Note that the time required to achieve final reclamation is dependent on how long it takes for the tailings to drain and become accessible, as well as how long seepage from the tailings facility is required to be actively managed. Therefore, reclamation timing varies between alternatives.

2.2.5 Alternative 3 – Near West – Ultrathickened

Alternative 3 – Near West – Ultrathickened would include approximately 9,789 acres of disturbance, of which 7,195 acres is NFS, 314 acres is ASLD managed, and 2,280 acres is private land.

Alternative 3 is a modification of the tailings facility but remaining in the same location as Alternative 2. Alternative 3 was developed to respond to issues of public health and safety and groundwater quality. It addresses these issues by changing the techniques used in the tailings storage facility to reduce potential for seepage and exposure of PAG tailings. This action alternative would not change any plan components described under the proposed action, except for those associated with the tailings storage facility and tailings disposal. East Plant Site infrastructure, panel cave mining, West Plant Site ore processing, slurry copper concentrate delivery to the filter plant, and other utility corridors would remain identical to the proposed action (figure 2.2.5-1).

Alternative modifications to the proposed GPO tailings facility (figure 2.2.5-2) include the following:

- construction of two separate cells within the tailings facility: one for the NPAG and one for PAG tailings (PAG tailings would be kept saturated to prevent oxidation), separated by an internal splitter berm, in order to better control water quality concerns associated with PAG tailings (see figure 2.2.2-12);
- inclusion of engineered low-permeability layers in the PAG tailings cell to limit seepage and maintain PAG tailings saturation, to better control water quality concerns associated with PAG tailings; and
- incorporating further thickening into the NPAG tailings processing prior to deposition in the impoundment (further increasing the solids to water content of the tailings, from 50 to 65 percent in Alternative 2, up to 62 to 70 percent in Alternative 3), in order to reduce the amount of seepage from the NPAG tailings.

The rationale for choosing this alternative for assessment in the EIS is that, compared with the proposed action, it would allow for a direct comparison of the impacts from further thickening and segregating the saturated PAG tailings in an engineered low-permeability layered cell. By contrast, Alternative 2 only uses a separate engineered low-permeability layered PAG tailings cell during the first 9 years of operation and is not optimally located over less-fractured bedrock.

2.2.5.1 Alternative 3 Mine Plan Components

Water Use

This alternative uses the least water of the four conventional tailings alternatives (Alternatives 2, 3, 5, and 6) and is estimated to need about 490,000 acre-feet of groundwater pumped from the Desert Wellfield through the life of the mine (see appendix H). This is about 17 percent less water than the alternative without additional thickening of the NPAG tailings (Alternative 2), primarily as a result of greater recovery of water from the tailings and less evaporation losses from deposited tailings.

Tailings Facility – Tailings Type

The modified proposed action includes a slurry tailings disposal method, with the tailings split into a wet slurry of approximately 84 percent NPAG and 16 percent PAG tailings by total volume. The PAG tailings would be thickened at the West Plant Site to approximately 50 percent solids content and the NPAG tailings to approximately 65 percent solids. The cyclone overflow of the NPAG tailings would be thickened at the tailings storage facility site prior to depositing into the impoundment. Under this alternative both the NPAG tailings and cyclone overflow which is deposited in the impoundment would be high-density thickened at the tailings storage facility site to a higher solids content in comparison to Alternative 2 (NPAG thickened to 70 percent; cyclone overflow of the NPAG tailings thickened to 62 percent).

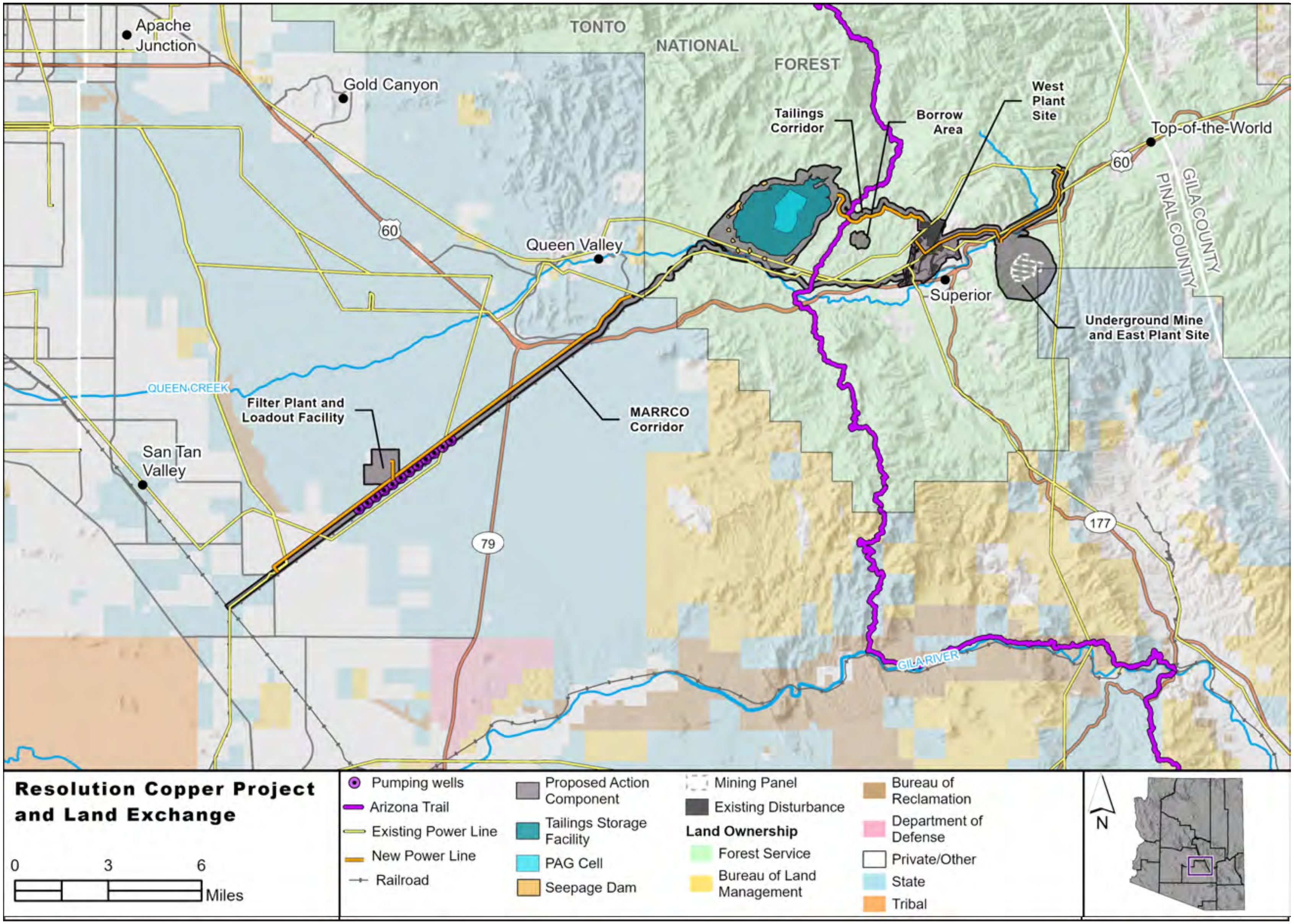


Figure 2.2.5-1. Alternative 3 – Near West – Ultrathickened overview

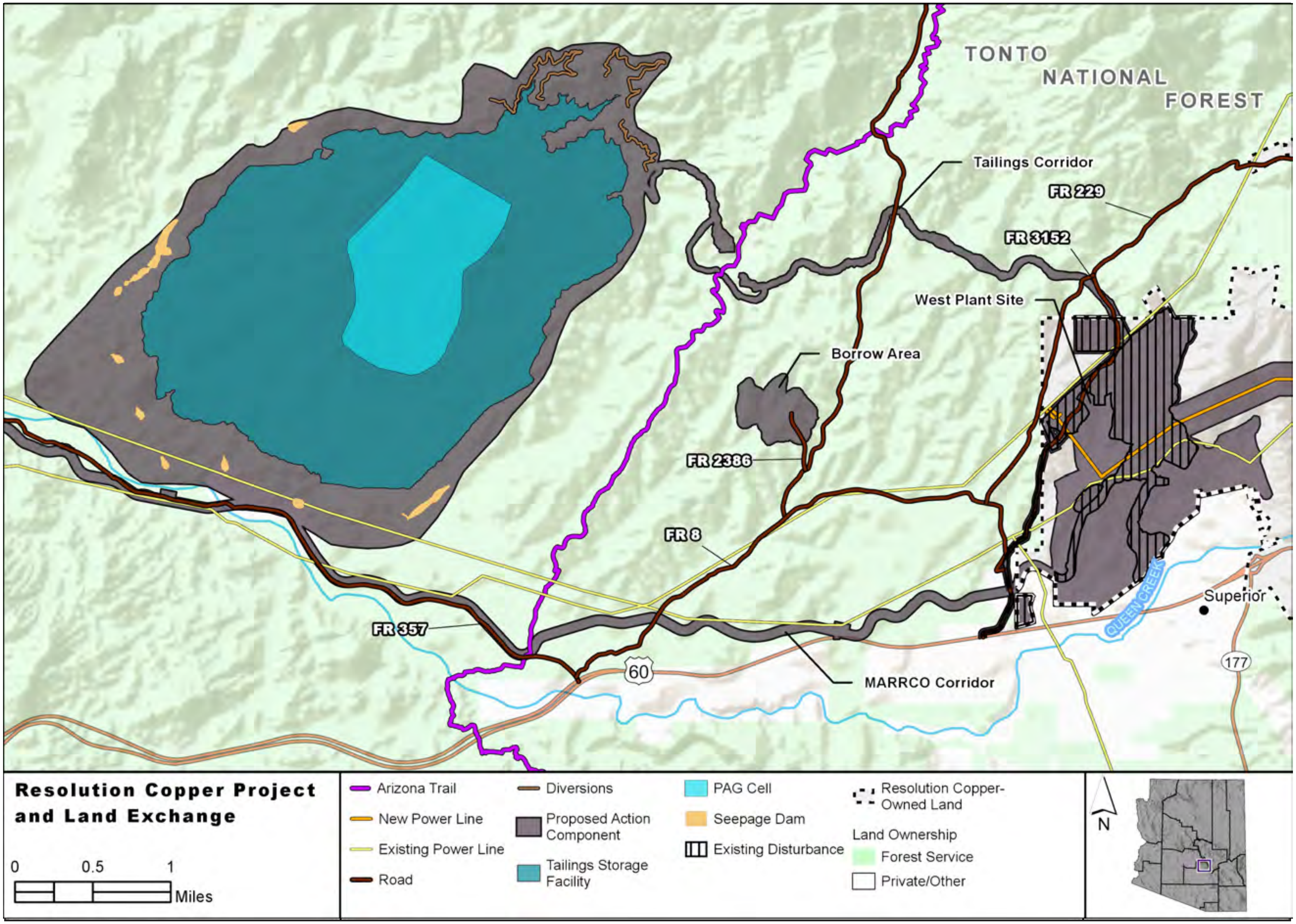


Figure 2.2.5-2. Alternative 3 – Near West – Ultrathickened tailings storage facility

Tailings Facility – Tailings Conveyance

Tailings conveyance via pipeline to the modified proposed action tailings facility would be the same as described in Alternative 2 – Near West Proposed Action.

Tailings Facility – Embankment Type

Alternative 3 would use the same approach, including an earthen starter dam, raised with compacted cyclone sand in a modified centerline construction; however, the downstream slope would be 3H:1. Borrow material would come from the same locations as described in Alternative 2. The PAG tailings cell would be located within the larger NPAG deposit, separated by a splitter berm construction of compacted cycloned sand.

Tailings Facility – Liner

Where NPAG tailings are deposited on potentially high-permeability bedrock, the foundation would be covered with an engineered, low-permeability layers prior to tailings deposition. The PAG tailings cell would be hydraulically contained by engineered, low-permeability layers and deposited over less-fractured bedrock.

Alternative 3 would make use of the same phased approach for control and collection of seepage as Alternative 2, including downstream seepage collection ponds, and additional grouting, collection ponds, or pumping wells if needed.

Tailings Facility – Disposal Method

The PAG tailings would be sent directly to a floating deposition barge for subaqueous deposition located within the PAG cell. The difference to apply high-density thickening of the NPAG tailings would occur prior to placement within the tailings storage facility to further reduce entrained water through evaporation and thereby reduce seepage. There is a potential for even more water to be removed from the tailings through "thin-lift" deposition techniques (depositing tailings in very thin layers), which would be used if found to be feasible with ultrathickened tailings.

The PAG tailings would be maintained in a saturated condition under a water cover at least 10 feet deep throughout operations. A primary difference between Alternatives 2 and 3 is the location of the recycled water pond. Under Alternative 2 the recycled water pond overlies both a portion of the NPAG and all of the PAG tailings, while under Alternative 3 the recycled water pond would only overlie the PAG tailings cell. Low spots that accumulate water, released from the tailings or stormwater on the NPAG tailings surface, would be pumped and the water would be directed to the PAG tailings cell.

Tailings Facility – Auxiliary Facilities

Access roads and other auxiliary facilities associated with Alternative 3 are similar to those described in section 2.2.4. Stormwater diversion channels would be needed to route upstream storm flows around the facility. Precipitation falling within the facility would be incorporated into the tailings reclaim water. Additional cyclone thickeners would be required to thicken the NPAG tailings to a greater percentage than Alternative 2.

Tailings Facility – Closure and Reclamation

During operations, the cycloned sand embankment slopes would be progressively reclaimed as facility development allowed (i.e., lower slopes would be reclaimed as subsequent lifts added). Channels and other features would be constructed at strategic locations on the closed embankment slopes to convey stormwater away from the facility and seepage ponds, and the slopes would be progressively covered with a low-permeability, erosion-resistant soil layer (e.g., Gila conglomerate) and revegetated.

In the final years of operations, tailings would be deposited to promote surface water runoff to the north, where runoff would then be directed downstream, diverting around the seepage collection ponds, and surfaces throughout the facility would be reshaped as necessary to eliminate any potential for standing water.

Following closure, the recycled water pond within the PAG cell would gradually be reduced in size and the seepage ponds downstream would be enlarged in order to maximize evaporation. The PAG cell would then be covered with a layer of NPAG tailings topped by a 1- to 2-foot layer of low-permeability, erosion-resistant soil (e.g., Gila conglomerate or equivalent soil, sand, and gravel mix) and revegetated. The remaining NPAG areas would similarly be covered by a 1- to 2-foot layer of low-permeability, erosion-resistant soil (e.g., Gila conglomerate or equivalent soil, sand, and gravel mix) and revegetated. The reclamation timing is dependent on the surface being dry enough to allow equipment access.

Active closure would be required for up to 9 years after the end of operations. Any water collected in the seepage collection ponds beyond the evaporation capacity of the seepage collection ponds would need to be actively treated. The sludge containing concentrated metals and salts from evaporation would require cleanup and handling as a solid or hazardous waste.

Other closure and reclamation measures, such as the removal of buildings, pipelines, electrical equipment and electrical lines, and the recontouring and revegetation of parking areas and other areas of ground disturbance, would be substantially identical to those described for Alternative 2.

Table 2.2.5-1 summarizes the components of the Alternative 3 tailings storage facility.

Table 2.2.5-1. Summary of Alternative 3 – Near West – Ultrathickened tailings storage facility

Tailings Storage Facility	Description
Location	3 miles west of the West Plant Site, north of Hewitt Canyon Road (NFS Road 357); same as Alternative 2 – Near West Proposed Action
Land ownership	NFS
Distance from West Plant Site	3 miles
Tailings type and disposal	Thickened slurry tailings placed subaqueously for PAG tailings from barge, NPAG placed hydraulically from perimeter At disposal—PAG tailings would be 50% solids content; thickened cyclone overflow (NPAG) would be 62% solids content; and additionally thickened NPAG stream sent directly from the mill would be 70% solids content.
Tailings embankment	Cycloned tailings and earthen starter dam, raised with compacted cyclone sand in a modified centerline construction approach with a 3H:1V slope
Lining and other seepage controls	Engineered, low-permeability layers would be installed prior to start-up. These would include the entire PAG cell and in other areas where the foundation may have high permeability. Seepage from the tailings would be recovered in 11 seepage collection ponds downstream of the embankment. The seepage and stormwater collected at the collection ponds would be managed during operations for use in the process water system. Finger and blanket drains would underlie the embankment and part of the NPAG tailings
Approximate size at fence line of tailings storage facility	4,909 acres
Approximate embankment height	510 feet
Tailings pipelines / conveyance	Thickened slurry pumped in two streams (PAG and NPAG) to the tailings storage facility and recycled water pipeline to return water to processing loop at West Plant Site 5.33 miles of corridor from West Plant Site to tailings storage facility
Auxiliary facilities	Two clusters of 26 cyclones, two high-density thickeners Upstream surface water north, west, and east of the tailings storage facility would be diverted to the extent possible around the facility through constructed diversion channels. This non-contact water would be diverted downstream to Queen Creek.
Other design considerations	8 miles of NFS roads are expected to be decommissioned or lost. Arizona Trail would need to be crossed by the slurry pipeline corridor and associated access road, but not rerouted.
Closure and reclamation	Reclamation of the tailings embankment face would occur progressively until about mine year 30 and continue through the end of the mining operations (approximately mine year 46). Dewatering of the tailings recycled water pond is estimated to take up to 5 years after the end of operations. Until that time, excess water collected in seepage ponds would be pumped back to recycled water pond, and reclamation would take place on the embankment and tailings beaches. After the recycled water pond is closed, seepage ponds would be enlarged to allow adequate evaporation of pond inflows, and the remaining reclamation of the tailings would occur.

2.2.6 Alternative 4 – Silver King

Alternative 4 – Silver King would include approximately 10,617 acres of disturbance of which 7,949 acres is NFS, 314 acres is ASLD managed, and 2,354 acres is private land.

The Silver King alternative was developed to respond to issues of water use, air quality, public health and safety, and groundwater quality through the use of filtered tailings instead of thickened slurry tailings (as proposed in the GPO) at an alternative location on Tonto National Forest land in an area known as Silver King. This alternative includes changes to the GPO for the tailings location, tailings processing and storage method, the location of the filter plant and loadout facility, and other emergency storage ponds which would increase the West Plant Site footprint and require different access road realignment along Silver King Mine Road, compared with the GPO and Alternatives 2, 3, 5, and 6. Other plan components of the GPO remain the same as described in Alternative 2 – Near West Proposed Action.

This tailings facility would occupy the lower end of Silver King Canyon, in the Silver King Wash, the lower portion of Whitford Canyon, and Peachville Tank, immediately adjacent to the West Plant Site north of Superior, Arizona (figure 2.2.6-1). The tailings footprint was designed to avoid existing mining operations at the Silver King Mine and a historic cemetery; however, 5.5 miles of the Arizona National Scenic Trail (Arizona Trail) would need to be rerouted and the McGinnel claim, 0.5 mile north of Silver King Mine, would be within the footprint of the tailings pile. Although the conceptual design of this facility is quite high (1,040 feet), the facility would consist of several benches to follow and mimic existing topography.

The use of filtered tailings reduces some concerns with water quality and public safety because removing water from the slurry prior to placement decreases the mobility of the tailings, providing greater stability of these tailings and a substantial reduction in seepage. Filtered tailings would allow progressive reclamation and compaction, but this alternative has large, dry, exposed surfaces that need to be managed to avoid air quality concerns. At this time, filtered tailings have not been used on a facility with a production rate as high as that proposed by Resolution Copper.

Tailings slurry would be delivered in separate tailings pipelines to two filter plants at the Silver King facility (one for PAG and one for NPAG) and filtering would then occur to remove water from the tailings, increasing percent solids generally to about 86 to 89 percent (vs. approximately 50 to 65 percent in the GPO tailings plan). Once filtered, the tailings would be conveyed into place as solids rather than pumped as a semi-liquid in a tailings pipeline, and, once in place, would be compacted in place using earthmoving equipment. The NPAG and PAG filtered tailings would be stacked in separate but nearly adjacent facilities.

Surface water management would include large upstream diversion dams with high-capacity outlets as well as large downstream collection ponds, as there would be no water recycling ponds, compared with slurry facilities to handle contact water. Emergency slurry ponds would be required for temporary storage of slurry in event of a tailings filter plant shutdown.

The rationale for choosing this alternative for detailed analysis is that, compared with the proposed action, it allows for a comparison of the impacts of thickened slurry tailings vs. filtered tailings, and it allows a comparison regarding whether the specific location selected for tailings in the GPO is preferable to other locations in the same general vicinity of Superior.

2.2.6.1 Alternative 4 Mine Plan Components

Relocation of Filter Plant and Loadout Facility

This alternative would relocate the filter plant and loadout facility from the proposed location near Magma Junction to the West Plant Site, near the concentrator on the existing rail line north of U.S. Route 60 (U.S. 60) (figure 2.2.6-2). This modification to the proposed action responds to issues of air quality, noise, and public health and safety associated with locating mining support facilities in the heavily populated East Salt River valley.

The filter plant and loadout facility would continue to pressure-filter the copper concentrate in a way that is similar to the proposed process

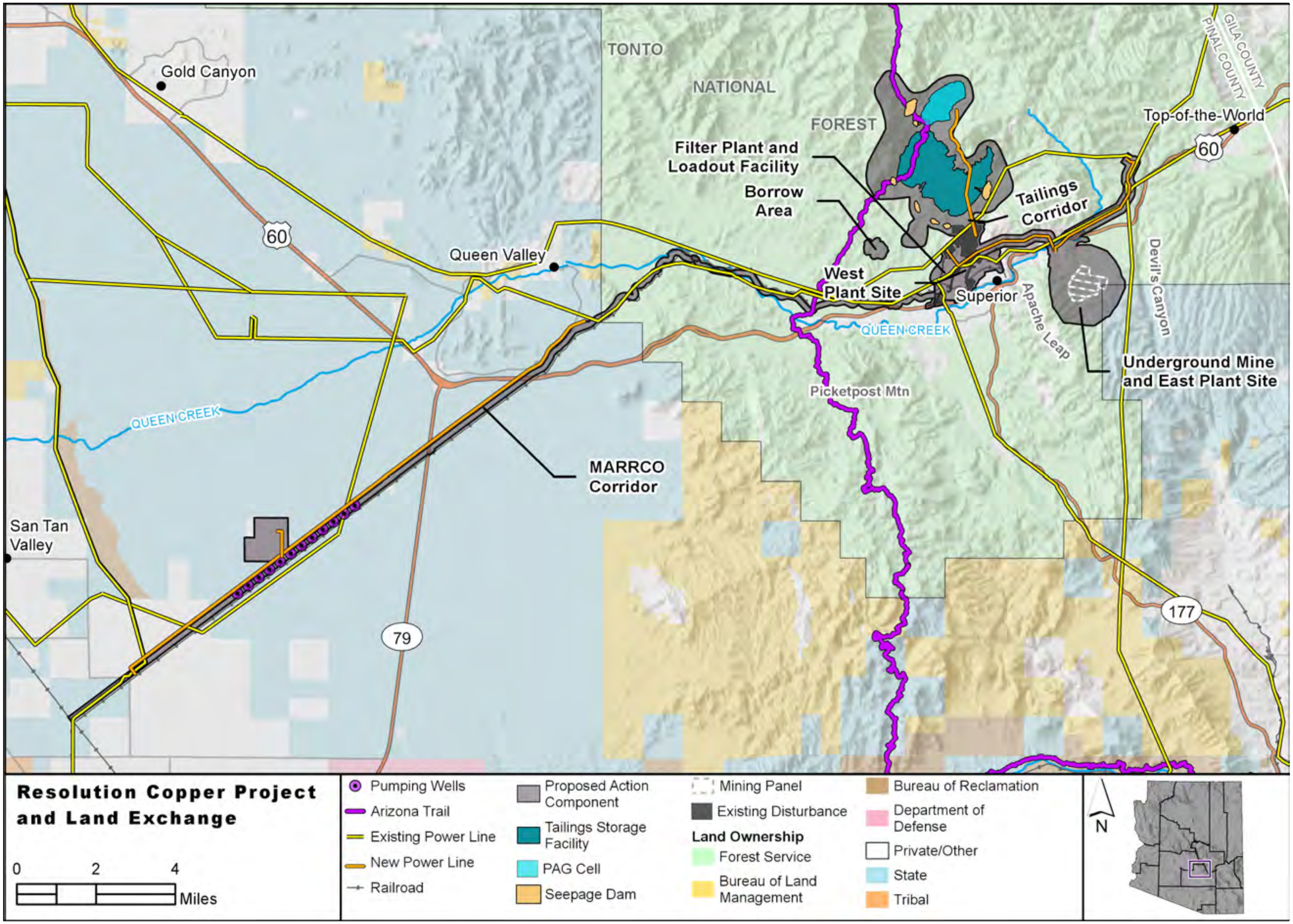


Figure 2.2.6-1. Alternative 4 – Silver King overview

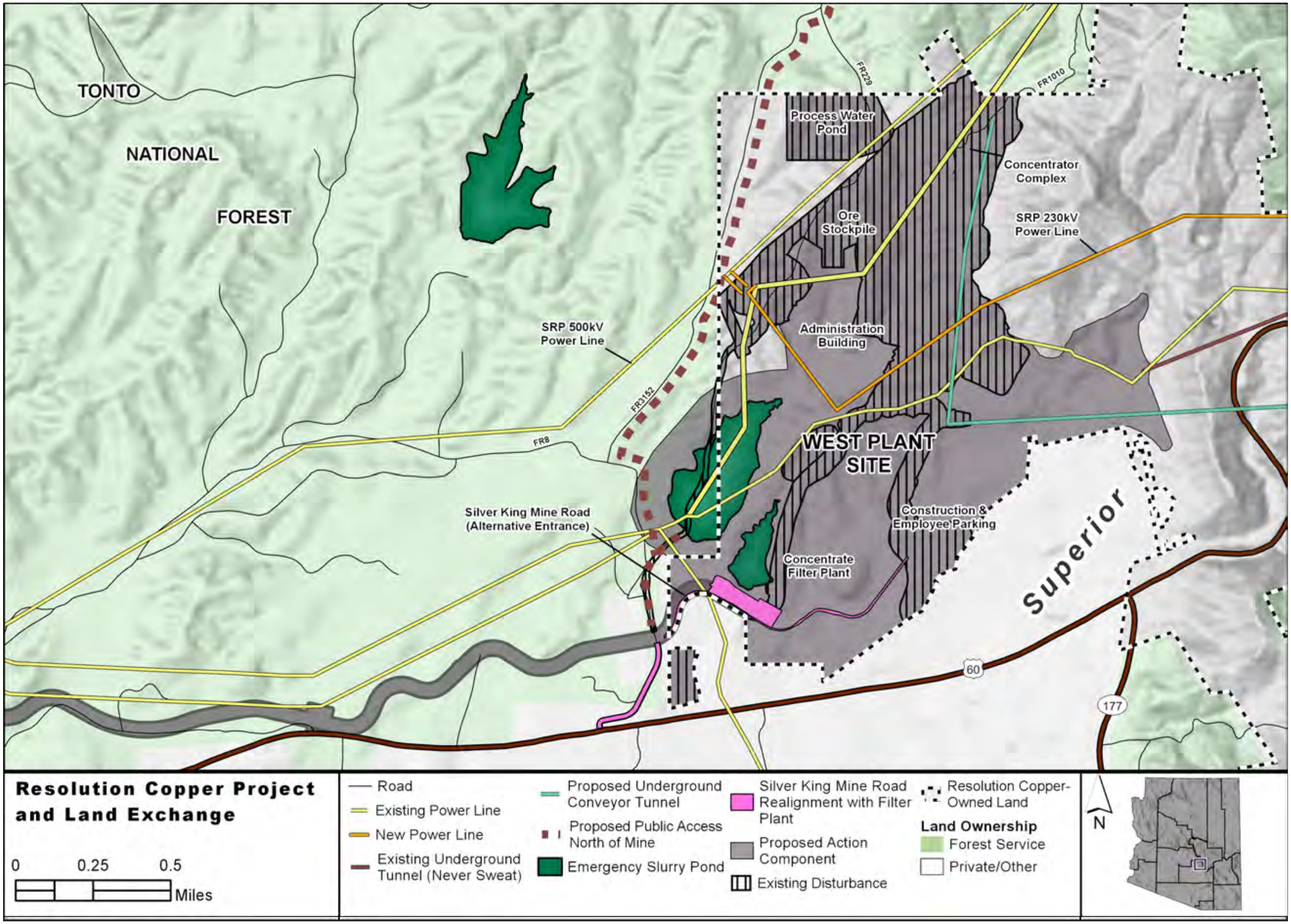


Figure 2.2.6-2. Relocation of filter plant and loadout facility

described in the GPO. Pipelines for copper concentrate and filtrate water would be located within the West Plant Site and not within the MARRCO corridor, thereby eliminating 21 miles of concentrate pipelines. This responds to issues of water quality and public health and safety that may be associated with concentrate pipeline ruptures or spills.

Two 50-railcar trains would instead use the MARRCO corridor twice a day to transport copper concentrate to market (concentrate loads would be transferred at Magma Junction to container cars of the Union Pacific Railroad for transport to an off-site smelter). The MARRCO corridor track would require upgrades along the entire length, bridge replacement at Queen Creek Bridge, and significant upgrades for crossings at Queen Creek, U.S. 60, State Route (SR) 79, the Arizona Trail, Hewitt Canyon Road, and other NFS roads. Except for the removal of concentrate pipelines, the dimensions and uses of water pipelines, groundwater wells, pump stations, and 69- and 12-kV power lines within the MARRCO corridor would remain unchanged from how these facilities are described in the GPO.

Water Use

This alternative uses the least amount of water of all the tailings alternatives and is estimated to need about 180,000 acre-feet of makeup water pumped from the Desert Wellfield through the life of the mine (see appendix H). This is about 65 percent less water than Alternative 2, due to recovery of water during filtering and subsequently less evaporative loss from the tailings beaches and recycled water pond.

Tailings Facility – Tailings Type

NPAG and PAG tailings streams would each undergo dewatering to a "filtered" tailings type. Filtering tailings would remove more water from the tailings slurry and result in filtered tailings with approximately 86 to 89 percent solids. At this moisture content, the tailings are referred to as a "dry cake" and must be transported by conveyor or truck to a filtered tailings storage facility. This modification responds to issues of public health and safety, water quality, and water use by removing water from the tailings. The filtered tailings can be placed and compacted into piles and have less water entrained in the tailings facility (figure 2.2.6-3).

Tailings Facility – Tailings Conveyance

Tailings slurry would be delivered by pipeline from the West Plant Site to the two separate Silver King filter plants, one located on higher ground above and adjacent to the NPAG facility approximately 1.5 miles north of the West Plant Site, and the other on higher ground above and adjacent to the PAG facility approximately 1.4 miles north-northwest of the NPAG site. Situating the filter plants on higher ground would allow for greater efficiency through downhill conveyance of the two types of filtered tailings to their respective storage facilities. Upon arriving at each filter plant, the NPAG and PAG tailings slurries would be pressure filtered to remove water, then subsequently handled as solids and delivered by conveyor and mechanically placed within each of the two tailings facilities.

Unlike a typical slurry tailings facility, where slurry can be emptied directly into the facility in the event of a processing halt, for filtered tailings, one or more emergency slurry storage ponds would be constructed close to the West Plant Site as emergency disposal location(s) for filtered tailings in the event that a filter plant temporarily stops processing. The emergency storage facilities would be constructed behind earthfill embankment(s) and would be lined.

Tailings Facility – Embankment Type

Filtered tailings are treated as solids (not liquids) and therefore do not require storage behind an embankment. No embankment would be required for construction of the Silver King alternative tailings storage facility; however, a compacted zone of tailings around the perimeter of the facility would provide structural support.

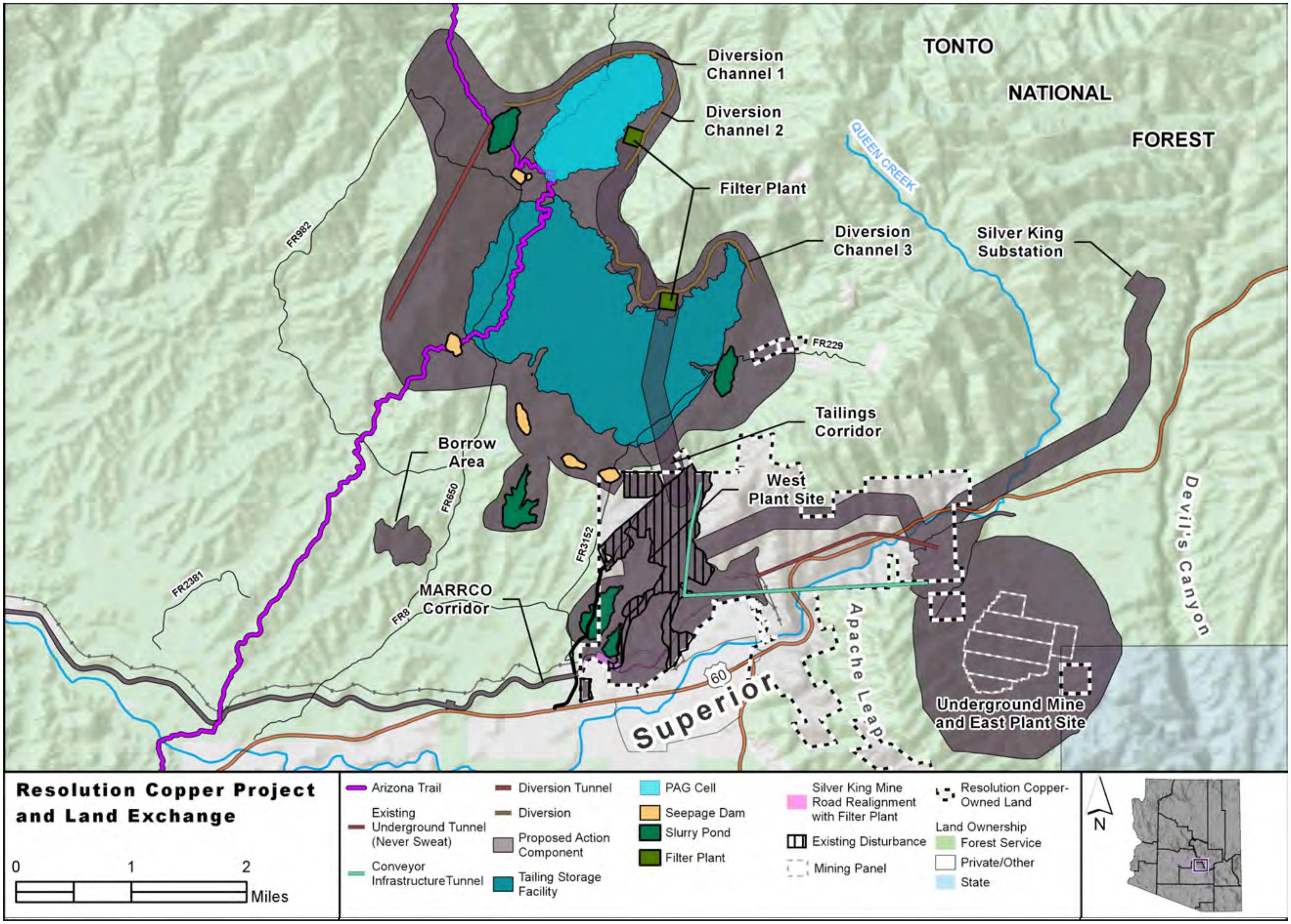


Figure 2.2.6-3. Alternative 4 – Silver King tailings storage facility

Tailings Facility – Liner

The Silver King alternative tailings storage facility would not be lined. As discussed further in section 3.7.2, the use of a full liner was considered during alternatives development and eventually dismissed from detailed consideration due to logistical concerns.

Tailings Facility – Disposal Method

Tailings would be placed using "trains," which are mechanical conveyors that place tailings in rows. Additional mobile mechanized equipment would be used to spread and compact the tailings. As stated previously, there would be two separate filtered tailings facilities: the NPAG tailings would be stacked closer to the West Plant Site and the PAG tailings farther north and upstream of the NPAG facility. Maintaining two separate facilities provides flexibility in how PAG tailings are managed and reclaimed.

Tailings Facility – Auxiliary Facilities

Unlike a slurry tailings facility, in which precipitation falling on the tailings is directed to the recycled water pond, stormwater must be managed on filtered facilities to prevent ponding on the surface of the tailings. Stormwater diversion channels, diversion tunnels, and retention structures would be needed to divert stormwater runoff from the tailings piles or move runoff quickly off of the facilities. During operations, the tailings surfaces would be sloped to eliminate ponding and direct runoff to perimeter ditches, sumps, and/or underdrains. The top surfaces of the tailings piles would be sloped toward the hillside and surface runoff would be collected in lined ditches and conveyed to lined contact water collection ponds. As described under "Tailings Conveyance" earlier in this section, emergency slurry storage ponds would be needed near the West Plant Site as an emergency disposal location, in the event that the filter plant temporarily shuts down.

Tailings Facility – Closure and Reclamation

The filtered tailings facilities would be constructed in horizontal lifts, thus the external slopes of the stack can be reclaimed starting early in the mine life, unlike slurry facilities that are unlikely to start embankment slope reclamation until after year 20. Because it is important to keep water away from the filtered facility, surface water diversion dams, tunnels, channels, and pipelines would be constructed where needed to direct the large upstream catchment runoff water away from the slopes and to limit erosion, and contact water would be directed to collection ponds for evaporation. After closure, upstream stormwater diversion features such as cutoff walls and channels would remain in place permanently to continue to direct surface water flows around and downstream of the tailings impoundments.

Active closure would be required for 5 years after the end of operations. During this time, reclamation of the exposed tailings would be in progress, and the need to retain stormwater in the collection ponds requires more capacity than the collection ponds can passively evaporate; active treatment may be required. Once stormwater can again be released downstream, after the tailings surface has been reclaimed with a stable closure cover, the collection ponds would be able to passively evaporate collected water. The sludge of concentrated metals and salts from evaporation would likely eventually require cleanup and handling as solid or hazardous waste.

The NPAG and PAG tailings piles would be treated as two separate facilities with separate covering, soil, and revegetation, but both stacks would use a store and release cover design to limit infiltration. At closure, the PAG tailings pile would be covered by an engineered low-permeability layer of compacted NPAG material that would be covered by a 1- to 2-foot layer of low-permeability, erosion-resistant soil (e.g., Gila conglomerate or equivalent soil, sand, and gravel mix) and revegetated. Other closure and reclamation measures, such as the removal of buildings, pipelines, electrical equipment and electrical lines, and the recontouring and revegetation of parking areas and other areas of ground disturbance, would be substantially identical to those described for Alternative 2.

Table 2.2.6-1 summarizes the components of the Silver King tailings storage facility.

Table 2.2.6-1. Summary of Alternative 4 – Silver King tailings storage facility

Tailings Storage Facility	Description
Location	Silver King Canyon (immediately north of and adjacent to the West Plant Site)
Land ownership	NFS
Distance from West Plant Site	1 mile
Tailings type and disposal	Filtered (dry stack) placed mechanically in two separate, but adjacent facilities At disposal—PAG tailings would be 86% solids content; NPAG tailings would be 89% solids content.
Tailings embankment	Perimeter of filtered pile would be compacted into a structural zone to provide physical support. The downstream slope would not exceed 3H:1V
Lining and other seepage controls	No lining of tailings, emergency temporary slurry ponds would be lined and retained by earthfill embankments. Seepage from the tailings would be recovered in five seepage collection ponds downstream of the facilities. Finger and blanket drains would underlie the tailings facilities.
Approximate size at fence line of tailings storage facility	5,661 acres
Approximate embankment height	The approximate maximum height of the filtered NPAG tailings facility is 1,040 feet and PAG tailings facility is 750 feet.
Tailings pipelines / conveyance	Thickened slurry would be pumped in two streams (PAG and NPAG) to the tailings storage facility and a recycled water pipeline would return water to processing loop at West Plant Site. There would be two filter plants (one for NPAG and one for PAG) at the Silver King tailings storage facility. After tailings are pressure filtered, they would then be placed within the facility by conveyor. 0.20 mile of corridor from West Plant Site to tailings storage facility.
Auxiliary facilities	Pressure filters, conveyors, mechanical spreaders, and mobile earthmoving equipment would be used for filtering and depositing the tailings. The filter plant and loadout facility would be relocated from the proposed location near Magma Junction to the West Plant Site. The facility would continue to pressure-filter the concentrate similar to the proposed process described in the GPO. Pipelines for copper concentrate and filtrate water would be located within the West Plant Site and not within the MARRCO corridor. Two 50-railcar trains would use the MARRCO corridor twice a day to transport copper concentrate to market. Permanent diversion channels upslope of the tailings pile would divert non-contact water around the tailings pile and discharge to either the West or East Diversion reservoirs. Multiple temporary slurry storage ponds would be required near the West Plant Site as emergency disposal locations in the event of planned or unplanned shutdowns. The ponds would be lined and retained by earthfill embankments.
Other design considerations	NFS Road 229 would need to be rerouted for private parcel access. 17.7 miles of NFS roads are expected to be decommissioned or lost. Approximately 5.5 miles of the Arizona National Scenic Trail would need to be rerouted. The 230-kV and 115-kV transmission lines would need to be crossed or rerouted between the East Plant Site and the West Plant Site.
Closure and reclamation	Reclamation and contouring of the filtered tailings would occur concurrently during mining operations. Reclamation would begin on outer slopes as early as practicable. Seepage and contact water collection ponds would remain in place until reclamation of tailings surfaces is complete, about 5 years after closure. Seepage ponds would remain in place to evaporate seepage or runoff unless water quality were sufficient to allow discharge.

2.2.7 Alternative 5 – Peg Leg

Alternative 5 – Peg Leg West Tailings Corridor Option would include approximately 17,285 acres of disturbance, of which 2,675 acres is NFS, 7,574 acres is BLM managed, 4,642 acres is ASLD managed, and 2,394 acres is private land.

Alternative 5 – Peg Leg East Tailings Corridor Option would include approximately 16,938 acres of disturbance, of which 2,752 acres is NFS, 7,105 acres is BLM managed, 4,659 acres is ASLD managed, and 2,422 acres is private land.

The Peg Leg alternative was developed to respond to the issues of public health and safety and groundwater quality. This alternative includes changes to the GPO for storing tailings, including the tailings facility location, tailings conveyance route to storage facility, and tailings storage embankment type. Public health and safety is addressed by locating the tailings facility in an area farther from residential populations and using a more resilient and robust embankment type than the upstream embankment proposed in the original GPO. Water quality is addressed by containing and controlling any seepage from the facility, and the greater distance to downstream perennial waters. Other plan components of the GPO remain the same as described in Alternative 2 – Near West Proposed Action.

The Peg Leg alternative tailings facility location is on a mixture of ASLD-administered and BLM-administered and private land south of the Gila River (figure 2.2.7-1). Selection of this alternative by the Forest Supervisor would not automatically approve this alternative, as BLM would require submittal of a mining plan of operations to approve the proposal. Since the other areas are not Federal land, obtaining access to use ASLD-administered trust land and private land is the responsibility of the applicant. The thickened slurry would be pumped from the West Plant Site in a split stream (approximately 84 percent NPAG and 16 percent PAG) via pipeline alternatives extending 28 miles on a western route and 23 miles on a proposed eastern route, and placed behind a centerline embankment retaining the larger NPAG tailings facility; the separate PAG cell would be situated behind a downstream embankment located adjacent to the NPAG impoundment. The PAG tailings would be kept saturated to prevent oxidation (the same as for the GPO).

This alternative tailings location was selected for its distance from residential areas and other infrastructure. The advantageous characteristics of this site include a greater distance from Superior, Queen Creek, and other communities, along with a gently sloping 4 percent topography on alluvial soils underlain by shallow bedrock on the eastern portion. This alternative also rose from a desire to consolidate mining activities on the landscape—this alternative is geographically close to the ASARCO Ray Mine complex and the planned Ripsey Wash tailings facility.

2.2.7.1 Alternative 5 Mine Plan Components

Water Use

This alternative uses about 540,000 acre-feet of groundwater pumped from the Desert Wellfield through the life of the mine (see appendix H). This is about 8 percent less water than under Alternative 2. This location has greater seepage losses to the aquifer. However, this increased water use is offset by the capture of more precipitation and runoff at this location and greater recovery of reclaimed water.

Tailings Facility – Tailings Type

Tailings types would be the same as described in Alternative 2 – Near West Proposed Action. The thickened tailings would consist of approximately 84 percent NPAG and 16 percent PAG.

The smaller PAG facility would be located on what is primarily granitic and granodiorite bedrock at the eastern portion of the Peg Leg facility footprint and would be constructed in a "four-square" pattern of separate cells as a way to reduce the pond size required for operations (i.e., the water cap needed to prevent airborne oxygen from interacting with the PAG tailings). The NPAG tailings would be located on what is primarily an alluvial material base immediately to the west and slightly downslope

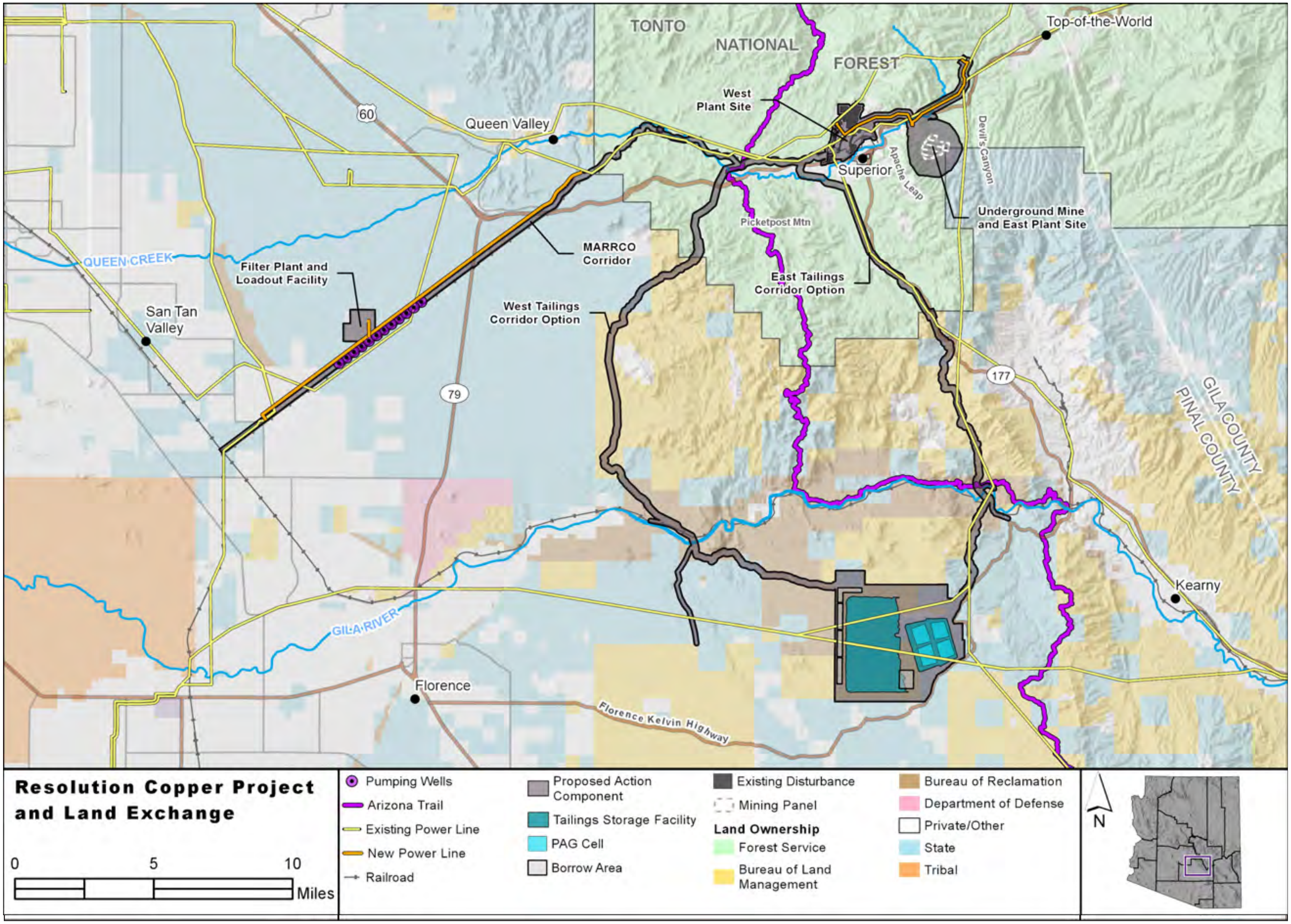


Figure 2.2.7-1. Alternative 5 – Peg Leg overview

from the PAG location. Figure 2.2.7-2 shows the tailings storage facility for this alternative.

Tailings Facility – Tailings Conveyance

The tailings would be pumped as a thickened slurry in two separate pipelines from the West Plant Site to the Peg Leg tailings storage facility approximately 25 miles to the south. Two pipeline corridor routes from the West Plant Site are presently being studied: a western alignment that would initially follow the MARRCO corridor south and then traverse primarily BLM-administered lands before crossing the Gila River and then turning eastward to the Peg Leg site, and an eastern alignment that would initially lie within the SR 177 easement and then shift more directly southward across BLM-administered and private lands before crossing the Gila River west of the Kelvin Bridge area prior to connecting to the Peg Leg facility (see figure 2.2.7-2).

Tailings Facility – Embankment Type

As stated, the Peg Leg tailings facility would comprise two physically separate types of storage facilities: PAG and NPAG. The two facilities would remain segregated throughout the entire life of the mine.

A "downstream" embankment design, which is material-intensive and requires a larger footprint to be designed as a water retaining embankment, is proposed for the PAG cell as it contains a water cover to limit oxidation. This embankment would be constructed using a mixture of earthfill excavated from within the tailings facility footprint and compacted cycloned sand. At the end of mine life, the PAG embankment would be approximately 200 feet in height. The entire PAG facility would include engineered low-permeability layers, or possibly a full synthetic liner.

The NPAG tailings would be retained behind a "centerline" design embankment[21] just to the west and slightly downstream of the PAG facility. The NPAG embankment would be constructed first using earthfill excavated from within the facility footprint, followed by compacted cycloned sand (underflow). The NPAG facility would be partially lined with an engineered low-permeability lining and other low-permeability layers under the recycled water pond area of the impoundment. At completion, the NPAG main embankment would be approximately 310 feet in height.

Tailings Facility – Liner

A full engineered low-permeability lining or other low-permeability layer would be installed at the PAG facility and partial engineered low-permeability lining positioned along the starter dam and under the recycled water pond within the NPAG impoundment (the full areal extent of the liner needed in the NPAG facility would be assessed and adjusted during operations). Other seepage containment techniques, such as use of low-permeability tailing fines (cyclone overflow), as well as grouting or sealing of fractures in base rock using asphalt or bentonite or other materials, may be used to augment the engineered low-permeability lining within both the PAG and NPAG cells.

Alternative 5 developed in part from the concept of a fully lined tailings facility. In practice, a full engineered low-permeability liner over such a large area would be both impractical and ineffective. However, because this alternative is located on alluvium, the potential water losses are expected to be substantial and a wide variety of seepage containment techniques would need to be employed to limit seepage to the extent possible and recover water for recycling back into the mine process (see section 3.7.2.4).

Embankment seepage would be captured in drains at the toe of the dams at each facility and collected in lined surface water and seepage

21. Care should be taken to not confuse "modified centerline" with "centerline" designs. The modified centerline embankment type still has some resemblance to an upstream embankment, in that the crest of the embankment does move upstream over time and the embankment lifts are still constructed partially over tailings. The true centerline design builds the crest straight upward and retains a solid core that is not underlain by tailings.

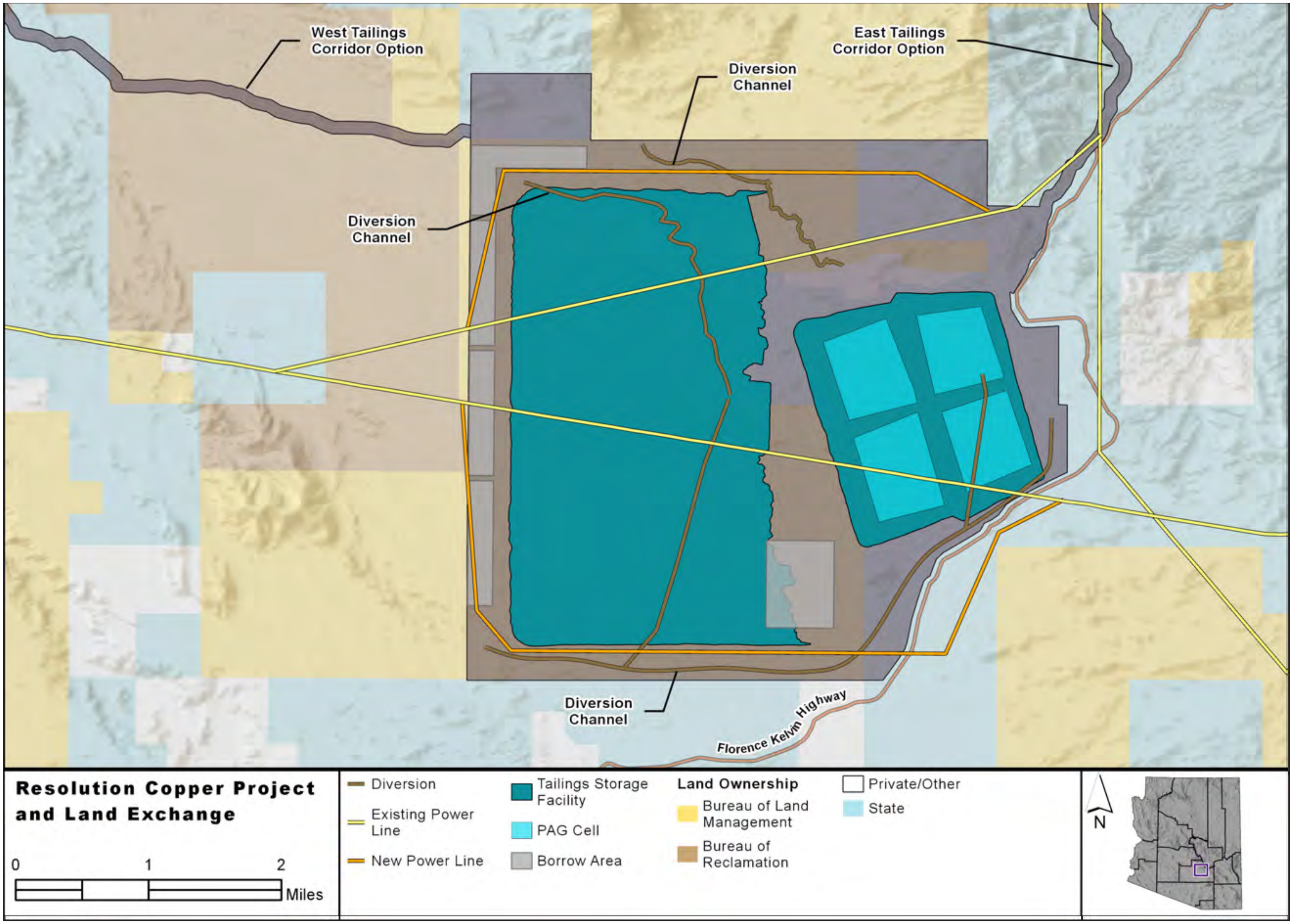


Figure 2.2.7-2. Alternative 5 – Peg Leg tailings storage facility

collection ponds. This collected water would then be pumped back to the recycled water ponds at each facility. A groundwater pumpback system would be operated downgradient of the tailings facility to recover seepage.

The uncontained seepage from the facility is expected to produce a groundwater mound. A well field would be installed downstream of the facility to further control seepage and groundwater would be pumped back to the recycled water pond.

Tailings Facility – Disposal Method

Tailings would be deposited by pipeline to their respective cells around each embankment. In this alternative, the PAG tailings would be deposited subaqueously. NPAG slurry would initially be deposited using traditional methods but would later transition to “thin-lift” (i.e., thin layer) deposition techniques to further increase evaporation and reduce seepage.

Tailings Facility – Auxiliary Facilities

Stormwater diversion channels and retention structures would be needed to manage stormwater runoff from the NPAG and PAG cells and to manage upstream (upslope) storm flows. Cutoff walls and diversion berms and channels would be constructed on the northern, eastern, and southern boundaries of the tailings facility to divert stormwater flows around the tailings impoundments.

Additional facilities that would support operations at the Peg Leg site would include electrical power lines and a substation; a cyclone separation plant; water pumping facilities for the PAG cells; collection ponds; a vehicle maintenance and fuel shop; an administration/ maintenance building; an equipment storage building; and vehicle parking areas.

Existing powerlines would need to be rerouted around the tailings facility, including a 115-kV SRP powerline and a 12.5-kV San Carlos Irrigation Project powerline as shown in figure 2.2.7-2.

Tailings Facility – Closure and Reclamation

A difference in the management of this alternative with tailings stored in perpetuity on BLM-managed lands, would require the GPO to remain active along with any reclamation bonds for many decades. After final tailings deposition and formal closure of the Peg Leg tailings storage facility, the surfaces of both the NPAG and PAG facilities would be shaped as necessary to prevent standing water. Surface water diversion features, including channels, would be constructed to limit erosion and direct precipitation that falls within the facilities to lined collection ponds to evaporate. Upstream diversion features would continue to direct stormwater flows around and downstream of the two impoundments; these structures would permanently remain in place after all other closure and disassembly/removal work had concluded.

The NPAG facility would be covered with 1 to 2 feet of low-permeability, erosion-resistant soil (e.g., Gila conglomerate, or a sand, soil, and gravel mix) and revegetated. The PAG facility is separated into four separate cells to reduce the footprint of saturated tailings, thus reducing seepage and to promote early closure and reclamation. Each PAG cell would operate for approximately 10 years and would then be closed. The PAG facility would first be covered with a minimum of 10 feet of NPAG material, then topped with a similar 1- to 2-foot thickness of erosion-resistant soil and revegetated.

The seepage collection ponds would remain in place and passively evaporate seepage, and seepage extraction wells downstream would remain in place to control seepage as long as necessary. These seepage features are estimated to be in place between 100 to 150 years after closure. Once the collection ponds can be closed, the closure plan calls for encapsulating the accumulated sludge in geomembrane and backfilling with soil.

Other closure and reclamation measures, such as the removal of buildings, pipelines, electrical equipment and electrical lines, and the recontouring and revegetation of parking areas and other areas of ground disturbance, would be substantially identical to those described for Alternative 2.

Table 2.2.7-1 summarizes the components of the Peg Leg tailings storage facility.

Table 2.2.7-1. Summary of Alternative 5 – Peg Leg tailings storage facility

Tailings Storage Facility	Description
Location	South of the Gila River
Land ownership	ASLD, BLM, private
Distance from West Plant Site	15
Tailings type and disposal	Thickened slurry tailings placed subaqueously for PAG tailings from barge in one of four cells, NPAG placed hydraulically from perimeter in a thin-lift deposition once feasible At disposal—PAG tailings would be 50% solids content; thickened cyclone overflow (NPAG) would be 60% solids content; and thickened NPAG stream sent directly from the mill would be 60% solids content.
Tailings embankment	Cyclone sand centerline-type embankment at NPAG facility with a 3H:1V slope; earthfill and cyclone sand downstream-type embankment at PAG facility
Lining and other seepage controls	Foundation treatments and/or low-permeability liners and layers under the entire PAG cell, under the NPAG starter cell, and where needed under the rest of the NPAG facility, depending on foundation conditions Seepage from the tailings would be recovered in six seepage collection ponds downstream of the embankments. The seepage and stormwater collected at the collection ponds would be managed during operations for use in the process water system. Finger and blanket drains would underlie the embankment and part of the NPAG tailings. Seepage collection pumpback wells would be placed downstream of tailings storage facility.
Approximate size at fence line of tailings storage facility	10,782 acres
Approximate embankment height	310 feet NPAG; 200 feet PAG
Pipelines / conveyance	Thickened slurry pumped in two streams (PAG and NPAG) to the tailings storage facility and recycled water pipeline to return water to processing loop at West Plant Site West Option: 28 miles of corridor from West Plant Site to tailings storage facility East Option: 23 miles of corridor from West Plant Site to tailings storage facility
Auxiliary facilities	Booster pumps may be located at West Plant Site to improve pumping across topography. Diversions will divert water around the facility and back into downstream channels.
Other design considerations	Two transmission line corridors would need to be crossed and both transmission line corridors rerouted around the Peg Leg site. The Arizona National Scenic Trail would need to be crossed by the tailings pipeline corridors. No NFS roads are expected to be decommissioned or lost due to the tailings storage facility at Peg Leg, although BLM estimates 29 miles of inventoried routes would be directly affected.
Closure and reclamation	Reclamation of the tailings embankment face would not occur until construction of the tailings embankment face is complete, which would be at the end of the mining operations (approximately mine year 46). Seepage ponds would remain in use roughly 30 years after closure; groundwater pumpback system would remain in use roughly 20 years after closure.

2.2.8 Alternative 6 – Skunk Camp

Alternative 6 – Skunk Camp North Tailings Corridor Option would include approximately 15,872 acres of disturbance of which 3,265 acres is NFS, 7,923 acres is ASLD managed, and 4,684 acres is private land.

Alternative 6 – Skunk Camp South Tailings Corridor Option would include approximately 16,324 acres of disturbance of which 3,461 acres is NFS, 8,161 acres is ASLD managed, and 4,702 acres is private land.

The Skunk Camp alternative was developed to respond to the issues of public health and safety, groundwater quality, impacts on scenic resources and recreational opportunities and to limit the impacts on NFS surface resources. This alternative includes changes to the GPO for storing tailings, including the tailings facility location, tailings conveyance, and tailings storage embankment type. Public health and safety is addressed by locating the tailings facility in an area farther from specifically established towns and population centers. Groundwater quality is addressed by containing and controlling seepage from the facility. Additionally, the proposed Skunk Camp location is much less likely to adversely impact recreational users of public lands than the GPO location, and would be largely out of public view. Like Alternative 5, this alternative also rose in part from the desire to consolidate mining disturbance on the landscape; the Skunk Camp location is just east of the ASARCO Ray Mine. Other plan components of the GPO remain the same as described in Alternative 2 – Near West Proposed Action.

The Skunk Camp alternative tailings facility location is on a mixture of ASLD-administered and private land that would occupy the upper portion of Dripping Spring Valley, the northeastern slopes and foothills of the Dripping Spring Mountains, and the southwestern foothills of the Pinal Mountains, including a 4-mile reach of Dripping Spring Wash, a 3.5-mile reach of Stone Cabin Wash, and a 4.8-mile reach of Skunk Camp Wash. The proposed site lies approximately 2 miles due east of the existing ASARCO Ray Mine and approximately 13 miles north of the point where Dripping Spring Wash drains into the Gila River (figure 2.2.8-1). Selection of this alternative by the Forest Supervisor would not automatically approve this alternative, since the other areas are not Federal land, obtaining access to use ASLD-administered trust land and private land is the responsibility of the applicant.

The Forest Service has identified Alternative 6 – Skunk Camp as the Lead Agency's preferred alternative and seeks public feedback during the 90-day comment period for the DEIS regarding this choice.

2.2.8.1 Alternative 6 Mine Plan Components

Water Use

This alternative would need about 540,000 acre-feet of groundwater pumped from the Desert Wellfield through the life of the mine (see appendix H), or about 8 percent less water than under Alternative 2.

Tailings Facility – Tailings Type

Tailings types would be the same as described in Alternative 2 – Near West Proposed Action. The PAG tailings would be thickened at the West Plant Site. The thickened tailings would consist of approximately 84 percent NPAG and 16 percent PAG. Figure 2.2.8-2 shows the tailings storage facility for this alternative.

Tailings Facility – Tailings Conveyance

The two separate tailings streams (PAG and NPAG) would be piped as a thickened slurry from the West Plant Site to the Skunk Camp tailings storage facility, located approximately 14 miles (straight line) southeast of the West Plant Site. Like Alternative 5, two different route options from the West Plant Site are presently being studied. See figure 2.2.8-1 for both pipeline routes under consideration.

Tailings Facility – Embankment Type

As stated, the Skunk Camp tailings facility would comprise two physically separate starter facilities: PAG and NPAG (see figure 2.2.8-2).

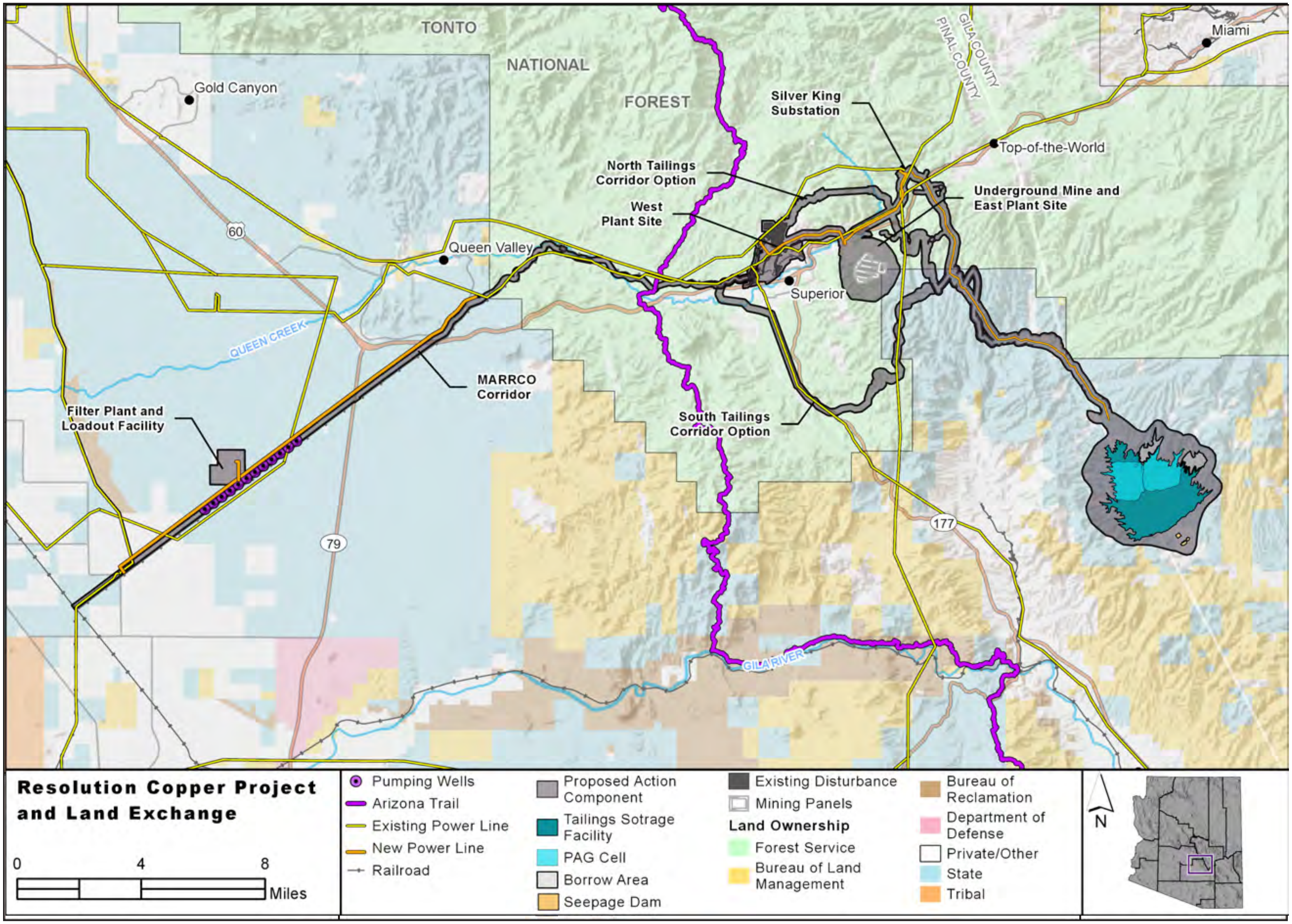


Figure 2.2.8-1. Alternative 6 – Skunk Camp overview

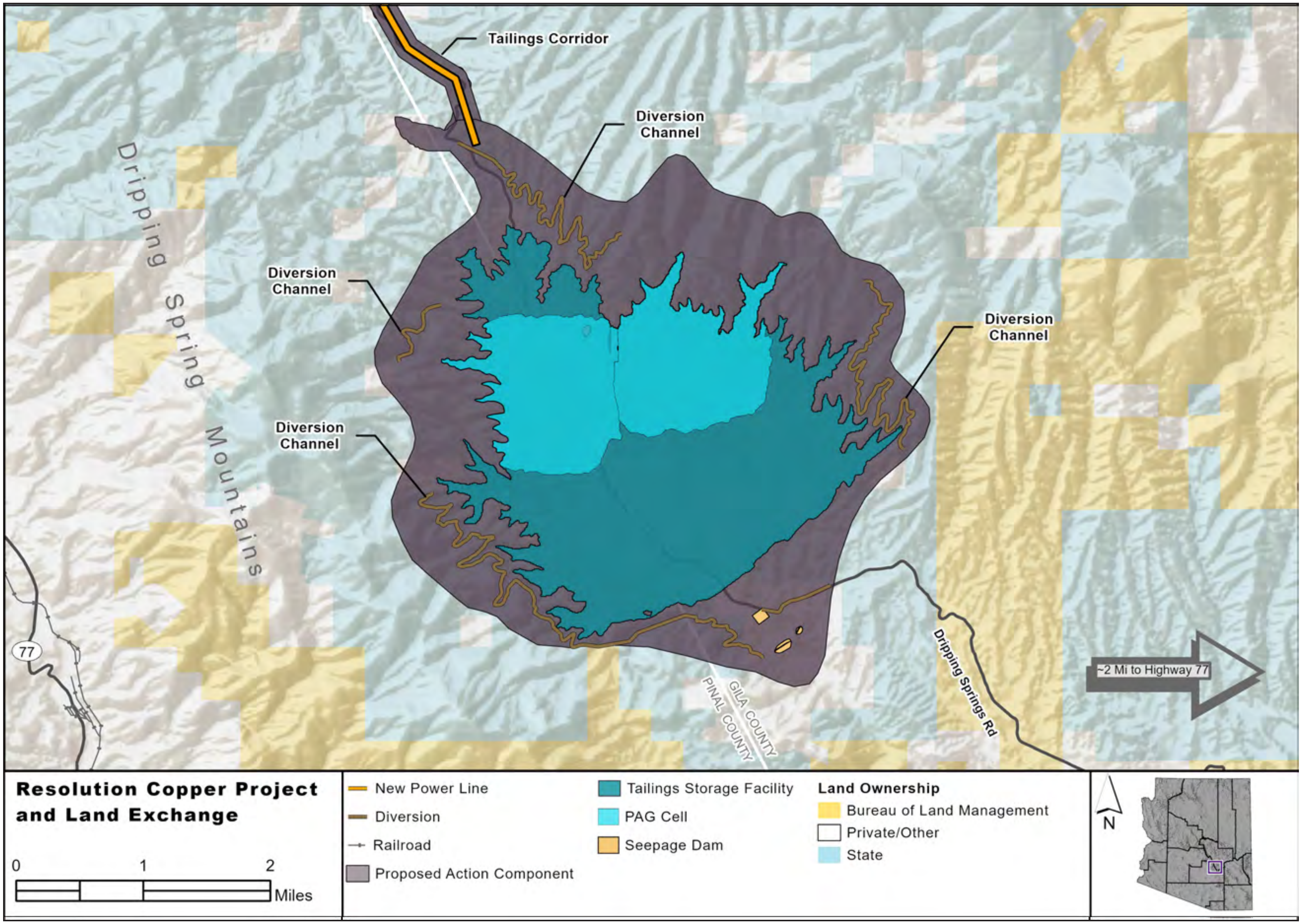


Figure 2.2.8-2. Alternative 6 – Skunk Camp tailings storage facility

Once delivered as a slurry to the Skunk Camp site, NPAG tailings would be cycloned to separate the coarser particles for use as embankment fill for part of the year, with the cyclone overflow (i.e., finer particles) being thickened at the tailings storage facility site before discharge into the impoundment. PAG tailings would be deposited into two separate cells, operated sequentially behind a separate cycloned sand embankment, to the north (upstream) end of the facility until they are encapsulated by the NPAG tailings.

The PAG and NPAG cells would be impounded by separate cross-valley starter embankments initially constructed of borrow material from within the ultimate tailings facility footprint. The impoundments would then periodically be raised in elevation during operations with compacted cycloned sand fill. The NPAG cell would use the centerline embankment construction approach, while the PAG cells would be constructed as downstream dams. The NPAG embankment would contain an underdrain system comprising sand and gravel blanket and finger drains (primarily along main drainages, with some extended beneath the NPAG beach) to maintain a low saturated surface in the tailings embankment and to intercept and direct seepage from the impoundment to the downstream seepage collection system ponds.

At full buildout, the embankment containing the NPAG tailings would be approximately 490 feet in height. As stated, the PAG cell embankment would be behind (upstream) and ultimately contained within the larger NPAG deposit.

Tailings Facility – Liner

To limit seepage under or around the Skunk Camp tailings storage facility, the PAG cell would incorporate an engineered low-permeability layer on the foundation and on the upstream face of the containment embankment. Engineered low-permeability layer containment could comprise one or more of the following: engineered low-permeability liner, compacted fine tailings, asphalt, slurry bentonite, cemented paste tailings, etc. To collect seepage downstream of the tailings storage facility, a foundation cut-off wall at the seepage collection pond would be constructed.

A single downvalley seepage collection pond would be the primary means for seepage and embankment construction and surface water collection during operations, with the collected water then pumped to a recycled water pond located within the operating PAG cell for use as process water at the cyclone house and/or at the West Plant Site, or for dust management at the tailings storage facility.

Tailings Facility – Disposal Method

Tailings would be deposited by pipeline to their respective cells around each embankment. In this alternative, the PAG tailings would be deposited subaqueously. NPAG slurry would initially be deposited using traditional methods.

Tailings Facility – Auxiliary Facilities

Five diversion dams, five diversion channels, and two non-contact water surface water pipelines would be constructed along the east and west sides of the tailings storage facility to intercept and route the upstream catchments around the facility. Collection ditches would be constructed along the embankment toe and at underdrain discharges to convey contact water to the seepage collection pond. Additional facilities at the Skunk Camp site would include the cyclone processing system (building to house the hydrocyclone(s), slurry dilution tanks, storage tanks, and associated equipment); an electrical substation and electrical distribution lines; a vehicle maintenance and fuel shop; equipment storage warehouse; administration and locker room facilities; and parking areas.

This is the only alternative that would require new transmission lines rather than tying into local lines nearby the facility. A new power line would be constructed from the existing Silver King substation north of U.S. 60 and Oak Flat that would follow a southeast alignment for 11.7 miles to the Skunk Camp location. Preliminary assessment of line voltage options show that either a 69-kV or 115-kV voltage level would be adequate to supply power to Skunk Camp. Further assessment by the electrical utility operating Silver King substation would be needed to determine the adequate voltage and construction engineering, including access roads to service Skunk Camp.

Tailings Facility – Closure and Reclamation

Toward the end of operations, the tailings would be deposited or regraded to slope toward the north. At the end of operations, the remaining area of PAG tailings would be covered with a minimum 10-foot layer of NPAG tailings. The surfaces of both the NPAG and PAG facilities would be shaped to prevent standing water and divert runoff into channels leading to the downstream collection pond, and both NPAG and PAG areas would be covered by a 1- to 2-foot layer of low-permeability, erosion-resistant soil (e.g., Gila conglomerate or equivalent soil, sand, and gravel mix) and revegetated. The timing of reclamation is dependent on the surface being dry enough to allow equipment access for reclamation. A closure channel would be cut into the ridge between the tailings storage facility and the Mineral Creek drainage to convey the closed tailings storage facility runoff north.

Estimated seepage rates suggest active closure would be required up to 20 years after the end of operations. Up to 5 years after closure, the recycled water pond is still present and therefore all engineered seepage controls could remain operational. After 5 years, the recycled water pond is no longer present and seepage collection ponds would be expanded to maximize evaporation with active water management until the ponds could passively evaporate all incoming seepage (estimated at 20 years). The sludge containing concentrated metals and salts from evaporation would likely require cleanup and handling as a solid or hazardous waste.

Other closure and reclamation measures, such as the removal of buildings, pipelines, electrical equipment and electrical lines, and the recontouring and revegetation of parking areas and other areas of ground disturbance, would be substantially identical to those described for Alternative 2. Upstream (upslope) surface water diversion walls, channels, and other stormwater control elements would remain permanently in place to continue to direct surface flows around and downstream of the tailings impoundments. Final reclamation plans would include the designs and long-term requirements for maintenance of these permanent facilities.

Table 2.2.8-1 summarizes the components of the Skunk Camp tailings storage facility.

Table 2.2.8-1. Summary of Alternative 6 – Skunk Camp tailings storage facility

Tailings Storage Facility	Description
Location	In Dripping Spring Wash approximately 13 miles north of confluence with the Gila River
Land ownership	ASLD, private
Distance from West Plant Site	15 miles
Tailings type and disposal	Thickened slurry tailings placed subaqueously for PAG tailings from barge in one of two cells, NPAG placed hydraulically from perimeter At disposal—PAG tailings would be 50% solids content; thickened cyclone overflow (NPAG) would be 60% solids content; and thickened NPAG stream sent directly from the mill would be 60% solids content.
Tailings embankment	Earthen starter dams raised with compacted cyclone sand. The NPAG facility would be a centerline construction approach with a 3H:1V slope and the PAG cells would be a downstream construction approach with a 2.5H:1V slope.
Lining and other seepage controls	Engineered, low-permeability layers would be installed on PAG cell foundation and the upstream slope of the embankment.
Approximate size at fence line of tailings storage facility	10,072 acres
Approximate embankment height	490 feet
Pipelines / conveyance	Thickened slurry pumped in two streams (PAG and NPAG) to the tailings storage facility and recycled water pipeline to return water to processing loop at West Plant Site North Option: 19.78 miles of corridor from West Plant Site to tailings storage facility South Option: 25.18 miles of corridor from West Plant Site to tailings storage facility
Auxiliary facilities	Surface water diversions would be large due to the steep surrounding terrain and need to surround the tailings facility on northern, eastern, and western sides with extensive stormwater diversion structures.
Other design considerations	No NFS roads are expected to be decommissioned or lost due to the tailings storage facility at Skunk Camp, although BLM has identified loss of access to mining activities and grazing facilities.
Closure and reclamation	Reclamation of the NPAG tailings embankment face would begin as soon as the slope reaches its final extent starting at approximately mine year 10–15. The top of the tailings storage facility would not be reclaimed until after mining is complete. Closure of the tailings recycled water pond is estimated to take up to 5 years after closure. Until that time, excess seepage in seepage ponds would be pumped back to the recycled water pond, and reclamation would take place on the embankment and tailings beaches. After the recycled water pond is closed, seepage ponds would be used to evaporate seepage, and the remaining reclamation of the tailings surface would occur.

2.2.9 Alternative GPO Components Common to All Action Alternatives

Minor modifications to two facilities proposed in the GPO have been considered in order to address specific resource impacts. These “alternative components,” described in the following subsections, may be applied to the proposed action or any of the action alternatives.

2.2.9.1 Relocation of Process Water Pond within West Plant Site

This alternative component would move the process water pond, as proposed in the GPO, off approximately 11.4 acres of NFS land immediately north of and adjacent to the West Plant Site and relocate the pond and associated facilities (e.g., fencing, stormwater control systems) fully within Resolution Copper private property boundaries on the western portion of the West Plant Site (figure 2.2.9-1).

As noted earlier, this potential amendment to the GPO was voluntarily brought to the attention of Tonto National Forest staff by representatives of Resolution Copper, who suggested this particular modification as a relatively low-cost change the company could make to reduce overall project impacts on NFS surface resources. It is anticipated that this alternative component to the GPO would be implemented under any project alternative and regardless of the site ultimately selected for location of the tailings storage facility and associated linear project features such as slurry pipelines and power lines.

2.2.9.2 Redesign and/or Improvement of Vehicle Access to and from the West Plant Site

Resolution Copper is also proposing an alternative routing of Silver King Mine Road (NFS Road 229), which would be used to transport mine personnel, equipment, supplies, and molybdenum and other mine products, to and/or from the West Plant Site (see figure 2.2.2-8). This rerouting is anticipated to reduce typical use of NFS Road 229 by mine personnel from 2.3 miles, as described in the GPO, to just 0.4 mile. It is anticipated that this alternative component to the GPO would be implemented under any project alternative and regardless of the site ultimately selected for location of the tailings storage facility and associated linear project features such as slurry pipelines and power lines.

2.3 Mitigation Common to All Action Alternatives

Mitigation measures, as defined by the CEQ regulations (40 CFR 1508.20), include the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating an impact over time, through preservation and maintenance operations during the life of the action; and
- Compensating for an impact by replacing or providing substitute resources or environments.

The Forest Service has developed mitigation measures and monitoring actions to be included as project design features in the proposed action and action alternatives. The effectiveness of the mitigation measures and monitoring actions has been evaluated as part of the projected impacts analyses for the proposed action and action alternatives. Refer to the impacts analyses in chapter 3 for further detail.

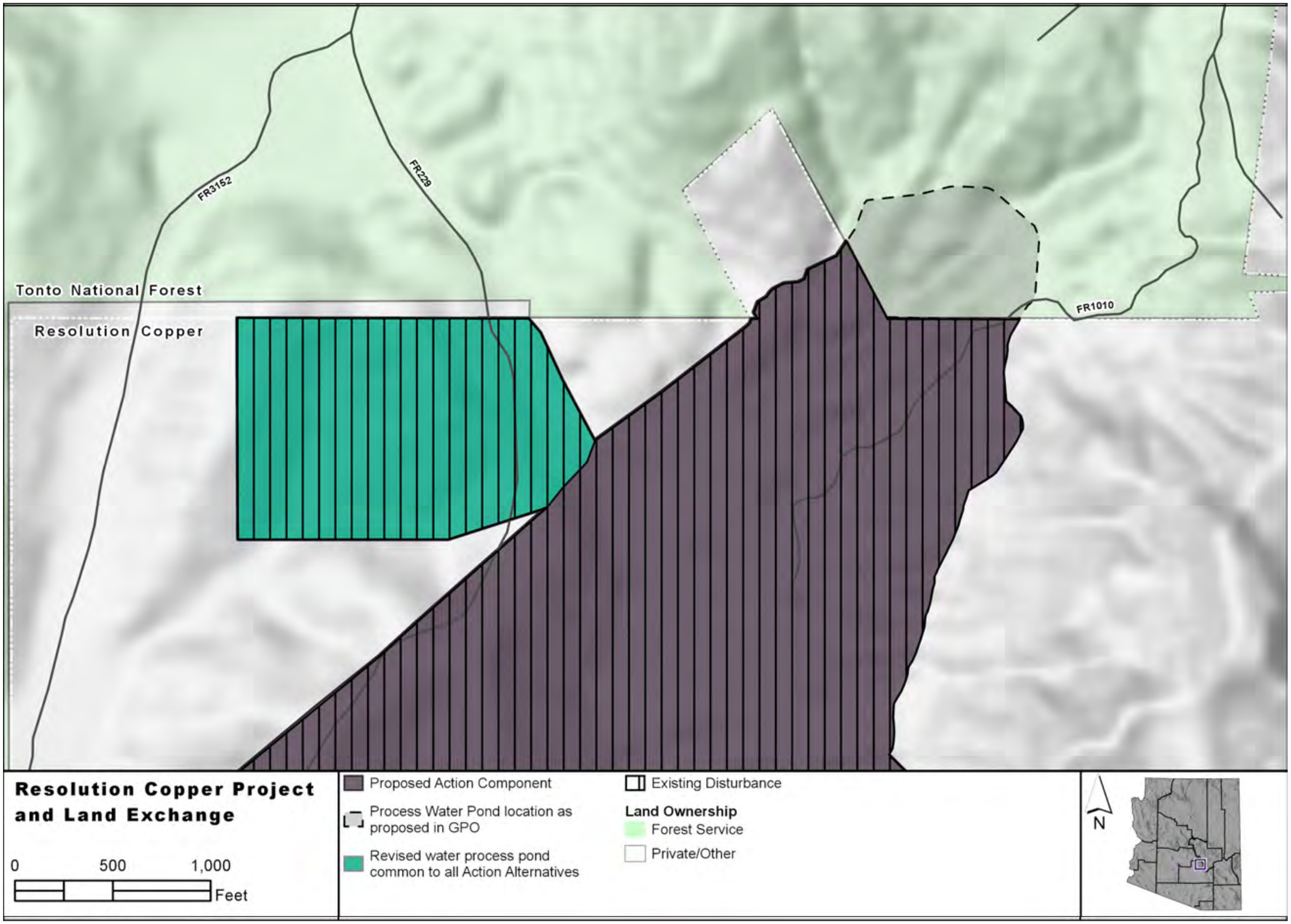


Figure 2.2.9-1. Relocation of process water pond within West Plant Site

2.3.1 Mitigation and Monitoring

The Forest Service has developed mitigation and monitoring actions that are evaluated in chapter 3 to be included in the proposed action and action alternatives. The framework for the project mitigation and monitoring plan is contained in appendix J of this DEIS. It is important to note that the full suite of mitigation measures and monitoring actions would not be known until many or most of the required permits have been issued, which often contain required measures intended to avoid or reduce environmental effects. It is fully expected that a more detailed and complete monitoring plan would be contained in the FEIS and ROD and ultimately included in the final GPO.

2.3.1.1 Authority

The CEQ (2011) states that agencies should not commit to mitigation measures absent the authority or expectation of resources to ensure that the mitigation is performed. The framework mitigation and monitoring plan is designed to clearly disclose which mitigation and monitoring items are within the authority of the Forest Service, or other regulatory and permitting agencies, such as the USACE, Arizona Department of Environmental Quality (ADEQ), and Arizona Department of Water Resources (ADWR).

Forest Service

The role of the Forest Service under its primary authorities in the Organic Administration Act, Locatable Regulations (36 CFR 228 Subpart A), and Multiple-Use Mining Act is to ensure that mining activities minimize adverse environmental effects on NFS surface resources.

Forest Service mitigation measures and monitoring are items that would help to minimize impacts on Forest Service surface resources; or are required by the project's U.S. Department of the Interior Fish and Wildlife Service (FWS) biological opinion, and the project's Programmatic Agreement (PA) with the Arizona State Historic Preservation Office (SHPO) and other signatories for compliance with the National Historic Preservation Act. The Forest Service is responsible for determining whether the implementation of mitigation and the results of monitoring comply with the decision that would be documented in the ROD and in compliance with the final GPO.

The Forest Service has no authority, obligation, or expertise to determine or enforce compliance with other agencies' laws or regulations. The Forest Service seeks to coordinate with other agencies to approve a legally compliant final GPO; however, it is the operator's responsibility to ensure that its actions comply with applicable laws.

Other Regulatory and Permitting Agencies

Mitigation and monitoring items under this heading are within the authority of other regulatory permitting agencies, including the ADEQ, ADWR, ASLD, BLM, Pinal County Air Quality District, and USACE. Mitigation and monitoring measures under this authority include permit requirements and stipulations from legally binding permits and authorizations, such as the air quality permit, Aquifer Protection Permit, and groundwater withdrawal permit (see appendix H for a complete listing of permit requirements and stipulations). These other regulatory and permitting agencies would share monitoring results and any instances of non-compliance with the Forest Service. The Forest Service would use the information provided by the regulatory and permitting agencies to determine compliance with the decision that would be documented in the ROD and compliance with the final GPO.

Resolution Copper

Resolution Copper has agreed to implement additional mitigation and monitoring measures in the mitigation and monitoring plan that are outside the scope of the authorities listed here. As these were considered as required in the resource analyses, the final ROD would require these mitigations be enforced. These include contractual, financial, and other agreements over which the Forest Service and other regulatory agencies have no jurisdiction. The Forest Service and regulatory agencies have no authority, obligation, or expertise to determine or enforce compliance of these measures. Since the Forest Service and regulatory permitting agencies cannot require implementation of the mitigation and monitoring measures in this authority, their implementation is not guaranteed until required by a signed final ROD and revised GPO with the mitigations included. The effectiveness of these mitigation measures is included in chapter 3 impact analyses.

2.3.1.2 Applicant-Committed Environmental Design Measures

Applicant-committed environmental design measures are features incorporated into the design of the project by Resolution Copper to reduce potential impacts on resources. These measures would be non-discretionary as they are included in the project design, and their effects are accounted for in the analysis of environmental consequences disclosed in each resource section of chapter 3.

2.3.1.3 Monitoring and Evaluation

Monitoring is fundamental for ensuring the implementation and effectiveness of mitigation commitments, meeting legal and permitting requirements, and identifying trends and possible means for improvement (Council on Environmental Quality 2011). CEQ regulations explicitly require that "a monitoring and enforcement program shall be adopted . . . where applicable for any mitigation" (40 CFR 1505.2(c)). In addition, any adaptive management approaches "must also describe the monitoring that would take place to inform the responsible official whether the action is having its intended effect" (36 CFR 220.5(e)). Detailed monitoring plans would be incorporated by reference into the agency's decision document to ensure that they are legally binding. The following monitoring plans would identify the monitoring area, the monitoring systems, and future actions if thresholds are triggered:

- Subsidence management plan (appendix to GPO)
- Groundwater mitigation and monitoring plan
- Road use plan (appendix to GPO)
- Environmental emergency and response and contingency plan (appendix to GPO)
- Fire prevention and response plan (appendix to GPO)
- Preliminary spill prevention control and countermeasures plan (SPCC) (appendix to GPO)
- Explosives management plan (appendix to GPO)
- Acid rock drainage management plan (appendix to GPO)
- Hydrocarbon management plan (appendix to GPO)
- Environmental materials management plan (appendix to GPO)
- Preliminary stormwater pollution prevention plan (SWPPP) (appendix to GPO)
- Wildlife management plan (appendix to GPO)
- Noxious weed and invasive species plan (Resolution Copper 2019)
- Historic properties treatment plan for Oak Flat land exchange parcel (Deaver and O'Mack 2019)
- Historic properties treatment plan for GPO (in process)
- Tailings pipeline management plan (AMEC Foster Wheeler Americas Limited 2019)
- Concentrate pipeline management plan (M3 Engineering and Technology Corporation 2019b)

Monitoring and evaluation activities would be prescribed, conducted, and/or reviewed by Resolution Copper, the Forest Service, and other agencies with regulatory or permitting authority. Resolution Copper would fund monitoring as set forth in the ROD, approved final GPO, and the final mitigation and monitoring plan. Other monitoring activities may be associated with the regulatory authority of other Federal and State agencies and would be funded by permit fees or the agencies themselves as part of their normal activities.

Evaluation and Reporting

Resolution Copper would submit an annual report to the Forest Service that contains a description of all activities conducted on NFS lands during the previous year and a summary of the amount of acreage disturbed, status of reclamation, spills or releases of chemicals or fuel, and results of all monitoring plans in a format approved by the Forest Service, including a complete data summary and any data trends, status of mining plan (tons of ore and waste mined and any changes to methods or equipment), and plans for the coming year. In addition to annual reporting, individual monitoring measures would also specify reporting requirements, which could include short-term emergency notification (for example, reporting spills within 72 hours) and interim reports (such as quarterly reports). The Forest Service would review reporting to ensure that mitigation commitments were implemented on NFS lands and the effectiveness of the mitigation. Significant changes would be required to be incorporated into the approved final GPO and reflected in financial assurance. Past, ongoing, or projected impacts on the environment may also require amendment of the approved final GPO, ROD, and/or financial assurance held for the project.

2.3.1.4 Financial Assurances

As part of the approval of a final GPO, the Forest Service would require Resolution Copper to post financial assurance, or reclamation bond, that would provide adequate funding to allow the Forest Service to complete reclamation and post-closure operation, maintenance activities, and necessary monitoring on NFS land for as long as required to return the site to a stable and acceptable condition. The amount of financial assurance would be determined by the Forest Service and would "address all Forest Service costs that would be incurred in taking over operations because of operator default" (U.S. Forest Service 2004). The financial assurance would be required in a readily available bond instrument payable to the Forest Service. In order to ensure that the bond can be adjusted as needed to reflect actual costs and inflation, there would be provisions allowing for periodic adjustment on bonds in the final GPO prior to approval.

The reclamation bond amount is an estimate of both direct and indirect costs to reclaim the operation, based on contractors performing the work. This estimate is also to consider the time of operation in which reclamation costs would peak. This cost peak can be determined by looking subjectively at the mine schedule and timing of greatest areas and volumes of disturbance and materials or quantitatively calculating reclamation costs on an annual basis. As reclamation plans evolve from conceptual designs during permitting to as-built designs during construction, the bond estimates and requirements would be adjusted. Further, "Reclamation standards and bond estimates (with accompanying details) become legally binding when the operator changes the proposed Plan of Operation to include them, posts the required bond, and is notified by the authorized officer that the Plan of Operation is approved" (U.S. Forest Service 2004).

Other agencies also require separate financial assurance. The USACE requires financial assurance under Section 404 of the CWA where applicable. The ADEQ, ASLD, and Arizona State Mine Inspector also require bonds as part of their permitting authority. The BLM would require bonds if the project occurred on lands under their permitting authority. The APP requires bonding for closure and groundwater protection. Since the components of the final decision are unknown at this time, it is premature for the Forest Service to calculate bond.

Further discussion of financial assurance is included in section 1.5.5, and in certain sections of chapter 3, including section 3.3 (Soils and Vegetation), 3.7.2 (Groundwater and Surface Water Quality), and 3.10.1 (Tailings and Pipeline Safety).

2.4 Effects of the Land Exchange

As described in section 2.2.3.1, a completed land exchange is considered for all resource analyses in chapter 3.

Physically, the panel caving proposed to take place under Oak Flat is independent of the land exchange. The deposit would be mined with fundamentally the same techniques and require fundamentally the same infrastructure, and result in the same surface subsidence, regardless of whether the surface is under Forest Service jurisdiction or is private. The two primary differences are (1) the regulatory framework under which mining would occur "with" or "without" Federal oversight, and (2) without the land exchange, minerals underneath the withdrawal boundary could not be extracted. If a land exchange does not occur, Resolution Copper would mine and reclaim the mined land under Federal, State, and local permits and an approved GPO under 36 CFR 228 Subpart A. If the land exchange does occur and the Oak Flat area becomes private lands, Resolution Copper would be required to conduct its activities in accordance with all applicable Federal, State, and local permits but may not be subject to the requirement of obtaining an approved GPO under 36 CFR 228 Subpart A.

Mine operations are governed by several Federal, State, and local regulatory frameworks. Each of the regulatory frameworks is founded in statute and implemented through regulations and policies of the responsible agency. Agency regulations or rules provide guidance to the agency so it can implement the laws and provide guidance to mine operators so they can follow the laws. Each agency requires certain types of information (filing requirements) before it can process and issue permits under its regulations. Many of the filing requirements for permits from the various agencies are duplicative, even though each agency has its own regulatory authority and responsibilities. Performance standards specify the norm governing how operations would occur and describe the level of compliance expected by the agency.

Performance standards required by the Forest Service for mining on Federal land are contained in 36 CFR 228.8: "All operations shall be conducted so as, where feasible, to minimize adverse environmental impacts on National Forest surface resources." These include specific requirements for air quality, water quality, solid waste, scenery values, fishery and wildlife habitat, roads, and reclamation.

State agencies have similar performance standards. For example, the goal of the State's Aquifer Protection Permit program is to ensure no degradation of the state's groundwater. ADEQ ensures this goal by implementing the performance standards outlined by the best available demonstrated control technology (Arizona Department of Environmental Quality 2004). Also, the goal of the state mined land reclamation rules is to ensure safe and environmentally sound reclamation of mined lands. The Office of the Arizona State Mine Inspector ensures this goal by requiring operators to meet operational and post-mine performance standards specified in the regulations at Arizona Revised Statutes (ARS) R11-2-601 *et seq*.

To ensure consistency, Federal, State, and local agencies in Arizona typically require that operators follow all other Federal, State, and local permit requirements and standards. The Forest Service specifies this explicitly for air quality (36 CFR 228.8(a)), water quality (36 CFR 228.8(b)), and solid waste (36 CFR 228.8(c)). Regulation also allows for certification or approval issued by State agencies or other Federal agencies to be accepted by the Forest Service as compliance with similar or parallel Forest Service regulations (36 CFR 228.8(h)).

While there is substantial overlap in many resources, there are also some resources that may lack any form of regulatory protection except under Federal jurisdiction. For instance, Forest Service regulations address scenic values (36 CFR 228.8(d)) and fisheries and wildlife habitat (36 CFR 228.8(e)), both of which are afforded little specific protection solely under other applicable Federal or State laws, the notable exception being species that are federally listed under the ESA.

A discussion of the differences in the regulatory framework if the land exchange occurs (mining occurs on private land) vs. if the land exchange does not occur (mining occurs under Forest Service jurisdiction) is included in appendix I.

2.5 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. The information on the following pages is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively between alternatives. See also Appendix E, Alternatives Impact Summary.

GEOLOGY, MINERALS, AND SUBSIDENCE — DEIS SECTION 3.2

Key factors to analyze the issue of geology, minerals, and subsidence	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of the extent, amount, and timing of land subsidence, with estimates of uncertainty • Assessment of potential public health risk from geological hazards, including seismic activity • Assessment of the potential to impact caves or karst resources, and paleontological resources • Assessment of impact on unpatented mining claims	Modeling indicates the subsidence area would first become evident at the surface at Oak Flat in mine year 6 or 7. At full mine development in year 40 or 41, the subsidence area is expected to be approximately 800–1,115 feet deep and approximately 1.8 miles in diameter. No damage is anticipated at Apache Leap, Devil's Canyon, or U.S. 60. Resolution Copper has stated they would cease mining additional subsurface panels if through ongoing monitoring it appears any of these areas would be impacted (see "Subsidence Impacts" in section 3.2.4.2). Potential risks to public safety from mine-induced seismic or other geological activity are low. Induced mine seismicity is possible, but unlikely to be of sufficient magnitude to cause structural damage (see "Geological Hazards" in section 3.2.4.2). With the exception of a small outcropping of Martin limestone that would be destroyed in the tailings facility footprint, no surface areas or geological units with known potential for caves, karsts, or paleontological resources are located within the predicted areas of disturbance (see "Paleontological Resources" and "Caves and Karst" in section 3.2.4.2). Access may be inhibited to non–Resolution Copper unpatented load or placer mining claims located under the tailings storage facility and pipeline (see "Unpatented Mining Claims" in section 3.2.4.2).	No. Subsidence is anticipated to only occur in the East Plant Site/Oak Flat area; these effects would be common to all action alternatives. Similarly, no geological or seismic activity of any kind is expected at any of the other proposed project facilities. All other alternatives also have non–Resolution Copper unpatented mining claims within either the tailings storage facility footprint or the tailings pipeline corridor.

SOILS AND VEGETATION — DEIS SECTION 3.3

Key factors to analyze the issue of soils and vegetation	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Acres of disturbance leading to lost soil productivity • Assessment of the potential for revegetation of tailings and other mine facilities, based on revegetation efforts conducted in central and southern Arizona • Evaluation of alteration of soil productivity and soil development • Assessment of impacts on special status vegetation species • Assessment of the potential to create conditions conducive for invasive species	All action alternatives, including Alternative 2, would result in impacts on endangered Arizona hedgehog cactus at the East Plant Site/subsidence area and possibly also at other project locations (see “Special Status Plant Species” in section 3.3.3.2 and “Construction/Operational Impacts” in section 3.3.4.2). Alternative 2 would remove or modify approximately 10,033 acres of vegetation and soils. Based on case studies in Arizona and New Mexico, a minimum of 8% of vegetation cover (including both native and non-native species) can consistently be established by year 10 within project disturbance areas (see “Expected Effectiveness of Reclamation Plans” in section 3.3.4.2). The revegetation response is expected to be influenced by the nature of the surface disturbance. Irrigation or active soil management could enhance revegetation success, thereby reducing erosional losses and net negative impacts on soil productivity. However, even with optimal soil management, impacts on soil health and productivity may last centuries to millennia; the ecosystem may not meet desired future conditions. Habitat may be suitable for generalist wildlife and plant species, but rare plants and wildlife with specific habitat requirements are unlikely to return (see “Potential to Achieve Desired Future Conditions” in section 3.3.4.2). The proposed project, under any action alternative, would increase the potential for noxious weed cover and possibly alter natural fire regimes. Reclamation of disturbed areas would decrease but not eliminate the likelihood of noxious weeds becoming established or spreading (see “Noxious Weeds” in section 3.3.4.2).	Yes. These discussions are applicable to all proposed and alternative tailings locations, but disturbance acreages would vary by alternative. Alternative 3: Same as Alternative 2 Alternative 4 would remove or modify approximately 10,861 acres of vegetation and soils. Alternative 5 would remove or modify approximately 17,153 to 17,530 acres of vegetation and soils, depending on pipeline route. Both the east and west pipeline corridor options would also impact critical habitat. The west pipeline option would disturb around 103 acres of Acuña cactus critical habitat, and the east pipeline option would disturb about 12 acres of critical habitat. Alternative 6 would remove or modify approximately 16,166 to 16,557 acres of vegetation and soils.

NOISE AND VIBRATION — DEIS SECTION 3.4

Key factors to analyze the issue of noise and vibration	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of the ability of alternatives to meet rural landscape expectations • Assessment of noise levels (A-weighted decibels [dBA]) and geographic area impacted from mine operations, blasting, and traffic, and qualitative assessment of effects of noise at nearby residences and sensitive receptors • Assessment of effects of vibrations from blasting and mine operations at nearby residences and sensitive receptors	Noise impacts were modeled for 15 sensitive receptors representing residential, recreation, and conservation land uses. Under most conditions, predicted noise and vibrations during construction and operations, for both blasting and non-blasting activities, at sensitive receptors are below thresholds of concern; rural character would not change due to noise (see section 3.4.4.2).	Yes. For Alternatives 3, 4, and 5, noise impacts are the same, with noise and vibration levels at sensitive receptors below thresholds of concern under most conditions. For Alternative 6, noise levels along Dripping Springs Road exceed thresholds of concern. However, there would be no residual impacts after mitigation is implemented (i.e., new routing of access road), therefore rural character would not be altered due to increased noise.

TRANSPORTATION AND ACCESS — DEIS SECTION 3.5

Key factors to analyze the issue of transportation and access	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of change in type and pattern of traffic by road and vehicle type • Assessment of the change in level of service (LOS) on potential highway routes and local roads • Assessment of roads decommissioned by the mine and roads lost to motorized access	Sixty-four trips expected during the peak hour in peak construction and 46 trips expected during the peak hour during normal operations. Project-related traffic would contribute to decreased LOS at many intersections; unacceptable LOS (E/F) caused by project-related traffic occurs at Silver King Mine Road/U.S. 60 (construction and operations), Main Street/U.S. 60 (construction and operations), SR 177/U.S. 60 (construction), and Magma Mine Road/U.S. 60 (operations). A total of 8.0 miles of NFS roads would be lost due to the West Plant Site, East Plant Site, and filter plant and loadout facility. For the tailings facility, 21.7 miles of NFS roads would be lost and decommissioned.	Yes. Alternatives 3, 5, and 6 would have similar impacts as Alternative 2, but Alternative 4 would increase to 88 trips expected during the peak hour in peak construction and 58 trips expected during the peak hour during normal operations, due to placing the filter plant and loadout facility at the West Plant Site. LOS impacts from project-related traffic are similar to Alternative 2 for all other alternatives. At Alternative 4, a total of 17.7 miles of NFS roads would be lost to the tailings storage facility. Alternative 5 would not have loss to NFS roads but would result in the loss or decommissioning of 29 miles of BLM inventoried routes. Alternative 6 would be located on private lands and impact 5.7 miles of Dripping Springs Road.

AIR QUALITY — DEIS SECTION 3.6

Key factors to analyze the issue of air quality	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Fugitive dust emissions • Stationary and mobile-source criteria air pollutant emissions and anticipated project conformance or non-conformance with National Ambient Air Quality Standards (NAAQS) • Conformance with the State Implementation Plan (SIP) in designated nonattainment and maintenance areas • Class I areas and air quality-related value impacts	Analysis finds that neither daily nor annual maximum impacts for fugitive dust ($PM_{2.5}$ and PM_{10}) would exceed established air quality thresholds; no predicted results for criteria pollutants are anticipated to exceed the NAAQS at the ambient air boundary/fence line (see "Air Quality Impact Assessment" in section 3.6.4.2). The Forest Service determined that no conformity analysis is warranted. While the East Plant Site would be partially located in the Hayden PM_{10} Nonattainment Area and the filter plant and loadout facility would be located in the West Pinal PM_{10} Nonattainment Area, modeling results demonstrate that the impacts from the proposed action and alternatives would not exceed ambient air quality standards for these areas, and PM_{10} emissions for stationary sources are well below the 100 tons/year threshold (see "Conformity" in section 3.6.3.2). Impacts are projected to be less than the PSD increments at all Class I areas but exceed 50% of the PM_{10} and $PM_{2.5}$ PSD increments at the Superstition Wilderness. Impacts on air quality-related values (deposition and visibility) would be within established thresholds for *de minimis* levels of acceptability (see "Impacts at Sensitive Areas" in section 3.6.4.2).	No. Emissions are largely similar between all alternatives, and no alternative is predicted to exceed NAAQS for criteria pollutants at the ambient air boundary/fence line.

WATER RESOURCES: GROUNDWATER QUANTITY AND GROUNDWATER-DEPENDENT ECOSYSTEMS (GDES) — DEIS SECTION 3.7.1

Key factors to analyze the issue of groundwater quantity and groundwater-dependent ecosystems	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Geographic extent in which water resources may be impacted and number of GDEs degraded or lost. • Impact on public groundwater supplies • Comparison of mine water needs • Potential for subsidence to occur as a result of groundwater withdrawal.	Under no action, six GDEs (all springs) are anticipated to be impacted by groundwater drawdown from ongoing dewatering (see “Alternative 1 – No Action” in section 3.7.1.4). When block-caving occurs, groundwater impacts expand to overlying aquifers and two more GDEs (springs) are anticipated to be impacted. Alternative 2 also directly disturbs five GDEs (all springs), and reductions in stormwater runoff impact three more GDEs (Devil’s Canyon and two reaches of Queen Creek). There are surface water rights associated with many of these GDEs. A total of 16 GDEs would be impacted by Alternative 2. Loss of water would be mitigated but impacts on natural setting would remain (see Alternative 2, “Groundwater-Dependent Ecosystems Impacted,” in section 3.7.1.4). Groundwater supplies in Superior and Top-of-the-World could be impacted by groundwater drawdown but would be replaced through mitigation (see “Anticipated Impacts on Water Supply Wells” in section 3.7.1.4). Over the mine life, Alternative 2 would dewater about 87,000 acre-feet from the mine and would require about 590,000 acre-feet of makeup water pumped from the Desert Wellfield. The wellfield pumping would incrementally contribute to ground subsidence in the East Salt River valley, and cumulatively reduce overall groundwater availability in the area (see ”Changes in Basin Water Balance – Mine Dewatering” and Alternative 2, “Changes in Desert Wellfield Pumping,” in section 3.7.1.4; and also see section 3.7.1.5).	Yes. There are differences between alternatives in the number of GDEs impacted and the amount of makeup water required. Alternative 3 would impact the same GDEs as Alternative 2 but would pump about 490,000 acre-feet from the Desert Wellfield over the mine life (see Alternative 3 in section 3.7.1.4). Alternative 4 would impact 14 GDEs (eight springs from groundwater drawdown, three springs from direct disturbance, and three stream reaches from reductions in stormwater runoff [Devil’s Canyon and two areas of Queen Creek]). Alternative 4 uses filtered tailings and would pump about 180,000 acre-feet from the Desert Wellfield over the mine life, much less than the other alternatives (see Alternative 4 in section 3.7.1.4). Alternative 5 would impact 14 GDEs (eight springs from groundwater drawdown, two springs from direct disturbance, and four stream segments from reductions in stormwater runoff [Devil’s Canyon, two areas of Queen Creek, and the Gila River]). Alternative 5 would pump about 540,000 acre-feet from the Desert Wellfield over the mine life (see Alternative 5 in section 3.7.1.4). Alternative 6 would impact the same GDEs and would pump about the same amount of water as Alternative 5 (see Alternative 6 in section 3.7.1.4).

WATER RESOURCES: GROUNDWATER AND SURFACE WATER QUALITY — DEIS SECTION 3.7.2

Key factors to analyze the issue of groundwater and surface water quality	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Anticipated groundwater and surface water quality changes, compared for context to Arizona water quality standards, in the block-cave zone and from tailings seepage • Anticipated surface water quality impacts from stormwater runoff • Assessment of seepage control techniques • Potential for a lake to develop in the subsidence crater • Reductions in assimilative capacity • Potential impacts on impaired waters • Assessment of the potential for processing chemicals, asbestos, or radioactive materials in tailings seepage	After closure, the reflooded block-cave zone is anticipated to have poor water quality (above Arizona water standards). No lake is anticipated to develop in the subsidence crater, and no other exposure pathways exist for this water (see “Potential for Subsidence Lake Development” in section 3.7.2.4). Stormwater runoff could have poor water quality but no stormwater contacting tailings or facilities is released during operations or post-closure until reclamation is successful and water meets appropriate standards (see “Potential Surface Water Quality Impacts from Stormwater Runoff” in section 3.7.2.4). Engineered seepage controls designed for Alternative 2 are modeled to capture 99% of seepage. No concentrations are above aquifer water quality standards; however, selenium concentrations in Queen Creek at Whitlow Ranch Dam are anticipated to be above surface water standards. There are substantial difficulties in adding additional seepage controls at this location; the risk for potential water quality problems is high (see Alternative 2, “Potential Water Quality Impacts from Tailings Storage Facility,” in section 3.7.2.4). Assimilative capacity for selenium in Queen Creek is used up by impact of tailings seepage. Queen Creek is impaired for copper, and copper load from tailings seepage inhibits watershed load reduction efforts (see “Potential Impacts on Impaired Waters” and “Predicted Reductions in Assimilative Capacity” in section 3.7.2.4). Analysis found little risk of processing chemicals, asbestos, or radioactive materials to persist in tailings or tailings seepage (see “Other Water Quality Concerns” in section 3.7.2.4).	Yes. All alternatives differ in engineered seepage controls, risk of water quality problems from tailings seepage, and impacts on downstream waters for assimilative capacity and impairment. Engineered seepage controls designed for Alternative 3 are modeled to capture 99.5% of seepage. This results in no concentrations above aquifer or surface water standards. Adding seepage controls at this location would be difficult, and risk for potential water quality problems high (see Alternative 3, “Potential Water Quality Impacts from Tailings Storage Facility,” in section 3.7.2.4). Engineered seepage controls designed for Alternative 4 are assumed (not modeled) to capture 90% of seepage. This results in no concentrations are above aquifer water quality standards; however, selenium concentrations in Queen Creek at Whitlow Ranch Dam are anticipated to be above surface water standards. Some potential exists to add seepage controls at this location, so risk of potential water quality problems is less than Alternatives 2 and 3 (see Alternative 4, “Potential Water Quality Impacts from Tailings Storage Facility,” in section 3.7.2.4). Engineered seepage controls designed for Alternative 5 are modeled to capture 84% of seepage. This results in no concentrations above aquifer or surface water standards. Alternative 5 also has substantial flexibility for adding other layers of seepage controls during operations as needed (see Alternative 5, “Potential Water Quality Impacts from Tailings Storage Facility,” in section 3.7.2.4). Engineered seepage controls designed for Alternative 6 are modeled to capture 90% of seepage. This results in no concentrations above aquifer or surface water standards. Alternative 6 also has substantial flexibility for adding other layers of seepage controls during operations as needed (see Alternative 6, “Potential Water Quality Impacts from Tailings Storage Facility,” in section 3.7.2.4).

WATER RESOURCES: SURFACE WATER QUANTITY — DEIS SECTION 3.7.3

Key factors to analyze the issue of surface water quantity	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of the change in volume, frequency, and magnitude of runoff from the project area, as it affects Devil's Canyon, Queen Creek, and the Gila River • Acres of 100-year floodplains impacted • Acres of wetland impacted, based on National Wetlands Inventory • Acres of potentially jurisdictional waters of the U.S. (Clean Water Act 404 permit) • Potential changes in downstream geomorphology and sediment yield	There would be a reduction in average annual runoff due to the subsidence crater capturing precipitation, amounting to 3.5% at the mouth of Devil's Canyon, and 3.5% in Queen Creek at Whitlow Ranch Dam. The Alternative 2 tailings storage facility also captures precipitation, resulting in a combined loss in Queen Creek at Whitlow Ranch Dam of 6.5% (see Alternative 2, "Impacts on Surface Runoff and Streamflow," in section 3.7.3.4). Alternative 2 impacts 8.5 acres of floodplain (though Federal Emergency Management Agency [FEMA] coverage is incomplete), 98.6 acres of wetlands in the National Wetlands Inventory (94% of these are xeroriparian/ephemeral washes), and zero acres of impacts of jurisdictional waters (the USACE gave an approved delineation to Resolution Copper in 2015 that indicates waters upstream of Whitlow Ranch Dam are not considered jurisdictional; see Alternative 2 in section 3.7.3.4). Geomorphology and sediment impacts in downstream waters are unlikely to change for any alternative, due to nature of ephemeral washes and stormwater controls (see "Impacts on Sediment Yields and Geomorphology of Streams" in section 3.7.3.4).	Yes. Alternative 3 is identical to Alternative 2, but surface flow reductions, floodplains, wetlands, and waters of the U.S. differ for Alternatives 4 through 6. Alternative 4 results in an 8.9% combined loss of average annual runoff in Queen Creek at Whitlow Ranch Dam and 19.9% loss in Queen Creek at Boyce Thompson Arboretum. Alternative 4 impacts the same floodplains as Alternative 2, 90.5 acres of wetlands in the National Wetlands Inventory (95% of these are xeroriparian/ ephemeral washes), and zero acres of impacts on jurisdictional waters (see Alternative 4 In section 3.7.3.4). Alternative 5 results in a 0.2% loss of average annual runoff in the Gila River at Donnelly Wash. Alternative 5 impacts up to 171 acres of floodplains (varies by pipeline route), up to 228.6 acres of wetlands in the National Wetlands Inventory (96% are xeroriparian/ ephemeral washes), and 182.5 acres of potentially jurisdictional waters of the U.S. (Alternatives 5 and 6 are not in the Queen Creek drainage, unlike Alternative 2; see Alternative 5 in section 3.7.3.4). Alternative 6 results in a 0.5% loss of average annual runoff in the Gila River at Dripping Spring Wash and 0.3% in the Gila River at Donnelly Wash. Alternative 6 impacts 794 acres of mapped floodplain, up to 274 acres of wetlands in the National Wetlands Inventory (85% are xeroriparian/ephemeral washes), and 120 acres of potentially jurisdictional waters (see Alternative 6 in section 3.7.3.4).

WILDLIFE AND SPECIAL STATUS WILDLIFE SPECIES — DEIS SECTION 3.8

Key factors to analyze the issue of wildlife	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of effects on riparian habitat and species due to changes in flow • Assessment of acres of suitable habitat disturbed for each special status species and by type of terrestrial and aquatic habitat lost, altered, or indirectly impacted • Potential of mortality of animal species resulting from the increased volume of traffic related to mine operations • Effects on wildlife behavior from noise, vibrations, and light • Change in movement corridors and connectivity between wildlife habitats • Impacts on aquatic habitats and surface water that support wildlife and plants	Alternative 2 would impact 16 groundwater-dependent ecosystems (GDEs). For the springs or stream segments impacted by groundwater drawdown or surface water flow reductions, mitigation would replace the water source and prevent widespread loss of riparian habitat. The remaining GDEs are lost to surface disturbance and would not be mitigated. Loss of xeroriparian habitat occurs for all alternatives. Habitat would be impacted to some extent for 50 special status wildlife species (see table 3.8.4.2 for details). Specific impacts could occur with western yellow-billed cuckoo (endangered) and southwestern willow flycatcher (endangered) from vegetation removal or project activities. Gila chub (endangered) has critical habitat along Mineral Creek but is not known to be present and habitat in Mineral Creek is not anticipated to be impacted (see “Impacts on Special Status Wildlife Species” in section 3.8.4.2). There is a high probability of mortality and/or injury of wildlife individuals from collisions with mine construction and employee vehicles as well as the potential mortality of burrowing animals in areas where grading would occur. Some individuals would be likely to move away from the sources of disturbance to adjacent or nearby habitats. Project-related noise, vibration, and light may also lead to increased stress on individuals and alteration of feeding, breeding, and other behaviors (see “General Construction Impacts” and “General Operations Impacts” in section 3.8.4.2). There would be loss and fragmentation of movement and dispersal habitats from the subsidence area and tailings storage facility. Ground-clearing and consequent fragmentation of habitat blocks for other mine-related facilities would also inhibit wildlife movement (see “Wildlife Connectivity” in section 3.8.4.2). There are 15 identified wildlife waters within 5 miles of the project footprint. Under Alternative 2, three would be lost beneath the tailings storage facility.	Yes. Alternative 3 is similar to Alternative 2. Alternative 4 would have more reduction in surface flow and greater impacts on Queen Creek. Alternatives 5 and 6 would have less impact on Queen Creek due to surface flow reductions. A total of 14 GDEs and 2 wildlife waters would be impacted under Alternatives 4, 5, and 6. Specific acres of habitat affected varies between alternatives (see table 3.8.4.2 for details). Alternative 6 (north and south tailings corridor options) would impact the greatest amount of acreage for Habitat Block 1 areas.

RECREATION — DEIS SECTION 3.9

Key factors to analyze the issue of recreation	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Changes in Recreation Opportunity Spectrum designations • Assessment of acres of the Tonto National Forest that would be unavailable for recreational use, for various phases of mine life and reclamation • Assessment of potential for noise to reach recreation areas (i.e., audio "footprint") • Assessment of impacts on solitude in designated wilderness and other backcountry areas • Assessment of hunter-days lost (quantity based on number of permits available and number of days in season) • Assessment of miles of Arizona National Scenic Trail, NFS trails, or other known trails requiring relocation, and qualitative assessment of user trail experience • Assessment of increased pressure on other areas, including roads and trails/ trailheads, from displacement and relocation of recreational use as a result of mine facilities	Under Alternative 2, based on the Recreation Opportunity Spectrum (ROS) designation of user experiences, direct removal of 5,288 acres of the semi-primitive motorized setting, and 2,215 acres within the roaded natural setting (see table 3.9.4-1). All public access would be eliminated on 4,933 acres. Rock climbing opportunities at Euro Dog Valley, Oak Flat, and other portions of the mine area would be lost under all action alternatives but would be partially mitigated by new climbing area(s) set aside by Resolution Copper (see "Rock Climbing" in section 3.9.4.2). Under most conditions, with sensitive receptors representing recreation users, predicted noise during construction and operation are below thresholds of concern (see Alternative 2, "Recreation Opportunity Spectrum," in section 3.9.4.3). Visitors to the Superstition Wilderness, Picketpost Mountain, and Apache Leap would have foreground and background views of the tailings facilities from trails and overlooks, and the recreation setting from certain site-specific views could change. Under Alternative 2, 0.07 mile of the tailings pipeline corridor would intersect the Arizona Trail (see Alternative 2, "Recreation Sites," in section 3.9.4.3). The number of Arizona hunting permits that are issued in individual Game Management Units would not change as a result of the any of the action alternatives being implemented, though some individual's preferred hunting grounds may be lost (see "Hunting" in section 3.9.4.2). Under all action alternatives, it is likely that increased use would occur on other nearby lands that provide similar experiences, depending upon the recreational user type. A minor to moderate increase in user activity would be expected to occur in recreational use areas elsewhere, with uses largely similar to those displaced.	Yes. Alternative 3 is identical to Alternative 2. Alternative 4 would remove 5,548 acres of the semi-primitive motorized setting and 2,078 acres within the roaded natural setting. Alternative 4 would require 3.05 miles of the Arizona Trail to be closed and relocated to an area that would be safe for public use. Under Alternative 4, 26 NFS roads would be impacted for motorized recreation. Alternative 5 (east option) would remove 986 acres of the semi-primitive motorized setting, 1,209 acres of the semi-primitive non-motorized setting, and 1,977 acres of the roaded natural setting. Alternative 5 (west option) would remove 1,173 acres of the semi-primitive motorized setting, and 1,453 acres of the roaded natural setting. Under Alternative 5, 23 miles of BLM routes would be impacted for motorized recreation, and additional BLM and NFS roads would be crossed by the pipeline. Alternative 5 would intersect the Passage 16 segment of the Arizona Trail by 0.18 mile of the proposed tailings storage facility east pipeline. Visitors to the White Canyon Wilderness would have background views of the Alternative 5 east pipeline from some trails and overlooks. Alternative 6 (north option) would remove 1,665 acres of the semi-primitive motorized setting, and 1,740 acres of the roaded natural setting. Alternative 6 (south option) would remove 1,617 acres of the semi-primitive motorized setting, and 2,054 acres of roaded natural setting. Under Alternative 6, no BLM or NFS roads are within the footprint, although roads are crossed by the pipeline. The Alternative 6 south pipeline would be visible from trails and overlooks on Picketpost Mountain and the north pipeline from Superstition Wilderness.

PUBLIC HEALTH AND SAFETY: TAILINGS AND PIPELINE SAFETY — DEIS SECTION 3.10.1

Key factors to analyze the issue of tailings and pipeline safety	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Qualitative assessment of the risk of failure of tailings embankment or concentrate/tailings pipelines and potential impacts downstream in the event of a failure	Risk of failure of all alternatives is minimized by required adherence to National Dam Safety Program and APP standards, and applicant-committed environmental protection measures (see "Federal Requirements for Tailings Facility Design" in section 3.10.1.3). Failure of a slurry tailings facility has historically been demonstrated to have the potential to runout tailings dozens or even hundreds of miles downstream. Consequences of a catastrophic failure at the Alternative 2 tailings storage facility would include possible loss of life and limb, destruction of property, and displacement of large populations with a downstream population of over 600,000, including Queen Valley, within a few miles downstream. A catastrophic failure would disrupt the Arizona economy, would result in contamination of soils and water, and would jeopardize water supplies for over 700,000 people and key water infrastructure like the CAP canal (see 3.10.1.4, Alternative 2). Consequences of a concentrate or tailings pipeline failure would include soil and water contamination and destruction of vegetation in any water bodies crossed. The Alternative 2 embankment is less resilient than Alternatives 5 and 6 due to: • modified-centerline construction instead of centerline construction • a long embankment (10 miles) • a freestanding structure • the potential to release PAG materials during a failure	Yes. While all built to the same standards, the alternatives differ in downstream environment and resilience of the design. Alternative 3 is similar to Alternative 2, but the design is more resilient because of the use of ultrathickened tailings (see Alternative 3 in section 3.10.1.4). Alternative 4 is fundamentally different from the other action alternatives. As a filtered tailings facility, if Alternative 4 were to fail, it would likely fail as an earth slump or landslide, impacting only several miles of xeroriparian wash and not jeopardizing life and limb, property, or water supplies (see Alternative 4 in section 3.10.1.4). Alternative 5 has smaller downstream populations (32,000), with no major population center for 20 miles. The Gila River Indian Community and substantial agricultural water supplies are downstream. Alternative 5 facility is more resilient than Alternatives 2 and 3 due to: centerline construction, a slightly shorter embankment (7 miles), and storage of PAG in separate cells that use downstream embankments (see Alternative 5 in section 3.10.1.4). Alternative 6 has the smallest downstream population (3,200) but with a population center just downstream. The Alternative 6 facility is more resilient than Alternatives 2, 3, or 5 due to: centerline construction, the shortest embankment (3 miles), cross-valley construction, and storage of PAG in separate cells that use downstream embankments (see Alternative 6 in section 3.10.1.4).

PUBLIC HEALTH AND SAFETY: FUELS AND FIRE MANAGEMENT — DEIS SECTION 3.10.2

Key factors to analyze the issue of fuels and fire management	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Potential for increased fire risk due to mine operations (i.e., inadvertent ignition) • Potential for increased fuelwood loads in the Oak Flat area as a result of subsidence and dewatering • Adequacy of Forest Service and municipal fire teams and equipment to respond to wildfires	Wildland fire is always a risk, particularly in areas where human activities and greater densities of standing and fallen vegetation intersect (areas, for example, such as Oak Flat). It is assumed that MSHA regulations, Resolution Copper's own internal policies, as well as Forest Service and Pinal County–announced fire risk alerts and restrictions during periods of drier conditions and higher winds, would serve to prevent most cases of inadvertent, human-caused ignition (see section 3.10.2.4). While some increase in dead and dying vegetation within the subsidence area may be expected, other plants may be expected to persist and still others to reestablish within the area, particularly once active subsidence ceases. The risk of human-caused ignitions in the subsidence area is effectively negligible because the area would be fenced off and no entry would be permitted. Die-off of riparian vegetation is not anticipated as a consequence of dewatering in the Oak Flat area generally, because agreed-upon mitigation measures would ensure replacement water in these areas. Wildland fire response in and adjacent to the project areas would be provided by local fire department personnel such as those from the Town of Superior. The Tonto National Forest, BLM, and Pinal County also provide support for initial wildland fire attack for areas within and adjacent to wildland–urban interface (WUI) areas, while the Arizona Department of Forestry and Fire Management is responsible for suppression of wildland fire on State Trust land and private property located outside incorporated communities. Historically, these assets and accompanying wildland fire control strategies have been considered adequate; it should be noted, however, that fire response resources tend to become limited during the height of the annual fire season due to commitments elsewhere in the state (see "Wildfire Response" in section 3.10.2.3).	Yes. While under any of the alternatives, the risk of inadvertent ignition and resulting wildland fire is considered quite low, Alternative 4 includes areas classified with shrub fuels (SH7) that burn with high intensity in the event of an ignition. Intense fire behavior was observed within the footprint of Alternative 4 during the Peachville Fire, which burned a portion of the proposed tailings area in 2005. In addition, the southern portion of the footprint for Alternative 4 is located within the WUI for the town of Superior, meaning this location could potentially expose life and property to wildfire impacts should an ignition occur. On the other hand, because of the close proximity to Superior, fire response to the area should be rapid with emergency services provided by both the Tonto National Forest and the Town of Superior (see section 3.10.2.4).

PUBLIC HEALTH AND SAFETY: HAZARDOUS MATERIALS — DEIS SECTION 3.10.3

Key factors to analyze the issue of hazardous materials	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Amount, type, location of storage, use, and disposal of hazardous materials and potential for release to the environment • Transportation of hazardous materials to the project area and potential for release to the environment • Fate and transport of different types of hazardous materials if they enter the environment	The Resolution Copper GPO and appendix G of the EIS provide information on the company's expected use of various chemicals and other hazardous materials in its mining and processing operations. MSHA and other regulations and standards govern the transport and storage of explosives and hazardous chemicals; risks of spills or releases are therefore considered possible, but unlikely. Potential releases of hazardous materials during transportation could occur, but the fate and transport of those hazardous materials depend entirely on where the release occurs and the quantity of the release. The company would be required by various local, State, and Federal regulations to maintain spill prevention, control, and emergency response plans.	No. See section 3.10.3.4.

SCENIC RESOURCES — DEIS SECTION 3.11

Key factors to analyze the issue of scenic resources	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Acres of Tonto National Forest that would no longer meet current forest plan Visual Quality Objective designations • Anticipated changes in landscape character from key analysis viewpoints, for various phases of mine life and reclamation • Miles of project area visibility along major thoroughfares in the area (i.e., U.S. 60, SR 79, and SR 177) • Potential for increase in sky brightness resulting from the mine facility and mine-related vehicle lighting	Analysis finds that within the project footprint the following acreage totals have designations that would not allow for the proposed project activities: 393 acres of Retention, and 5,184 acres of Partial Retention (see table 3.11.4-2). The analysis of anticipated changes in landscape character from key analysis viewpoints for Alternative 2 is too extensive to summarize here and is presented in tables 3.11.4-1, 3.11.4-3, 3.11.4-4, and 3.11.4-5. Analysis shows that Alternative 2 facilities would be visible along 21.2 miles of U.S. 60 and 2.5 miles of SR 177 (see table 3.11.4-4). Lighting at the East Plant Site, West Plant Site, and tailings facility would be visible and noticeable at night from the town of Superior, U.S. 60, Boyce Thompson Arboretum, the Arizona Trail, and the surrounding national forest landscape (see Alternative 2, “Dark Skies,” in section 3.11.4.1).	Yes. Under Alternative 4, analysis finds that within the project footprint the following acreage totals have designations that would not allow for the proposed project activities: 371 acres of Retention, and 4,663 acres of Partial Retention (see table 3.11.4-2). Analysis of anticipated changes in landscape character for Alternative 4 is presented in tables 3.11.4-6 and 3.11.4-7. Alternative 4 facilities would be visible along 18.3 miles of U.S. 60 and 3.6 miles of SR 177 (see table 3.11.4-6). Under Alternative 5, analysis finds that within the project footprint the following acreage totals have designations that would not allow for the proposed project activities: 691 (east) or 530 (west) acres of Retention, and 1,905 (east) or 1,824 (west) acres of Partial Retention (see table 3.11.4-2). Analysis of anticipated changes in landscape character for Alternative 5 is presented in tables 3.11.4-8 and 3.11.4-9. Alternative 5 facilities would be visible along 1.5 miles of U.S. 60 and 1.5 miles of SR 177 (see table 3.11.4-8). Under Alternative 6, analysis finds that within the project footprint the following acreage totals have designations that would not allow for the proposed project activities: 676 (north) or 771 (south) acres of Retention, and 2,043 (north) or 2,225 (south) acres of Partial Retention (see table 3.11.4-2). Analysis of anticipated changes in landscape character for Alternative 6 is presented in table 3.11.4-10. Dark sky impacts are similar among alternatives.

CULTURAL RESOURCES — DEIS SECTION 3.12

Key factors to analyze the issue of cultural resources	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of the impacts on places of traditional and cultural significance to Native Americans, including natural resources • Assessment of number of NRHP-eligible historic properties, sacred sites, and other landscape-scale properties to be buried, destroyed, or damaged • Assessment of impacts on historic properties, including number of NRHP-eligible historic properties expected to be visually impacted	The NRHP-listed *Chí'chil Biłdagoteel* Historic District TCP would be directly and permanently damaged. Under Alternatives 2 and 3, 101 NRHP-eligible sites and 31 sites of undetermined eligibility would be directly affected; another 29 sites would be indirectly affected (see "Direct Impacts" and "Indirect Impacts" in section 3.12.4.3). Additional historic properties and archaeological sites are located within 6 miles of the proposed project and could be impacted by their proximity to mining disturbance (see "Atmospheric Impacts" in section 3.12.4.3).	Under any action alternative, impacts of mine development at the associated project facilities would have equivalent adverse effects on cultural resources. Some surveys continue; all alternatives will be 100% pedestrian surveyed. For Alternative 4, 122 NRHP-eligible sites and 15 sites of undetermined eligibility would be directly affected; another 25 sites would be indirectly affected (see section 3.12.4.5). For Alternative 5 east option, 125 NRHP-eligible sites and 27 sites of undetermined eligibility would be directly affected; another 44 sites would be indirectly affected (see section 3.12.4.6). For Alternative 5 west option, 114 NRHP-eligible sites and 11 sites of undetermined eligibility would be directly affected; another 29 sites would be indirectly affected (see section 3.12.4.6). For Alternative 6 north option, 318 NRHP-eligible sites and 5 sites of undetermined eligibility would be directly affected depending on pipeline route; another 25 additional sites would be indirectly affected (see section 3.12.4.7). For Alternative 6 south option, 343 NRHP-eligible sites and 17 sites of undetermined eligibility would be directly affected depending on pipeline route; as another 41 additional sites would be indirectly affected (see section 3.12.4.7).

SOCIOECONOMICS — DEIS SECTION 3.13

Key factors to analyze the issue of socioeconomics	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of potential changes in employment, labor earnings, and area economic output as a result of the Resolution Copper Mine, including direct and indirect economic effects • Assessment of changes to tax revenues; potential increased need for road maintenance and local emergency services; potential changes in tourism and recreation; potential effects on property values	On average, the mine is projected to directly employ 1,500 workers, pay about $134 million per year in total employee compensation, and purchase about $546 million per year in goods and services. Including direct and multiplier effects, the proposed mine is projected to increase average annual economic value added in Arizona by about $1 billion (see “Impact on Employment, Earnings, and Value Added” under “Socioeconomic Impacts” in section 3.13.4.2). The proposed mine is projected to generate an average of between $88 and $113 million per year in state and local tax revenues and would also produce substantial revenues for the Federal Government, estimated at over $200 million per year (see “State and Local Government Revenue Summary” under “Socioeconomic Impacts” in section 3.13.4.2). Construction and operations of the proposed mine could affect both the Town of Superior’s costs to maintain its network of streets and roads as well as those of Pinal County. A number of agreements between Resolution Copper and the Town of Superior would offset impacts on quality of life, education, and emergency services (see “Mine-Related Demands and Costs for Public Services” under “Socioeconomic Impacts” in section 3.13.4.2). Property values are expected to decline in close proximity to the tailings storage facilities and are estimated to average 4.1% under Alternative 2 (see “Potential Property Value Effects” under “Socioeconomic Impacts” in section 3.13.4.2). Loss of hunting revenue due to the tailings storage facility is expected to be greatest under Alternative 2 (see “Potential Effects on the Nature-Based Tourism Economy” under “Socioeconomic Impacts” in section 3.13.4.2).	Yes. Socioeconomic effects under any of the action alternatives are anticipated to be fundamentally the same as Alternative 2, except for property values and hunting revenue. Property values are expected to decline 10.6% under Alternative 4; approximately 6.3% under Alternative 5; and about 4.0% under Alternative 6 (see table 3.13.4-5). Loss of hunting revenue is similarly high under Alternative 4, and lowest under Alternative 5. Being private and State lands, hunting effects have yet to be determined for Alternative 6.

TRIBAL VALUES AND CONCERNS — DEIS SECTION 3.14

Key factors to analyze the issue of tribal values and concerns	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Assessment of how cumulative resource disturbance impacts tribal values and spiritual practices • Assessment of number of sacred springs or other discrete sacred sites that would be impacted, and potential effects on Native Americans from the desecration of land, springs, burials, and sacred sites • Estimated acres of traditional resource collection areas that would be impacted	Development of the Resolution Copper Mine would directly and permanently damage the NRHP-listed *Chí'chil Biłdagoteel* Historic District TCP. Other large-scale mine development along with smaller transportation, utility, and private land development projects in the greater Superior region may also affect places and resources of value to Native Americans, including historical and ceremonial sites and culturally valued landforms and features. Dewatering or direct disturbance would impact between 14 and 16 groundwater dependent ecosystems, mostly sacred springs. While mitigation would replace water, impacts would remain to the natural setting of these places. Burials are likely to be impacted; the numbers and locations of burials would not be known until such sites are detected as a result of mine-related activities. Under this or any action alternative, one or more Emory oak groves at Oak Flat, used by tribal members for acorn collecting, would likely be lost. Other unspecified mineral- and/or plant-collecting locations would also likely be affected; historically, medicinal and other plants are frequently gathered near springs and seeps, so drawdown of water at these locations may also adversely affect plant availability.	Under any action alternative, impacts of mine development at the East Plant Site (Oak Flat), West Plant Site, MARRCO corridor, and at other ancillary facilities would have equivalent adverse effects on tribal values and concerns. Impacts on tribal values and concerns would be similar in context and intensity under Alternatives 4, 5, and 6; however, because the tailings storage facility under each of these alternatives would be in a different location, the specific impacts on potentially meaningful sites, resources, routes, and viewsheds would vary. See sections 3.11.4 (Scenic Resources), 3.12.4 (Cultural Resources), and 3.14.4 (Tribal Values and Concerns) for detailed impact analyses specific to each alternative.

ENVIRONMENTAL JUSTICE — DEIS SECTION 3.15

Key factors to analyze the issue of environmental justice	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Potential for disproportionate economic effects on identified environmental justice communities in the analysis area (see “Potential Effects on Environmental Justice Communities by Resource” in section 3.15.4.3)	Environmental justice communities identified in the analysis area include eight identified Native American communities, as well as • town of Hayden, • town of Miami, • city of Globe, • town of Superior, and • town of Winkelman. Economic effects from the mine would be most apparent in the environmental justice community of the town of Superior due to its immediate proximity to Resolution Copper Project operations. While mine-induced beneficial economic activity would be expected to increase in the region generally, the expected influx of new workers may also lead to shortages of area housing and/or pressures on municipal infrastructure such as roads, schools, and medical facilities, and may be accompanied by price increases. Such changes would be most likely to adversely affect low-income and minority individuals in the town of Superior and other environmental justice communities in the region. Environmental effects in the immediate area such as increased traffic, noise, increased potential exposure to hazardous material spills or releases, as well as loss of certain recreational opportunities and changes to area scenic resources, are anticipated to occur, but would affect everyone equally and would therefore not be disproportionate.	No. Anticipated impacts on the environmental justice communities identified in the analysis area are not anticipated to vary by alternative, with the town of Superior having the most apparent effects.

LIVESTOCK AND GRAZING — DEIS SECTION 3.16

Key factors to analyze the issue of livestock and grazing	What are the results of impact analysis for the proposed action (Alternative 2)?	Are the analyzed impacts of these issues substantially different under Alternatives 3, 4, 5, or 6?
• Potential for changes to acreages of grazing allotments; potential for loss of grazing-related facilities (waters, stock tanks, roads, fences, etc.); and potential for changes to available animal unit months (AUMs) within individual grazing allotments (see section 3.16.4.2).	Under Alternative 2, affected grazing allotments would experience a reduction of 8,572 acres and 666 AUMs over six allotments and 25 grazing-related facilities would also be lost (see Alternative 2 in section 3.16.4.2).	Yes. Although acreage changes to grazing allotments would be identical under Alternatives 2 and 3, Alternatives 4, 5, and 6 would be different. Alternative 4: There would be a reduction in 9,399 acres and 737 AUMs over six allotments, and 24 grazing-related facilities would be lost (see Alternative 4 in section 3.16.4.2). Alternative 5: For the east pipeline corridor: There would be a reduction in 15,672 acres and 1,378 AUMs over 10 allotments, and 14 grazing-related facilities would be lost (see Alternative 5 in section 3.16.4.2). For the west pipeline corridor: There would be a reduction in 16,186 acres and 2,380 AUMs over 12 allotments, and 14 grazing-related facilities would be lost (see Alternative 5 in section 3.16.4.2). Alternative 6: For the north pipeline corridor: There would be a reduction of 14,747 acres and 2,674 AUMs over nine allotments, and 21 grazing-related facilities would be lost (see Alternative 6 in section 3.16.4.2). For the south pipeline corridor: There would be a reduction in 15,209 acres and 2,745 AUMs over nine allotments, and 21 grazing-related facilities would be lost (see Alternative 6 in section 3.16.4.2).