PLAN OF OPERATIONS

RESOLUTION COPPER MINING, LLC BASELINE HYDROLOGIC & GEOTECHNICAL DATA GATHERING ACTIVITIES ON TONTO NATIONAL FOREST

POO-2013-031200-020

Prepared by:



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August 24, 2016

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1.0 INTRODUCTION

Resolution Copper Mining, LLC (Resolution), proposes to conduct baseline hydrologic and geotechnical testing and monitoring activities on National Forest System lands, located within the Tonto National Forest (TNF). The purpose of these activities is to collect hydrologic, geochemical and geotechnical data in order to provide baseline information on these aspects of the environment over an area being considered for a potential tailings storage site. The baseline hydrologic and geotechnical data gathering activities¹ ("Baseline Activities") include:

- 1) Constructing 16 drill sites to accommodate a total of 16 groundwater testing and monitoring wells that will impact approximately 4.21 acres.
- 2) Completing 38 geotechnical drill holes and piezometer installations that will affect approximately 0.27 acres. (Fourteen of the geotechnical drill holes are located on the proposed monitoring well drill site pads)
- 3) Constructing 32 geotechnical test trenches at 32 sites that will affect approximately 1.28 acres.
- 4) Completing necessary roadway improvements (refer to Appendix B) to facilitate access to hydraulic testing and monitoring wells, geotechnical drill holes/piezometers, and trenches on approximately 12.09 miles of existing roads on National Forest System lands that will affect approximately 14.67 acres.
- 5) Constructing two contractor laydown yards that will affect approximately 2.19 acres.
- 6) Improving or maintaining temporary access roads on previously disturbed areas for access to drill sites with monitoring wells or piezometers installed on National Forest System lands that will affect approximately 3.94 acres.
- 7) The use of short-term temporary access roads to bring a tracked rig and a service truck to off-road locations, which will affect 7.07 acres.

The total area of data gathering activity, accounting for new construction activity, road improvements, use of short-term temporary access roads, use of previously disturbed areas proposed to be used as temporary access roads and existing road surfaces requiring no improvements is approximately 75.40 acres. Proposed new construction disturbance will occur on a total of 33.63 acres, all on National Forest System lands. The proposed new construction activities as described in the Baseline Hydrological and Geotechnical Data Gathering Activities Plan of Operations are referred to hereon as the Baseline Activities.

¹ See Section 6.0 for definitions of hydrologic and geotechnical terms associated with Baseline Activities listed within this Plan of Operations.

The Baseline Activities will be conducted north and west of the town of Superior in Pinal County (Figure 1 – Location Map). The Baseline Activities area (the project area) includes the locations of the proposed monitoring well drill sites, geotechnical/piezometer drill sites, test trenches, previously disturbed areas proposed to be used as temporary access roads, short-term temporary access roads and existing roads that will provide access to the drill sites, and test trenches on National Forest System lands (Figure 2 – Baseline Activities Area). The northernmost point of the project area is located south of an intermittent tributary of Roblas Canyon, south of the intersection of Forest Service Roads 1903 and 1906. The southernmost point of the project area is located at the intersection of U.S. 60 and Forest Service Road 357 (which parallels Queen Creek). The easternmost point of the project area is located along Forest Service Road 172, southwest of Roblas Butte, in the Mesa Ranger District.

Baseline Activities will occur in these non-contiguous areas of National Forest System lands in the following townships, ranges and sections of the Gila and Salt River Baseline and Meridian, Pinal County (Figure 2):

- Township 1 South, Range 11 East in portions of Sections 13, 21-28, and 33-36;
- Township 1 South, Range 12 East in portions of Sections 19-21 and 28-34;
- Township 2 South, Range 11 East in portions of Sections 1-3; and
- Township 2 South, Range 12 East in portions of Section 6.





2.0 CONTACT AND OPERATOR INFORMATION

The operator of the baseline hydrologic and geotechnical activities program is:

Resolution Copper Mining, LLC by Resolution Copper Company, as Manager and not on its own behalf

Ms. Victoria Peacey, Senior Manager – Permitting and Approvals 102 Magma Heights Superior, AZ 85173 Tel: (520) 689-3313

Claim names, claim types, serial numbers and claim owners for claims associated directly with the proposed Baseline Activities are listed in Appendix C.

3.0 DESCRIPTION OF DATA GATHERING ACTIVITIES

3.1 Hydrologic Testing and Monitoring Wells

3.1.1 Purpose and Location of Activity

A total of 16 hydrologic testing and monitoring well sites (DS-A, DS-B, DS-C, DS-D, DS-E, DS-F, DS-G, DS-H, DS-J, DS-K, DS-L, DS-M, DS-N, DS-O and DS-P) will be drilled for hydrologic testing on National Forest System lands (Figure 2 and Table 1). Monitoring well sites will be located nearby (typically 150 feet or less) existing roads to minimize the disturbance associated with site access. These wells will be drilled only for data gathering (testing and monitoring) to further the current understanding of hydrologic conditions over an area being considered for a potential tailings storage site. These wells will not be water supply wells, nor are they being permitted as water supply wells.

Data to be obtained from the hydrologic testing and monitoring wells will include: (1) depth to groundwater level; (2) lithology and geochemistry of drill cuttings; (3) aquifer hydraulic parameters, including transmissivity, hydraulic conductivity, and storage coefficients; and (4) chemical quality of groundwater.

Table 1 provides a summary of the location information and estimated surface disturbance associated with the proposed monitoring well sites. Surface disturbance varies due to the specific topography of each monitoring well site. Monitoring well sites located in relatively level areas will have a disturbance area slightly greater than the size of the drill pad (0.18 acres). Monitoring well sites located on uneven terrain will require a greater disturbance area to accommodate for cut and fill to produce the same size drill pad (please see Appendix B for specific details on disturbance for each monitoring well site). Complete detailed descriptions of the proposed activities are provided in Appendix A. Roadway improvements required to gain access to the proposed hydrologic testing wells are identified in Figure 2 and Section 3.4.

Table 1. Estimated Disturbance Area for Groundwater Testing and Monitoring Sites. The typical work area dimension for groundwater testing and monitoring drill sites is 80 feet by 100 feet (0.18 acre). Because of topographic constraints, some sites will have a larger footprint than others. The area of disturbance for each proposed site is based upon the mapping provided in Appendix B. Location data is provided in NAD 27 UTM Zone 12N meters.

Monitoring	Northing	Easting	Elevation	Legal Description ¹	Hydraulic	Acres of New
Well Site	(UTM)	(UTM)	(f t)		Testing	Disturbance
					Depth $(feet)^2$	
National Fore	est System la	nds				
DS-A	3686724	487809	2,877	T1S, R12E, Sec 28	1,969	0.24
				NW 1/4 NE 1/4 NE 1/4		
DS-B	3685733	487026	2,707	T1S, R12E, Sec 28	656	0.22
				NW 1/4 NE 1/4 SW 1/4		
DS-C	3684301	487098	2,684	T1S, R12E, Sec 33	1,312	0.30
				NE ¼ NE ¼ SW ¼		
DS-D	3683331	485715	2,543	T2S, R12E, Sec 6	1,312	0.21
				SE ¼ NW ¼ NE ¼		
DS-E	3683000	484489	2,487	T2S, R11E, Sec 1	1,640	0.20
				NW 1/4 SE 1/4 NE 1/4		
DS-F	3686240	483663	2,500	T1S, R12E, Sec 30	1,312	0.26
				NE ¼ SW ¼ NW ¼		
DS-G	3685823	482634	2,497	T1S, R11E, Sec 25	1,312	0.29
				NW 1/4 NW 1/4 SE 1/4		
DS-H	3687256	482810	2,671	T1S, R11E, Sec 24	1,969	0.52
				SE ¼ NW ¼ SE ¼		
DS-I	3688276	483069	2,717	T1S, R11E, Sec 24	656	0.20
				NW 1/4 NE 1/4 NE 1/4		
DS-J	3687993	482232	2,618	T1S, R11E, Sec 24	1,312	0.32
				SW 1/4 NE 1/4 NW 1/4		
DS-K	3686607	480323	2,379	T1S, R11E, Sec 26	1,312	0.25
				NE ¼ NW ¼ NW ¼		
DS-L	3686710	479542	2,270	T1S, R11E, Sec 27	1,640	0.22
				NE ¼ NW ¼ NE ¼		
DS-M	3685948	481180	2,487	T1S, R11E, Sec 26	1,312	0.23
				NE ¼ NW ¼ SE ¼		
DS-N	3684659	482742	2,410	T1S, R11E, Sec 36	1,312	0.21
				NE 1/4 SW 1/4 NE 1/4		
DS-O	3685883	478613	2,220	T1S, R11E, Sec 27	1,969	0.21
				NW 1/4 NW 1/4 SW 1/4		
DS-P	3688543	483063	2,834	T1S, R11E, Sec 13	656	0.33
				SW 1/4 SE 1/4 SE 1/4		
Total:						4.21 acres

¹ Legal Descriptions are based on the state of Arizona Gila and Salt River Baseline and Meridian.

 2 This is the estimated testing depth and not the authorized total depth of the hole.

A description of each of the groundwater testing and monitoring sites follows.

DS-A. Drill Site DS-A will be located adjacent to and accessed via Forest Road 2371 on previously disturbed (used by recreational vehicles as a parking spot and turnaround) National Forest System lands in Township 1 South, Range 12 East, in the NW ¹/₄, NE ¹/₄, NE ¹/₄ of Section 28. Planned activities include the construction of one groundwater testing and monitoring well

(HRES-A), and construction of one geotechnical hole (GT-34). The estimated surface disturbance for this site will be 0.24 acre.

DS-B. Drill Site DS-B will be located adjacent to and accessed via Forest Road 650 on undisturbed National Forest System lands in Township 1 South, Range 12 East, in the NW ¹/₄, NE ¹/₄, SW ¹/₄ of Section 28. Planned activities include the construction of one groundwater testing and monitoring well (HRES-B). The estimated surface disturbance for this site will be 0.22 acre.

DS-C. Drill Site DS-C will be located adjacent to and accessed via Forest Road 2387 on undisturbed National Forest System lands in Township 1 South, Range 12 East, in the NE ¹/₄, NE ¹/₄, SW ¹/₄ of Section 33. Planned activities include the construction of one groundwater testing and monitoring well (HRES-C) and construction of one geotechnical hole (GT-27). The estimated surface disturbance for this site will be 0.30 acre.

DS-D. Drill Site DS-D will be accessed via Forest Road 8, then by turning southeast onto a previously disturbed area proposed to be used as a temporary access road for approximately 52 feet. Drill Site DS-D will be located on previously disturbed (historically used for drilling and currently used as a makeshift camp site and parking lot) National Forest System lands in Township 2 South, Range 12 East, in the SE ¼, NW ¼, NE ¼ of Section 6. Planned activities include the construction of one groundwater testing and monitoring well (HRES-D) and construction of one geotechnical hole (GT-26). The estimated surface disturbance for this site will be 0.21 acre.

DS-E. Drill Site DS-E will be located adjacent to and accessed via Forest Road 293, then by turning southeast onto a previously disturbed area proposed to be used as a temporary access road for approximately 75 feet. Drill Site DS-E will be located on undisturbed National Forest System lands in Township 2 South, Range 11 East, in the NW ¹/₄, SE ¹/₄, NE ¹/₄ of Section 1. Planned activities include the construction of one groundwater testing and monitoring well (HRES-E) and construction of one geotechnical hole (GT-24). The estimated surface disturbance for this site will be 0.20 acre.

DS-F. Drill Site DS-F will be located adjacent to and accessed via Forest Road 2364 on undisturbed National Forest System lands in Township 1 South, Range 12 East, in the NE ¹/₄, SW ¹/₄, NW ¹/₄ of Section 30. Planned activities include the construction of one groundwater testing and monitoring well (HRES-F) and construction of one geotechnical hole (GT-20). The estimated surface disturbance for this site will be 0.26 acre.

DS-G. Drill Site DS-G will be located adjacent to and accessed via Forest Road 2359 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the NW ¹/₄, NW ¹/₄, SE ¹/₄ of Section 25. Planned activities include the construction of one groundwater

testing and monitoring well (HRES-G) and construction of one geotechnical hole (GT-15). The estimated surface disturbance for this site will be 0.29 acre.

DS-H. Drill Site DS-H will be located adjacent to and accessed via Forest Road 1903 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the SE ¹/₄, NW ¹/₄, SE ¹/₄ of Section 24. Planned activities include the construction of one groundwater testing and monitoring well (HRES-H) and construction of one geotechnical hole (GT-19). The estimated surface disturbance for this site will be 0.52 acre.

DS-I. Drill Site DS-I will be located adjacent to and accessed via Forest Road 1903 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the NW ¹/₄, NE ¹/₄ of Section 24. Planned activities include the construction of one groundwater testing and monitoring well (HRES-I) and construction of one geotechnical hole (GT-18). The estimated surface disturbance for this site will be 0.20 acre.

DS-J. Drill Site DS-J will be located adjacent to and accessed via Forest Road 1908 on undisturbed National Forest System lands in Township 1 South, Range 11 East in the SW ¹/₄, NE ¹/₄, NW ¹/₄ of Section 24. Planned activities include the construction of one groundwater testing and monitoring well (HRES-J) and construction of one geotechnical hole (GT-17). The estimated surface disturbance for this site will be 0.32 acre.

DS-K. Drill Site DS-K will be located adjacent to and accessed via Forest Road 1918 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the NE ¹/₄, NW ¹/₄, NW ¹/₄ of Section 26. Planned activities include the construction of one groundwater testing and monitoring well (HRES-K) and construction of one geotechnical hole (GT-3). The estimated surface disturbance for this site will be 0.25 acre.

DS-L. Drill Site DS-L will be located adjacent to and accessed via Forest Road 252 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the NE ¹/₄, NW ¹/₄, NE ¹/₄ of Section 27. Planned activities include the construction of one groundwater testing and monitoring well (HRES-L) and construction of one geotechnical hole (GT-2). The estimated surface disturbance for this site will be 0.22 acre.

DS-M. Drill Site DS-M will be located adjacent to and accessed via Forest Road 1916 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the NE ¹/₄, NW ¹/₄, SE ¹/₄ of Section 26. Planned activities include the construction of one groundwater testing and monitoring well (HRES-M) and construction of one geotechnical hole (GT-7). The estimated surface disturbance for this site will be 0.23 acre.

DS-N. Drill Site DS-N will be located adjacent to and accessed via Forest Road 518 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the NE ¼, SW ¼, NE ¼ of Section 36. Planned activities include the construction of one groundwater testing

and monitoring well (HRES-N) and construction of one geotechnical hole (GT-14). The estimated surface disturbance for this site will be 0.21 acre.

DS-O. Drill Site DS-O will be located adjacent to and accessed via Forest Road 3713 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the NW ¹/₄, NW ¹/₄, SW ¹/₄ of Section 27. Planned activities include the construction of one groundwater testing and monitoring well (HRES-O) and construction of one geotechnical hole (GT-35). The estimated surface disturbance for this site will be 0.21 acre.

DS-P. Drill Site DS-P will be located adjacent to and accessed via Forest Road 1903 on undisturbed National Forest System lands in Township 1 South, Range 11 East, in the SW ¹/₄, SE ¹/₄, SE ¹/₄ of Section 13. Planned activities include the construction of one groundwater testing and monitoring well (HRES-P). The estimated surface disturbance for this site will be 0.33 acre.

3.1.2 Hydrologic Monitor Well Drilling and Construction

The monitoring well sites proposed as a part of this Plan have an approximately 80 foot by 100 foot disturbance footprint. Figure 3 depicts a typical layout of the drill pad and associated equipment at a drill site. Due to topography and field conditions, some sites will require additional surface area for grading and fill slopes, while some sites may require less. The estimated disturbance area for each individual site is identified in Table 1 and in Section 3.6 of this Plan.

Complete detailed descriptions of the proposed hydrologic monitoring activities are provided in Appendix A and plan views of the proposed activities with 2012 aerial base mapping are provided in Appendix B.

Up to two drill rigs (located at different monitoring well sites) may be in use at any one time for hydrologic monitor well drilling. Construction of each groundwater testing and monitoring well will begin with a nominal 18-inch-diameter hole that will be drilled to a minimum 20-foot depth, followed by the placement of a 12 3/4-inch-diameter steel surface casing that will be set and cemented into place. Once the surface casing is established a nominal 9 7/8-inch borehole will be drilled to the required depth (see Table 1 and Appendix A) using the air assisted reverse-circulation method.

Drill cuttings (polymer and bentonite) will be collected in large storage tanks (9,000 gallon capacity) located within the disturbance footprint of each drill site. The tanks will be used during drilling operations to hold drill cuttings that are brought to surface using the air lift method. Resolution will collect excess cuttings generated during drilling activities and dispose of them off of National Forest System lands. These materials will be disposed of at a permitted facility in accordance with applicable State of Arizona regulations.

Upon completion of geophysical logging, a 4-inch blank and slotted steel casing will be installed to the depth of each well. Determination of the interval(s) for placement of the slotted casing will be based on the geophysical logging and the results of well development testing. Figure 4 depicts a typical vertical cross-section of a groundwater testing and monitoring well.

During drilling and well construction, careful observation of any formation water entering the borehole will be made. Drilling may be paused periodically to evaluate the quantity and quality of the groundwater encountered by the borehole at depth. Air lift pumping will be used to raise the water to the surface to be evaluated. A hydrologist will be on site to monitor the drilling operations and an industry standard suite of geophysical well logs will be documented before casing is installed.

Well construction and drilling activities are expected last approximately 25 weeks. The additional activities of installing pumps and instrumentation to perform aquifer testing are expected to be completed within two years of the construction of drill sites and wells. Hydrological monitoring and testing is proposed throughout the authorization period.

A typical equipment list for the proposed groundwater monitoring well drilling is provided in Table 2.



3.1.3 Hydrologic Data Gathering and Testing Sequence

Hydraulic testing is currently planned to occur primarily in the range of approximately 300 to 2,000 feet to target specific geologic units (Table 1 and Appendix A), however, due to uncertainty associated with the exact location of geologic units at depth, the total depth of some boreholes may be drilled to a maximum of 2,300 feet in the event that hydraulic testing depth has to be adjusted. A schematic diagram of well construction is shown on Figure 4. Detailed descriptions of hydrological terms (i.e. packer testing, slug testing, etc.) are contained in Section 7.0.

The general approach for the development of each monitor well is summarized as follows:

- Observe and record the details of drilling.
- Measure the water production rate during dual-wall reverse circulation drilling.
- Obtain and describe drill cuttings at 3-meter depth intervals and at depths where a change in geologic unit is noted.
- Conduct borehole geophysical logging (resistivity, natural gamma, spontaneous potential, sonic, temperature and caliper logs); if fracturing is evident, optical or acoustic borehole imaging logs may be collected to better define the occurrence and orientation of fractures.
- Based on lithologic and borehole geophysical data and groundwater level, decide on appropriate depths for top and bottom of perforated intervals per well (perforated intervals will be separated by a minimum 6-meter section of blank casing within which an inflatable packer could be installed for separate testing of each interval).
- Observe and record the details of monitor well construction; the monitor wells will be completed with 4-inch blank and slotted steel casing, gravel-packed, and sealed in the annular space above each gravel-packed interval with bentonite and neat cement.
- Observe and record details of well development by air-lift pumping.
 - If air-lift pumping is determined to be unsustainable, develop the well by adding slugs of water with short duration air-lift pumping or bailing. If air-lift pumping is sustainable, a short duration air-lift pumping test will be conducted to estimate specific capacity for use in choosing an appropriately sized pump for aquifer testing.
- Once transducers and data loggers are established at each monitoring well site, the data will be downloaded from the data loggers via laptop computers monthly from each of the 16 wells for a total of 12 months, and from thereon data will be downloaded on a quarterly basis throughout the authorization period.

The purpose of aquifer testing is to determine aquifer hydraulic parameters. Testing will include short-term pumping tests or slug tests at the 16 monitor wells, and packer testing of selected perforated intervals in selected monitor wells. Pumping tests will begin approximately 30 days after drilling is completed at each site to allow groundwater conditions to equilibrate with ambient conditions. Approximately 12- to 48-hour tests will be conducted at each of the 16 hydrological monitoring wells that will yield sufficient flow for testing. Only one pump test will occur at any given time. It is expected that all pump testing will be completed within 135 days of the completion of drilling. No short-term pump test (12 to 48 hours) will be repeated. Depending on the results of the short-term pump test (e.g. no water recovery in a monitoring well) longer term (7 to 28 days) pumping tests, using multiple monitor wells, may be required in the future. Similar to the short-term pump test will occur at any one time. The tests will be used to determine hydraulic properties of hydrogeologic units encountered below groundwater level, and the range of variation in aquifer hydraulic properties for the site.

The monitor wells will be completed with perforated intervals in distinct geologic units and/or in zones of differing hydraulic characteristics within a given geologic unit (due to facies change or increased degree of fracturing). For each well, testing of the composite of all perforated intervals will be conducted either by pumping using a temporary pump assembly, or if pumping is not judged to be sustainable, a slug test will be conducted to understand the hydrogeologic characteristics. A slug test involves the abrupt removal, addition, or displacement of a known volume of water (or solid) and the subsequent monitoring of changes in water level as equilibrium conditions return. Based on results of testing the composite of perforated intervals, additional testing in selected individual perforated interval(s) may be conducted using an inflatable packer to isolate the test interval. For each completed monitor well, the general approach is summarized as follows:

- Select appropriate testing method based on the results of water production rates measured during the drilling process, well development, and air-lift testing following well construction.
- If a pumping test is to be conducted:
 - Monitor installation of a temporary test pump.
 - Monitor well development by pumping.
 - Conduct a short-term pumping test of composite perforated intervals, including a 24-hour pumping period followed by a 24-hour recovery period.
 - Monitor water levels during each test using pressure transducers, dataloggers, and/or an electric water level sounder.

- During pumping, obtain periodic measurements of color, sand content, temperature, pH, specific conductance of discharged water, and pumping rate.
- Obtain water samples, prepare chain-of-custody and analytical request forms, and deliver to a state certified laboratory for analysis of common and selected trace inorganic constituents and routine parameters; if discharged water is deemed representative of aquifer conditions (able to purge three borehole volumes), consider analyzing samples for a complete suite of analytes, including radiological and isotopical constituents.
- Conduct quality assurance/quality control analyses on laboratory results.
- If pumping is not sustainable for a pumping test, conduct a slug test:
 - Install and remove the slug.
 - Record water levels using pressure transducers and dataloggers.
- Prepare graphs and analyze data for determination of aquifer hydraulic parameters from pumping and slug tests.
- Based on the results of composite interval pumping tests or slug tests, determine if packer testing is warranted and select appropriate test intervals and methods.
- If packer testing is conducted, for each interval to be tested the following will be performed:
 - Installation and inflation of a temporary packer.
 - Installation of pumping equipment, injection equipment or slug, and monitor water levels or pressures using pressure transducers and dataloggers.
- Remove all testing equipment, set transducer and dataloggers for continual monitoring of the well.

Complete detailed descriptions of the proposed hydrology drilling and monitor well installations are provided in Appendix A and plan views of the proposed activities with 2012 aerial base mapping are provided in Appendix B.

Additionally, roads and roadway improvements required to gain access to the proposed hydrology drill hole and piezometer sites are identified in Figure 2 and Section 3.4.



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Plan of Operations

Schematic Diagram of Hydrological Testing and Monitoring Wells

Figure 4

Data Source: Errol L. Montgomery & Associates, Inc.

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Quantity	Equipment	Size							
Hydrologic Monitor Well Drilling									
2	Lang DH-90 Series Tophead Rotary Rig or equivalent	24ft x 52ft							
1	Tank (associated with active drill rigs)	9,000-gallon							
1	Winch Truck	10ft x 35ft							
1	Heavy duty air compressor								
1	Water Storage Tank (associated with active drill rigs)	9,000-gallon							
1	Portable Driller's Office	8ft x 15ft							
2	Generators associated with drill rigs	8ft x 15ft							
1	Front End Loader	10ft x 30ft							
1	Backhoe	10ft x 20ft							
1	Cat Grader or equivalent	14M							
2	Tracked Excavators	Cat 320							
1	Water Truck	10ft x 30ft							
Geotechni	cal Core Drilling								
1	BLY tracked drill rig or equivalent	7ft x 27ft							
1	Pipe Truck	10ft x 35ft							
1	Portable Water Storage Tank (associated with active drill rigs)	1,000-gallon							
1	1 Ton Driller/Tool Pusher (Light Vehicle)	1 Ton Flatbed or							
		Pickup Truck							
1	Cat Bulldozer	D-6							
1	Water Truck	10ft x 30ft							
Geotechni	cal Test Trenches								
1	Tracked Excavator	Cat 320							
1	Cat Bulldozer	D-6							
Access Ro	Access Road Improvement								
1	Track Hoe	10ft x 20ft							
1	Hammer Hoe	10ft x 20ft							
1	Front End Loader	10ft x 30ft							
1	Water Truck	10ft x 30ft							
1	Tracked Jaw Crusher	10ft x 20ft							
1	Cat Grader or equivalent	14M							

Table 2. Typical Equipment List

3.2 Geotechnical Drilling & Piezometer Installation

3.2.1 Purpose and Location of Activity

A total of 38 drill holes, GT-1 through GT-8, and GT-12 through GT-41, will be drilled for geotechnical testing and piezometer installation on National Forest System lands (Figure 2 and Table 3). These drill holes and piezometers are required to define the baseline soil and bedrock hydrological and geotechnical conditions. Data to be obtained will include: 1) stratigraphy; 2) unit densities; 3) unit geochemistry; 4) permeability; 5) depth to groundwater; 6) strength properties; and 7) hydraulic conductivity.

Existing roads and roadway improvements required to gain access to the proposed geotechnical drill hole and piezometer sites are identified in Figure 2 and Section 3.4.

Drill Site	Northing UTM	Easting UTM ¹	Elevation (ft)	Legal Description ²	Approximate Maximum Depth (Feet)	Approximate Acres of Disturbance	Located Within Proposed Monitoring Drill Site Pad
National	l Forest Syste	em lands					
GT-1	3686786	478851	2,267	T1S, R11E, Sec 27 NE ¼ NW ¼ NW ¼	250	0.01	No
GT-2	3686710	479542	2,265	T1S, R11E, Sec 27 NE ¼ NW ¼ NE ¼	250	0	Yes (Drill Site DS-L)
GT-3	3686609	480330	2,365	T1S, R11E, Sec 26 NE ¹ / ₄ NW ¹ / ₄ NW ¹ / ₄	250	0	Yes (Drill Site DS-K)
GT-4	3687016	480830	2,441	T1S, R11E, Sec 23 NE ¹ / ₄ SE ¹ / ₄ SW ¹ / ₄	250	0.01	No
GT-5	3686856	480995	2,418	T1S, R11E, Sec 23 SW ¹ / ₄ SW ¹ / ₄ SE ¹ / ₄	250	0.01	No
GT-6	3686268	480826	2,418	T1S, R11E, Sec 26 NE ¹ / ₄ SE ¹ / ₄ NW ¹ / ₄	250	0.01	No
GT-7	3685950	481190	2,487	T1S, R11E, Sec 26 NE ¹ / ₄ NW ¹ / ₄ SE ¹ / ₄	250	0	Yes (Drill Site DS-M)
GT-8	3685333	481522	2,362	T1S, R11E, Sec 26 SE ¹ / ₄ SE ¹ / ₄ SE ¹ / ₄	250	0.01	No
GT-12	3682996	482809	2,333	T2S, R11E, Sec 2 NW ¼ SE ¼ NE ¼	250	0.01	No
GT-13	3683367	483078	2,382	T2S, R11E, Sec 2 NE ¹ / ₄ NE ¹ / ₄ NE ¹ / ₄	250	0.01	No
GT-14	3684659	482742	2,405	T1S, R11E, Sec 36 NE ¹ / ₄ SW ¹ / ₄ NE ¹ / ₄	250	0	Yes (Drill Site DS-N)
GT-15	3685823	482634	2,415	T1S, R11E, Sec 25 NW ¹ / ₄ NW ¹ / ₄ SE ¹ / ₄	250	0	Yes (Drill Site DS-G)
GT-16	3686703	481830	2,543	T1S, R11E, Sec 25 NW ¹ / ₄ NW ¹ / ₄ NW ¹ / ₄	250	0.01	No
GT-17	3687993	482232	2,720	T1S, R11E, Sec 24 NW ¼ SE ¼ NW ¼	250	0	Yes (Drill Site DS-J)

 Table 3. Estimated Disturbance Area for Geotechnical Drill Holes and Piezometer Installation.

Plan of Operations

Drill Site	Northing UTM	Easting UTM ¹	Elevation (ft)	Legal Description ² Approximate Maximum Depth (Feet)		Approximate Acres of Disturbance	Located Within Proposed Monitoring Drill Site Pad
GT-18	3688284	483067	2,720	T1S, R11E, Sec 24	250	0	Yes (Drill
GT-19	3687256	482810	2,687	T1S, R11E, Sec 24 SE 1/4 NW 1/4 SE 1/4	250	0	Yes (Drill Site DS-H)
GT-20	3686246	483654	2,497	T1S, R12E, Sec 30 NE ¹ / ₄ SW ¹ / ₄ NW ¹ / ₄	250	0	Yes (Drill Site DS-F)
GT-21	3685633	483270	2,510	T1S, R11E, Sec 25 SE ¹ / ₄ NE ¹ / ₄ SE ¹ / ₄	250	0.01	No
GT-22	3684236	483972	2,402	T1S, R12E, Sec 31 NE ¹ / ₄ NE ¹ / ₄ SW ¹ / ₄	250	0.01	No
GT-23	3683780	484523	2,516	T1S, R12E, Sec 31 NW ¹ / ₄ SE ¹ / ₄ SE ¹ / ₄	250	0.01	No
GT-24	3683000	484489	2,462	T2S, R11E, Sec 1 NW ¼ SE ¼ NE ¼	250	0	Yes (Drill Site DS-E)
GT-25	3683125	485300	2,472	T2S, R12E, Sec 6 NE ¼ SE ¼ NW ¼	250	0.01	No
GT-26	3683324	485716	2,530	T2S, R12E, Sec 6 SE ¹ ⁄ ₄ NW ¹ ⁄ ₄ NE ¹ ⁄ ₄	250	0	Yes (Drill Site DS-D)
GT-27	3684296	487099	2,648	T1S, R12E, Sec 33 NW ¹ / ₄ NE ¹ / ₄ SW ¹ / ₄	250	0	Yes (Drill Site DS-C)
GT-28	3684906	486723	2,664	T1S, R12E, Sec 33 SE ¹ / ₄ NW ¹ / ₄ NW ¹ / ₄	250	0.01	No
GT-29	3685827	487064	2,709	T1S, R12E, Sec 28 NW ¹ / ₄ NE ¹ / ₄ SW ¹ / ₄	250	0.01	No
GT-30	3685992	485962	2,710	T1S, R12E, Sec 29 SE ¼ SW ¼ NE ¼	250	0.01	No
GT-31	3686907	484787	2,661	T1S, R12E, Sec 19 SE ¹ / ₄ SE ¹ / ₄ SE ¹ / ₄	250	0.01	No
GT-32	3686778	484152	2,621	T1S, R12E, Sec 19 SW ¹ / ₄ SW ¹ / ₄ SE ¹ / ₄	250	0.01	No
GT-33	3687473	485061	2,733	T1S, R12E, Sec 20 NW ¹ /4 NW ¹ /4 SW ¹ /4	250	0.01	No
GT-34	3686724	487809	2,877	T1S, R12E, Sec 28 NW ¼ NE ¼ NE ¼	250	0	Yes (Drill Site DS-A)
GT-35	3685883	478613	2,219	T1S, R11E, Sec 27 NW ¹ / ₄ NW ¹ / ₄ SW ¹ / ₄	250	0	Yes (Drill Site DS-O)
GT-36	3688275	483303	2,743	T1S, R12E, Sec 19 NW ¼ NW ¼ NW ¼	250	0.01	No
GT-37	3686099	480107	2,349	T1S, R11E, Sec 26 SW ¹ / ₄ SW ¹ / ₄ NW ¹ / ₄	250	0.01	No
GT-38	3685372	479985	2,431	T1S, R11E, Sec 27 SE ¼ SE ¼ SE ¼	250	0.01	No
GT-39	3684634	480657	2,247	T1S, R11E, Sec 35 NW ¼ SE ¼ NW ¼	250	0.01	No
GT-40	3685621	479447	2,303	T1S, R11E, Sec 27 SW ¹ / ₄ NW ¹ / ₄ SE ¹ / ₄	250	0.01	No
GT-41	3685403	480846	2,426	T1S, R11E, Sec 26 NE ¹ / ₄ SE ¹ / ₄ SW ¹ / ₄	250	0.01	No
Total :						0.27 acres	

¹ UTM NAD 27 Zone 12N meters

 2 Legal Descriptions are based on the state of Arizona Gila and Salt River Baseline and Meridian.

3.2.2 Description of Geotechnical Drilling Operations

For each geotechnical drilling and piezometer installation proposed as part of this Plan, there will be a disturbance footprint of approximately 15 feet by 40 feet (0.01 acre). In some cases, this disturbance will occur on a proposed monitoring drill site pad and will not result in additional disturbance beyond what will be required for the pad itself. This disturbance footprint provides required space for the placement of drill rigs and associated equipment (Figure 3). A portable water storage tank will not be required because the rig selected has a self-contained water tank. Water will be sourced via a truck which will be pulled off to the side of National Forest System land roads or on the temporary access road leading to each site. A bulldozer will not be required to be stationed on the area of surface disturbance.

Where practicable, proposed sites will be located along or adjacent to existing roads. When this is not possible (due to data gathering needs), a track mounted rig will be used to access the site. The track mounted rig selected for the proposed work does not require a constructed surface pad, nor does it require any existing roads to gain access. The combined estimated disturbance area for the placement of all the geotechnical drill sites is 0.27 acres on National Forest System lands. The estimated surface disturbance for each individual site is identified in Table 3 and Section 3.6 of this Plan.

Complete detailed descriptions of the proposed geotechnical drilling and piezometer installation are provided in Appendix A. Detailed descriptions of geotechnical terms (i.e. standard penetration test, etc.) are contained in Section 6.0.

The proposed activities involve utilizing one track mounted rig at each site that will be stationary until the drilling at that site is completed. Continuous Standard Penetration Tests (SPTs) in native soils and triple tube core sampling in bedrock to a maximum depth of approximately 250 feet (76.20 m) will be performed at each geotechnical drill site. Samples of the core will be obtained for laboratory testing at select intervals as determined by the site engineer. Packer permeability tests will be performed at select intervals. Geotechnical holes that encounter groundwater will be converted into piezometers. During withdrawal of the casing, a single 2-inch PVC standpipe piezometer will be installed. Each PVC standpipe will contain slotted well screens through zones of high permeability, groundwater, or select geologic units or structures. Bagged, washed coarse (10/20) silica filter sand will be placed in the annular space between the borehole wall and well screen to a distance of approximately 1 foot above the screen. A three foot seal of bentonite chips or pellets will then be placed above the filter sand. The well will then be grouted to surface. All wells will be outfitted with above-ground, steel protective casings (i.e. well vault) with a locking top cemented into place. If the well vault for a piezometer is located

nearby Forest Service roads, bollards will be placed near the well vault to reduce the risk of damage of the well.

At approximately six geotechnical drill site locations, shear wave velocity measurements will be taken. Shear wave velocity measurements are taken by installing and grouting a 2.5-inch PVC casing into the borehole. A wooden beam, approximately 84"x6"x6" will be centered on the borehole with the middle of the beam located approximately 5 feet from the hole collar. A seismic geophone will be lowered into the borehole and the wooden beam is struck with a sledge hammer to produce shear waves. Data will be collected at a number of depths by lowering the geophone down the borehole in 3 foot increments.

Please note that drilling and piezometer installations are planned for the same 41 sites (all drill sites are co-located) to minimize land disturbance.

A typical equipment list for the proposed geotechnical drilling and piezometer installation drilling is provided in Table 2. A schematic of an open standpipe piezometer installed in a borehole is provided in Figure 5.

A description of each of the geotechnical borehole and piezometer sites follows.

Drill Site GT-1. Drill Site GT-1 will be located on previously undisturbed National Forest System lands south of Roblas Butte and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the NE ¼ NW ¼ NW ¼ of Section 27. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acres. Drill Site GT-1 will be accessed from Forest Road 252.

Drill Site GT-2. Drill Site GT-2 will be located on previously undisturbed National Forest System lands west of the abandoned Bomboy Mine and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the NE ¼ NW ¼ NE ¼ of Section 27. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-2 will be collocated with Drill Site DS-L and as a result no additional surface disturbance will be created. Drill Site GT-2 will be accessed from Forest Road 252 and turning north onto a proposed short-term temporary access road for 70 feet.

Drill Site GT-3. Drill Site GT-3 will be located on previously undisturbed National Forest System lands north of the abandoned Bomboy Mine and adjacent to Forest Road 1918 in Township 1 South, Range 11 East, in the NE ¼ NW ¼ NW ¼ of Section 26. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-3 will be collocated with Drill Site DS-K and as a result no additional surface disturbance will be created. Drill Site GT-3 will be accessed from Forest Road 1918. **Drill Site GT-4**. Drill Site GT-4 will be located on previously undisturbed National Forest System lands northeast of the abandoned Bomboy Mine and adjacent to a previously disturbed area proposed to be used as a temporary access road off of Forest Road 252 in Township 1 South, Range 11 East, in the NE ¹/₄ SE ¹/₄ SW ¹/₄ of Section 23. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-4 will be accessed from Forest Road 252, turning north onto Forest Road 1917, traveling 0.40 mile, then continuing along a previously disturbed area to be used as a temporary access road, and traveling 0.17 mile in a northerly direction to Drill Site GT-4.

Drill Site GT-5. Drill Site GT-5 will be located on previously undisturbed National Forest System lands northeast of the abandoned Bomboy Mine and adjacent to Forest Road 1917 in Township 1 South, Range 11 East, in the SW ¼ SW ¼ SE ¼ of Section 23. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-5 will be accessed from Forest Road 252, turning north onto Forest Road 1917, and traveling 0.40 mile in a northerly direction, continuing along a previously disturbed area to be used as a temporary access road for 0.02 mile, and turning east onto a short-term temporary access road for 20 feet to Drill Site GT-5.

Drill Site GT-6. Drill Site GT-6 will be located on previously undisturbed National Forest System lands southeast of the abandoned Bomboy Mine and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the NE ¹/₄ SE ¹/₄ NW ¹/₄ of Section 26. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-6 will be accessed from Forest Road 252, then turning west onto a short-term temporary access road for 70 feet to Drill Site GT-6.

Drill Site GT-7. Drill Site GT-7 will be located on previously undisturbed National Forest System lands southeast of the Bomboy Mine and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the NE ¼ NW ¼ SE ¼ of Section 26. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-7 will be collocated with Drill Site DS-M and as a result no additional surface disturbance will be created. Drill Site GT-7 will be accessed from Forest Road 1915.

Drill Site GT-8. Drill Site GT-8 will be located on previously undisturbed National Forest System lands west of Bear Tank Canyon and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the SE ¹/₄ SE ¹/₄ SE ¹/₄ of Section 26. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered.

The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-8 will be accessed from Forest Road 252.

Drill Site GT-12. Drill Site GT-12 will be located on previously undisturbed National Forest System lands adjacent to the intersection of Forest Road 357 and Forest Road 293 in Township 2 South, Range 11 East, in the NW ¼ SE ¼ NE ¼ of Section 2. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-12 will be accessed from Forest Road 293 by turning northwest onto a short-term temporary access road and traveling for 40 feet to Drill Site GT-12.

Drill Site GT-13. Drill Site GT-13 will be located on previously undisturbed National Forest System lands north of the Magma Arizona Railroad line and adjacent to Forest Road 293 in Township 2 South, Range 11 East, in the NE ¹/₄ NE ¹/₄ NE ¹/₄ of Section 2. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-13 will be accessed from Forest Road 293.

Drill Site GT-14. Drill Site GT-14 will be located on previously undisturbed National Forest System lands east of Benson Spring Canyon and adjacent to Forest Road 518 in Township 1 South, Range 11 East, in the NE ¼ SW ¼ NE ¼ of Section 36. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-14 will be collocated with Drill Site DS-N and as a result no additional surface disturbance will be created. Drill Site GT-14 will be accessed from Forest Road 518.

Drill Site GT-15. Drill Site GT-15 will be located on previously undisturbed National Forest System lands east of Bear Tank Canyon and adjacent to Forest Road 2359 in Township 1 South, Range 11 East, in the NW ¼ NW ¼ SE ¼ of Section 25. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-15 will be collocated with Drill Site DS-G and as a result no additional surface disturbance will be created. Drill Site GT-15 will be accessed from Forest Road 2359.

Drill Site GT-16. Drill Site GT-16 will be located on previously undisturbed National Forest System lands west of Bear Tank Canyon and adjacent to the intersection of Forest Road 1907 and a previously disturbed area proposed to be used as a temporary access road in Township 1 South, Range 11 East, in the NW ¼ NW ¼ NW ¼ of Section 25. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-16 will be accessed from Forest Road 1907.

Drill Site GT-17. Drill Site GT-17 will be located on previously undisturbed National Forest System lands between Roblas Canyon and Bear Tank Canyon and adjacent to Forest Road 1908 in Township 1 South, Range 11 East, in the NW ¼ SE ¼ NW ¼ of Section 24. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-17 will be collocated with Drill Site DS-J and as a result no additional surface disturbance will be created. Drill Site GT-17 will be accessed from Forest Road 1903 by turning west onto Forest Road 1909 for 0.25 mile, continuing west at the fork in the road to Forest Road 1908, and traveling 0.15 mile in a westerly direction to Drill Site GT-17.

Drill Site GT-18. Drill Site GT-18 will be located on previously undisturbed National Forest System lands between Roblas Canyon and Bear Tank Canyon and adjacent to Forest Road 1903 in Township 1 South, Range 11 East, in the NW ¼ NE ¼ NE ¼ of Section 24. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-18 will be collocated with Drill Site DS-I and as a result no additional surface disturbance will be created. Drill Site GT-18 will be accessed from Forest Road 1903.

Drill Site GT-19. Drill Site GT-19 will be located on previously undisturbed National Forest System lands west of Bear Tank Canyon and adjacent to Forest Road 1903 in Township 1 South, Range 11 East, in the SE ¼ NW ¼ SE ¼ of Section 24. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-19 will be collocated with Drill Site DS-H and as a result no additional surface disturbance will be created. Drill Site GT-19 will be accessed from Forest Road 1903.

Drill Site GT-20. Drill Site GT-20 will be located on previously undisturbed National Forest System lands between Bear Tank Canyon and Potts Canyon and Adjacent to Forest Road 2364 in Township 1 South, Range 12 East, in the NE ¼ SW ¼ NW ¼ of Section 30. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-20 will be collocated with Drill Site DS-F and as a result no additional surface disturbance will be created. Drill Site GT-20 will be accessed from Forest Road 2364.

Drill Site GT-21. Drill Site GT-21 will be located on previously undisturbed National Forest System lands west of Potts Canyon and adjacent to the intersection of Forest Road 2380 and Forest Road 518 in Township 1 South, Range 11 East, in the SE ¹/₄ NE ¹/₄ SE ¹/₄ of Section 25. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-21 will be accessed from Forest Road 518.

Drill Site GT-22. Drill Site GT-22 will be located on previously undisturbed National Forest System lands east of Potts Canyon and adjacent to Forest Road 2381 in Township 1 South,

Range 12 East, in the NE ¹/₄ NE ¹/₄ SW ¹/₄ of Section 31. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-22 will be accessed from Forest Road 2381.

Drill Site GT-23. Drill Site GT-23 will be located on previously undisturbed National Forest System lands west of Rice Water Canyon and adjacent to Forest Road 2382 in Township 1 South, Range 12 East, in the NW ¹/₄ SE ¹/₄ SE ¹/₄ of Section 31. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-23 will be accessed from Forest Road 2382.

Drill Site GT-24. Drill Site GT-24 will be located on previously undisturbed National Forest System lands east of Rice Water Canyon and adjacent to Forest Road 293 in Township 2 South, Range 11 East, in the NW ¹/₄ SE ¹/₄ NE ¹/₄ of Section 1. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-24 will be collocated with Drill Site DS-E and as a result no additional surface disturbance will be created. Drill Site GT-24 will be accessed from Forest Road 293.

Drill Site GT-25. Drill Site GT-25 will be located on previously undisturbed National Forest System lands north of the Magma Arizona Railroad line and adjacent to Forest Road 8 in Township 2 South, Range 12 East, in the NE ¹/₄ SE ¹/₄ NW ¹/₄ of Section 6. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-25 will be accessed from Forest Road 8 by turning southeast onto a short-term temporary access road and traveling for 100 feet to Drill Site GT-25.

Drill Site GT-26. Drill Site GT-26 will be located on previously undisturbed National Forest System lands north of the Magma Arizona Railroad line and adjacent to Forest Road 8 in Township 2 South, Range 12 East, in the SE ¹/₄ NW ¹/₄ NE ¹/₄ of Section 6. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-26 will be collocated with Drill Site DS-D and as a result no additional surface disturbance will be created. Drill Site GT-26 will be accessed from Forest Road 8.

Drill Site GT-27. Drill Site GT-27 will be located on previously undisturbed National Forest System lands east of Happy Camp Canyon and adjacent to Forest Road 2387 in Township 1 South, Range 12 East, in the NW ¼ NE ¼ SW ¼ of Section 33. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-27 will be collocated with Drill Site DS-C and as a result no additional surface disturbance will be created. Drill Site GT-27 will be accessed from Forest Road 2387.

Drill Site GT-28. Drill Site GT-28 will be located on previously undisturbed National Forest System lands west of Happy Camp Canyon and adjacent to Forest Road 650 in Township 1 South, Range 12 East, in the SE ¼ NW ¼ NW ¼ of Section 33. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-28 will be accessed from Forest Road 650 by turning northwest on a proposed short-term temporary access road and traveling for 60 feet to Drill Site GT-28.

Drill Site GT-29. Drill Site GT-29 will be located on previously undisturbed National Forest System lands west of Happy Camp Canyon and adjacent to Forest Road 650 in Township 1 South, Range 12 East, in the NW ¼ NE ¼ SW ¼ of Section 28. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-29 will be accessed from Forest Road 650 by turning east on a short-term temporary access road and traveling for 40 feet to Drill Site GT-29.

Drill Site GT-30. Drill Site GT-30 will be located on previously undisturbed National Forest System lands west of Rice Water Canyon and adjacent to Forest Road 982 in Township 1 South, Range 12 East, in the SE ¹/₄ SW ¹/₄ NE ¹/₄ of Section 29. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-30 will be accessed from Forest Road 982 by turning north onto a short-term temporary access road and traveling for 50 feet to Drill Site GT-30.

Drill Site GT-31. Drill Site GT-31 will be located on previously undisturbed National Forest System lands west of Potts Canyon and adjacent to the intersection of Forest Road 2362 and Forest Road 518 in Township 1 South, Range 12 East, in the SE ¹/₄ SE ¹/₄ SE ¹/₄ of Section 19. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-31 will be accessed either from Forest Road 2362 or Forest Road 518.

Drill Site GT-32. Drill Site GT-32 will be located on previously undisturbed National Forest System lands west of Bear Tank Canyon and adjacent to Forest Road 2360 in Township 1 South, Range 12 East, in the SW ¼ SW ¼ SE ¼ of Section 19. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-32 will be accessed from Forest Road 2360 by turning east onto a short-term temporary access road and traveling for 80 feet to Drill Site GT-32.

Drill Site GT-33. Drill Site GT-33 will be located on previously undisturbed National Forest System lands west of Potts Canyon in Township 1 South, Range 12 East, in the NW ¼ NW ¼ SW ¼ of Section 20. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-33 will be accessed from Forest Road 982 by heading northward for approximately 0.35 mile along a short-term temporary access road to Drill Site GT-33.

Drill Site GT-34. Drill Site GT-34 will be located on previously undisturbed National Forest System lands west of Happy Camp Canyon and adjacent to Forest Road 2371 in Township 1 South, Range 12 East, in the NW ¼ NE ¼ NE ¼ of Section 28. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. Drill Site GT-34 will be collocated with Drill Site DS-A, and as a result, no additional surface disturbance will be created. Drill Site GT-34 will be accessed from Forest Road 2371.

Drill Site GT-35. Drill Site GT-35 will be located on previously undisturbed National Forest System lands east of Hewitt Canyon and adjacent to Forest Road 3717 in Township 1 South, Range 11 East, in the NW ¼ NW ¼ SW ¼ of Section 27. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. GT-35 will be collocated with Drill Site DS-O and as a result no additional surface disturbance will be created. Drill Site GT-35 will be accessed from Forest Road 252 by turning southwest onto Forest Road 3713 and traveling 0.47 mile to Drill Site GT-35.

Drill Site GT-36. Drill Site GT-36 will be located on previously undisturbed National Forest System lands west of Bear Tank Canyon in Township 1 South, Range 12 East, in the NW ¼ NW ¼ NW ¼ Of Section 19. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-36 will be accessed from Forest Road 1903 by turning east onto a previously disturbed area to be used as a temporary access road and traveling for approximately 56 feet.

Drill Site GT-37. Drill Site GT-37 will be located on previously undisturbed National Forest System lands south of the abandoned Bomboy Mine in Township 1 South, Range 11 East, in the SW ¼ SW ¼ NW ¼ of Section 26. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-37 will be accessed from Forest Road 252 by heading southeast along a previously disturbed area to be used as a temporary access road and traveling for approximately 0.40 mile to Drill Site GT-37.

Drill Site GT-38. Drill Site GT-38 will be located on previously undisturbed National Forest System lands south of the abandoned Bomboy Mine in Township 1 South, Range 11 East, in the SE ¹/₄ SE ¹/₄ of Section 27. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-38 will be accessed from Forest Road 1916, continuing along a previously disturbed area proposed to be used as a temporary access road for approximately 0.17 mile, then turning west and following a short-term temporary access road for approximately 0.97 mile to Drill Site GT-38.

Drill Site GT-39. Drill Site GT-39 will be located on previously undisturbed National Forest System lands north of Bear Tank Canyon in Township 1 South, Range 11 East, in the NW ¼ SE ¼ NW ¼ of Section 35. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-39 will be accessed from Forest Road 252 by turning westward and traveling approximately 1.07 miles along a short-term temporary access road to Drill Site GT-39.

Drill Site GT-40. Drill Site GT-40 will be located on previously undisturbed National Forest System lands southwest of the abandoned Bomboy Mine in Township 1 South, Range 11 East, in the SW ¼ NW ¼ SE ¼ of Section 27. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-40 will be accessed from Forest Road 252 by turning southeast and traveling approximately 0.82 mile along a short-term temporary access road to Drill Site GT-40.

Drill Site GT-41. Drill Site GT-41 will be located on previously undisturbed National Forest System lands southeast of the abandoned Bomboy Mine in Township 1 South, Range 11 East, in the NE ¼ SE ¼ SW ¼ of Section 26. Upon completion of geotechnical core recovery, a 2-inch PVC standpipe piezometer will be installed if groundwater is encountered. The estimated surface disturbance for this site is 0.01 acre. Drill Site GT-41 will be accessed from following Forest Road 1916 until its termination point, then continuing approximately 0.30 miles along a previously disturbed area to be used as a temporary access road to Drill Site GT-41.



3.3 Test Trenches

3.3.1 Purpose and Location of Activity

A total of 32 test trenches, TP-1 through TP-32 will be constructed for the purpose of investigating near surface soils and the weathered bedrock interface on National Forest System lands (Figure 2 and Table 4). In each trench, detailed stratigraphy and infiltration tests will be performed at several depths to estimate hydraulic conductivity of shallow surface soils. Samples will be collected through various soil and rock horizons to test strength parameters, physical properties, and for chemical analysis.

Road access and roadway improvements required to gain access to the test trenches are identified in Figure 2 and Section 3.4.

Trench Site	Northing UTM	Easting UTM ¹	Elevation (ft)	Legal Description ²	Approximate Maximum	Acres of Disturbance		
National Found Surface lands								
TD 1	rorest Syster	n lands	2.216	T10 D11E 0 27	16	0.04		
IP-I	3685829	4/8585	2,216	115, RTE, Sec $2/$	16	0.04		
TD 2	2695901	170616	2 200	$1NW \frac{74}{4}NW \frac{74}{4}SW \frac{74}{4}$	16	0.04		
IP-2	3083801	4/8040	2,206	NW ¹ / ₄ NW ¹ / ₄ SW ¹ / ₄	10	0.04		
TP-3	3686513	479190	2,244	T1S, R11E, Sec 27	16	0.04		
				SE ¼ NE ¼ NW ¼				
TP-4	3686338	479129	2,246	T1S, R11E, Sec 27	16	0.04		
				NE ¼ SE ¼ NW ¼				
TP-5	3686739	479609	2,270	T1S, R11E, Sec 27	16	0.04		
				NE ¼ NW ¼ NE ¼				
TP-6	3686453	479936	2,316	T1S, R11E, Sec 27	16	0.04		
				SE ¼ NE ¼ NE ¼				
TP-7	3686361	479922	2,306	T1S, R11E, Sec 27	16	0.04		
				NE 1/4 SE 1/4 NE 1/4				
TP-8	3684420	482121	2,343	T1S, R11E, Sec 36	16	0.04		
				SW 1/4 SE 1/4 NW 1/4				
TP-9	3684297	482345	2,349	T1S, R11E, Sec 36	16	0.04		
				NE 1/4 NE 1/4 SW 1/4				
TP-10	3683495	482249	2,326	T2S, R11E, Sec 2	16	0.04		
				NE 1/4 NE 1/4 NW 1/4				
TP-11	3683956	482653	2,352	T1S, R11E, Sec 36	16	0.04		
				NW 1/4 SW 1/4 SE 1/4				
TP-12	3684238	482842	2,402	T1S, R11E, Sec 36	16	0.04		
		10.000		NE ¼ NW ¼ SE ¼				
TP-13	3684356	482958	2,402	TIS, RIIE, Sec 36	16	0.04		
TTD 14	2602461	402025	2 2 7 2	NW ¹ / ₄ NE ¹ / ₄ SE ¹ / ₄	1.6	0.04		
TP-14	3683461	482925	2,372	T2S, R11E, Sec 2	16	0.04		
TD 15	2602244	402102	0.405	NE ¼ NE ¼ NE ¼	1.5	0.04		
TP-15	3683344	483192	2,405	12S, RIIE, Sec I	16	0.04		
TD 16	2692262	492407	2.405	5W ¹ / ₄ NW ¹ / ₄ NW ¹ / ₄	16	0.04		
IP-16	3683263	483495	2,405	12S, RHE, Sec I	16	0.04		
				SW 1/4 NE 1/4 NW 1/4				

Table 4. Estimated Disturbance Area for Test Trenches.

Trench	Northing	Easting	Elevation	Legal Description ²	Approximate	Acres of
Site	UTM	UTM	(ft)		Maximum Depth (Feet)	Disturbance
TP-17	3682573	484017	2,384	T2S, R11E, Sec 1	16	0.04
				NW 1/4 NW 1/4 SE 1/4		
TP-18	3682403	484699	2,418	T2S, R11E, Sec 1	16	0.04
				SE ¼ NE ¼ SE ¼		
TP-19	3682889	484982	2,451	T2S, R12E, Sec 6	16	0.04
				SE ¹ / ₄ SW ¹ / ₄ NW ¹ / ₄		
TP-20	3682870	485044	2,575	T2S, R12E, Sec 6	16	0.04
TTD 01	2 (0.01.0.0	40.5005	2.455	SE 1/4 SW 1/4 NW 1/4		0.04
TP-21	3683132	485287	2,477	T2S, R12E, Sec 6	16	0.04
TD 22	2602115	405242	2 470	SE ¹ / ₄ NE ¹ / ₄ NW ¹ / ₄	1.6	0.04
TP-22	3683115	485343	2,470	12S, R12E, Sec 6	16	0.04
TD 22	2692969	496090	2.546	NE ¹ /4 SE ¹ /4 NW ¹ /4	16	0.04
IP-25	3083808	480089	2,540	115, R12E, Sec 52 NE 14 SW 14 SE 14	10	0.04
TD 24	2692921	196111	2546	$\frac{\text{NE } 74 \text{ SW } 74 \text{ SE } 74}{\text{T1S } \text{D12E } \text{Sec } 22}$	16	0.04
11-24	5065651	400144	2,340	NW 1/4 SE 1/4 SE 1/4	10	0.04
TP-25	3684241	486895	2.654	T1S. R12E. Sec 33	16	0.04
			,	NE ¼ NW ¼ SW ¼		
TP-26	3684007	487981	2,723	T1S, R12E, Sec 33	16	0.04
				SE ¼ NE ¼ SE ¼		
TP-27	3684798	486676	2,625	T1S, R12E, Sec 33	16	0.04
				SW ¼ NW ¼ NW ¼		
TP-28	3686942	485081	2,618	T1S, R12E, Sec 20	16	0.04
				SW 1/4 SW 1/4 SW 1/4		
TP-29	3685824	487076	2,697	T1S, R12E, Sec 28	16	0.04
				NW 1/4 NE 1/4 SW 1/4		
TP-30	3687372	484421	2,625	T1S, R12E, Sec 19	16	0.04
				NE ¼ NW ¼ SE ¼		
TP-31	3686781	481027	2,408	T1S, R11E, Sec 26	16	0.04
	2 40 6 6 6 6	40.0 - 11.0		NW 1/4 NW 1/4 NE 1/4	4.5	
TP-32	3683908	482610	2,352	T1S, R11E, Sec 36	16	0.04
				NW 1/4 SW 1/4 SE 1/4		
Total :						1.32 acres

¹ UTM NAD 27 Zone 12M

² Legal Descriptions are based on the state of Arizona Gila and Salt River Baseline and Meridian.

3.3.2 Description of Test Trenching Operations

The test trenches will have an approximately 60 foot by 30 foot disturbance footprint (0.04 acres). Test trenches have been located adjacent to existing roads or trails, where possible, to minimize surface impacts. The estimated total disturbance area for all of the test trenches is approximately 1.32 acres, all of which will be located on National Forest System lands. The estimated surface disturbance for each individual site is identified in Section 3.6 of this Plan and in Table 4 above.

Complete, detailed descriptions of the proposed test trenches are provided in Appendix A.

The test trenches will be excavated using a CAT 320 tracked excavator (or equivalent). The dimensions make allowances for benching of the test trench walls to allow safe access of personnel to inspect the upper five feet of the trench walls and to perform soil infiltration tests.

The proposed test trenching activities will consist of excavating a 50 foot long trench to a maximum depth of 16 feet to map and sample near surface geology (Figures 6). The width of the infiltration excavation will be 20 feet (at its widest point) in the center of the test trench. This disturbance will be located within the proposed disturbance of 60 feet in length by 30 feet in width. Additional benching will not be needed to reach the maximum depth. The dimensions allow for benching of the test trench walls as described above, however all mapping will be done with personnel located outside of the trench. Contractors will comply with the Arizona Division of Occupational Safety and Health requirements for trenching and excavation.

The precise location of the test trench within the 60 foot by 30 foot footprint will be determined based on site conditions (i.e. topography, soils, presence of rocks/boulders, vegetation, etc.). The typical test trench excavation volume will be approximately 90 cubic yards. This material will be side cast from the excavation area to the surrounding temporary stockpile area. The total pad area will be approximately 200 square yards. Excavation areas will be approximately 50 square yards, leaving 150 square yards on which to temporarily stockpile the 90 cubic yards of excavation material. The actual location of the temporary stockpile within the pad and the trench's approximate size will depend on the placement of the test trench. For example, if the test trench is located in the approximate center of the 60 foot by 30 foot disturbance footprint, temporary stockpiles could be placed in one or all of the 4 corners of the disturbance footprint. However, if the test trench is located near the eastern or western boundary of the disturbance footprint, temporary stockpiles will be located along the opposite boundary of the trench placement. Regardless of where the test trench is actually located within the footprint, all of the temporary stockpiles and test trenches will be contained within the proposed 60 foot by 30 foot footprint as shown on Figures 6a and 6b.

In each trench, infiltration tests will be performed at shallow intervals (as determined) to assess near surface hydraulic conductivity. Samples of soil will be recovered for laboratory testing at select increments and/or variable unit types.

Infiltration tests will be conducted in two or more benches excavated within each trench. The depth for each infiltration test will be determined in the field, based on conditions and will occur at no deeper than 16 feet. The tests will be conducted using a ring infiltrometer and/or a constant-head (Guelph) permeameter. After completion of the infiltration testing at each depth, sediments will be inspected beneath the test surface to document wetting patterns and the presence of any significant heterogeneities (such as cemented zones) that may influence test results. Samples of
sediments tested will be analyzed and data will be evaluated to determine infiltration capacity and to estimate the vertical hydraulic conductivity for alluvial sediments tested.

Test trenches will typically be open for a time period of 24 hours but in some instances, may remain open for approximately two days. No more than two test trenches will be open at any one time. Sediment control features will be employed downgradient of temporary stockpiles excavated for test trenching activities. The test trenches will be backfilled immediately after completion of infiltration testing. The excavated soils will be placed in the trench in 2-foot-thick layers and compacted by tamping the excavator bucket. After backfilling each test trench, each trench site will be reclaimed by cross-ripping along the contour and re-vegetating with a native seed mix.

The excavator and any associated light vehicles will be stationed within the test trench disturbance area and/or the proposed short-term temporary access road leading to the Baseline Activity site; however, no road closures will be required. In the unlikely event that a site is left unmanned for a short period of time, barricading (i.e. safety cones, jersey barriers, temporary fencing, and/or yellow caution tape) will be used to prevent public, cattle and wildlife access. Excavation should be completed in less than one day and backfilled within approximately two days. Work will progress sequentially such that trenches will be backfilled and scarified prior to moving to a new site.

A typical equipment list for the proposed test trenching is provided in Table 2. Figures 6, 6a and 6b provide a schematic of a potential test trench and temporary stockpile layouts within the 60 foot by 30 foot disturbance footprint.

As a result of using a tracked excavator, no road improvements will be necessary. Any support vehicles (light vehicles to transport individuals) will be parked within the short-term temporary access roads. A description of each of the proposed test trench sites follows.

Test Trench TP-1. Test Trench TP-1 will be located on previously undisturbed National Forest System lands east of Hewitt Canyon and adjacent to Forest Road 3713 in Township 1 South, Range 11 East, in the NW ¼ NW ¼ SW ¼ of Section 27. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-1 will be accessed from Forest Road 252 by turning southwest onto Forest Road 3713 and traveling 0.5 mile, then turning southeast onto a short-term temporary access road for 70 feet to Test Trench TP-1.

Test Trench TP-2. Test Trench TP-2 will be located on previously undisturbed National Forest System lands east of Hewitt Canyon and adjacent to Forest Road 3713 in Township 1 South, Range 11 East, in the NW ¼ NW ¼ SW ¼ of Section 27. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-2 will be accessed from Forest Road 252 by turning southwest onto Forest Road 3713, continuing 0.78 mile, turning east onto a short-term temporary access road, and traveling approximately 0.33 mile to Test Trench TP-2.

Test Trench TP-3. Test Trench TP-3 will be located on previously undisturbed National Forest System lands southeast of Roblas Butte and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the SE ¼ NE ¼ NW ¼ of Section 27. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-3 will be accessed from Forest Road 252 by turning south onto a short-term temporary access road and traveling for 130 feet to Test Trench TP-3.

Test Trench TP-4. Test Trench TP-4 will be located on previously undisturbed National Forest System lands southeast of Roblas Butte and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the NE ¼ SE ¼ NW ¼ of Section 27. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-4 will be accessed from Forest Road 252 by turning southeast and following a short-term temporary access road for approximately 0.07 mile to Test Trench TP-4.

Test Trench TP-5. Test Trench TP-5 will be located on previously undisturbed National Forest System lands west of the abandoned Bomboy Mine and adjacent to Forest Road 3451 in Township 1 South, Range 11 East, in the NE ¼ NW ¼ NE ¼ of Section 27. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-5 will be accessed from Forest Road 3451 by turning west onto a short-term temporary access road and traveling for approximately 140 feet to Test Trench TP-5.

Test Trench TP-6. Test Trench TP-6 will be located on previously undisturbed National Forest System lands west of the abandoned Bomboy Mine and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the SE ¹/₄ NE ¹/₄ NE ¹/₄ of Section 27. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-6 will be accessed from Forest Road 252 by turning southeast onto a previously disturbed area proposed to be used as a temporary access road, traveling for approximately 0.10 mile, then turning northwest and following a short-term temporary access road for approximately 150 feet to Test Trench TP-6.

Test Trench TP-7. Test Trench TP-7 will be located on previously undisturbed National Forest System lands west of the abandoned Bomboy Mine and adjacent to Forest Road 252 in Township 1 South, Range 11 East, in the NE ¹/₄ SE ¹/₄ NE ¹/₄ of Section 27. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-7 will be accessed from Forest Road 252 by turning southeast onto a previously disturbed area to be used as a temporary access road,

traveling for approximately 0.15 miles, then turning west onto a short-term temporary access road and traveling for 40 feet to Test Trench TP-7.

Test Trench TP-8. Test Trench TP-8 will be located on previously undisturbed National Forest System lands between Benson Spring Canyon and Potts Canyon in Township 1 South, Range 11 East, in the SW ¼ SE ¼ NW ¼ of Section 36. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-8 will be accessed from Forest Road 252 by turning northeast and following a short-term temporary access road for approximately 0.05 mile to Test Trench TP-8.

Test Trench TP-9. Test Trench TP-9 will be located on previously undisturbed National Forest System lands between Benson Spring Canyon and Potts Canyon in Township 1 South, Range 11 East, in the NE ¹/₄ NE ¹/₄ SW ¹/₄ of Section 36. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-9 will be accessed from Forest Road 252 by turning north and following a short-term temporary access road for approximately 0.08 mile to Test Trench TP-9.

Test Trench TP-10. Test Trench TP-10 will be located on previously undisturbed National Forest System lands west of Potts Canyon and adjacent to Forest Road 252 in Township 2 South, Range 11 East, in the NE ¼ NE ¼ NW ¼ of Section 2. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-10 will be accessed from Forest Road 252 by turning southeast and following a short-term temporary access road for approximately 140 feet to Test Trench TP-10.

Test Trench TP-11. Test Trench TP-11 will be located on previously undisturbed National Forest System lands west of Potts Canyon and between Forest Road 252 and Forest Road 2381 in Township 1 South, Range 11 East, in the NW ¼ SW ¼ SE ¼ of Section 36. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-11 will be accessed from Forest Road 518 by continuing onto Forest Road 252 and then turning east and traveling approximately 0.12 mile along a short-term temporary access road to Test Trench TP-11.

Test Trench TP-12. Test Trench TP-12 will be located on previously undisturbed National Forest System lands west of Potts Canyon and between Forest Road 518 and Forest Road 2381 in Township 1 South, Range 11 East, in the NE ¹/₄ NW ¹/₄ SE ¹/₄ of Section 36. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-12 will be accessed from Forest Road 2381 by turning west and traveling approximately 0.70 mile along a short-term temporary access road to Test Trench TP-12.

Test Trench TP-13.Test Trench TP-13 will be located on previously undisturbed National Forest System lands west of Potts Canyon and between Forest Road 518 and Forest Road 2381in Township 1 South, Range 11 East, in the NW ¹/₄ NE ¹/₄ SE ¹/₄ of Section 36. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-13 will be accessed from Forest Road 2318 by turning west and traveling approximately 0.58 miles along a short-term temporary access road to Test Trench TP-13.

Test Trench TP-14. Test Trench TP-14 will be located on previously undisturbed National Forest System lands east of the intersection of Forest Road 293 and Forest Road 2383 in Township 2 South, Range 11 East, in the NE ¹/₄ NE ¹/₄ NE ¹/₄ of Section 2. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-14 will be accessed from Forest Road 293.

Test Trench TP-15. Test Trench TP-15 will be located on previously undisturbed National Forest System lands adjacent to Forest Road 293, approximately 0.19 mile east of TP-14 in Township 2 South, Range 11 East, in the SW ¼ NW ¼ NW ¼ of Section 1. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-15 will be accessed from Forest Road 293 by turning southeast and traveling approximately 0.02 mile along a short-term temporary access road to Test Trench TP-15.

Test Trench TP-16. Test Trench TP-16 will be located on previously undisturbed National Forest System lands adjacent to Forest Road 293, approximately 0.2 mile east of TP-15 in Township 2 South, Range 11 East, in the SW ¼ NE ¼ NW ¼ of Section 1. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-16 will be accessed from Forest Road 293 by turning south and traveling approximately 70 feet along a short-term temporary access road to Test Trench TP-16.

Test Trench TP-17. Test Trench TP-17 will be located on previously undisturbed National Forest System lands approximately 0.35 mile north of the Queen Creek Bridge and adjacent to Forest Road 2398 in Township 2 South, Range 11 East, in the NW ¼ NW ¼ SE ¼ of Section 1. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-17 will be accessed from Forest Road 2398 by turning north and traveling approximately 70 feet along a short-term temporary access road to Test Trench TP-17.

Test Trench TP-18. Test Trench TP-18 will be located on previously undisturbed National Forest System lands approximately 0.13 miles east of the intersection of Forest Road 8 and Forest Road 2397 in Township 2 South, Range 11 East, in the SE ¹/₄ NE ¹/₄ SE ¹/₄ of Section 1.

Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-18 will be accessed from Forest Road 2397.

Test Trench TP-19. Test Trench TP-19 will be located on previously undisturbed National Forest System lands approximately 280 feet northeast of the intersection of the Magma Arizona Railroad line and Forest Road 8 in Township 2 South, Range 12 East, in the SE ¹/₄ SW ¹/₄ NW ¹/₄ of Section 6. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-19 will be accessed from Forest Road 8 by turning southeast and traveling approximately 90 feet along a short-term temporary access road to Test Trench TP-19.

Test Trench TP-20. Test Trench TP-20 will be located on previously undisturbed National Forest System lands approximately 407 feet northeast of the intersection of the Magma Arizona Railroad line and Forest Road 8 in Township 2 South, Range 12 East, in the SE ¹/₄ SW ¹/₄ NW ¹/₄ of Section 6. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-20 will be accessed from Forest Road 8 by turning southeast and following a previously disturbed area to be used as a temporary access road for approximately 0.06 mile to Test Trench TP-20.

Test Trench TP-21. Test Trench TP-21 will be located on previously undisturbed National Forest System lands north of the Magma Arizona Railroad line and adjacent to Forest Road 8 in Township 2 South, Range 12 East, in the SE ¹/₄ NE ¹/₄ NW ¹/₄ of Section 6. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-21 will be accessed from Forest Road 8 by turning southwest and traveling approximately 20 feet along a short-term temporary access road to Test Trench TP-21.

Test Trench TP-22. Test Trench TP-22 will be located on previously undisturbed National Forest System lands north of the Magma Arizona Railroad line and adjacent to Forest Road 8 in Township 2 South, Range 12 East, in the NE ¼ SE ¼ NW ¼ of Section 6. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-22 will be accessed from Forest Road 8 by turning southeast and traveling approximately 0.08 mile along a short-term temporary access road to Test Trench TP-22.

Test Trench TP-23. Test Trench TP-23 will be located on previously undisturbed National Forest System lands approximately 0.11 mile southwest from the intersection of Forest Road 8 and Forest Road 650 in Township 1 South, Range 12 East, in the NE ¹/₄ SW ¹/₄ SE ¹/₄ of Section 32. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-23 will be

accessed from Forest Road 8 by turning northwest and traveling approximately 0.07 mile along a short-term temporary access road to Test Trench TP-23.

Test Trench TP-24. Test Trench TP-24 will be located on previously undisturbed National Forest System lands approximately 0.08 mile southwest from the intersection of Forest Road 8 and Forest Road 650 in Township 1 South, Range 12 East, in the NW ¹/₄ SE ¹/₄ SE ¹/₄ of Section 32. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-24 will be accessed from Forest Road 8 by turning northwest and traveling approximately 0.04 mile along a short-term temporary access road to Test Trench TP-24.

Test Trench TP-25. Test Trench TP-25 will be located on previously undisturbed National Forest System lands between Happy Camp Canyon and the Silver King Wash in Township 1 South, Range 12 East, in the NE ¼ NW ¼ SW ¼ of Section 33. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-25 will be accessed from Forest Road 2387.

Test Trench TP-26. Test Trench TP-26 will be located on previously undisturbed National Forest System lands adjacent to the Silver King Wash and Forest Road 8 in Township 1 South, Range 12 East, in the SE ¹/₄ NE ¹/₄ SE ¹/₄ of Section 33. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-26 will be accessed from Forest Road 8 by turning southwest and traveling along a short-term temporary access road for approximately 0.14 mile to Test Trench TP-26.

Test Trench TP-27. Test Trench TP-27 will be located on previously undisturbed National Forest System lands adjacent to Happy Camp Canyon and Forest Road 650 in Township 1 South, Range 12 East, in the SW ¼ NW ¼ NW ¼ of Section 33. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-27 will be accessed from Forest Road 650 by turning southeast and traveling approximately 90 feet along a short-term temporary access road to Test Trench TP-27.

Test Trench TP-28. Test Trench TP-28 will be located on previously undisturbed National Forest System lands northwest of Barnett Camp in Township 1 South, Range 12 East, in the SW ¹/₄ SW ¹/₄ of Section 20. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-28 will be accessed from Forest Road 982 by turning northeast and traveling approximately 30 feet along a short-term temporary access road to Test Trench TP-28.

Test Trench TP-29. Test Trench TP-29 will be located on previously undisturbed National Forest System lands adjacent to Happy Camp Canyon and Forest Road 650 in Township 1 South, Range 12 East, in the NW ¹/₄ NE ¹/₄ SW ¹/₄ of Section 28. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-29 will be accessed from Forest Road 650 by turning east and traveling approximately 0.03 mile along a short-term temporary access road to Test Trench TP-29.

Test Trench TP-30. Test Trench TP-30 will be located on previously undisturbed National Forest System lands approximately 0.67 miles east of the Bear Tank Canyon and adjacent to Forest Road 982 in Township 1 South, Range 12 East, in the NE ¼ NW ¼ SE ¼ of Section 19. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-30 will be accessed from Forest Road 982 by turning east and traveling approximately 30 feet along a short-term temporary access road to Test Trench TP-30.

Test Trench TP-31. Test Trench TP-31 will be located on previously undisturbed National Forest System lands northeast of the abandoned Bomboy Mine in Township 1 South, Range 11 East, in the NW ¼ NW ¼ NE ¼ of Section 26. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-31 will be accessed from Forest Road 252 by turning north onto Forest Road 1917 and traveling 0.37 miles in a northerly direction, then turning east and traveling approximately 30 feet along a short-term temporary access road to Test Trench TP-31.

Test Trench TP-32. Test Trench TP-32 will be located on previously undisturbed National Forest System lands west of Potts Canyon and between Forest Road 518 and Forest Road 2381 in Township 1 South, Range 11 East, in the NW ¼ SW ¼ SE ¼ of Section 36. Upon completion of geotechnical investigation and sample recovery, the excavation will be backfilled. The estimated surface disturbance for this site is 0.04 acre. Test Trench TP-32 will be accessed from Forest Road 518 by continuing onto Forest Road 252 and then turning east and traveling approximately 0.07 mile along a short-term temporary access road to Test Trench TP-32.







3.4 Access

All baseline data gathering locations will be accessed using existing Forest Service roads (including roads slated for closure), previously disturbed areas to be used as temporary access roads, and short-term temporary access roads on Forest Service lands. Disturbance for existing Forest Service roads and previously disturbed areas to be used as temporary access roads was calculated using actual roadway widths based on 2012 aerial imagery. Disturbance for existing roads to be improved was calculated using a conservative approach to estimate the maximum possible cut and fill boundary of the proposed improvement minus the existing disturbance of the roadway. The acreage for the short-term temporary access roads was estimated using a 10-foot surface disturbance width, which accounts for the width of the largest equipment to utilize short-term temporary access roads. These short-term temporary access roads require no road construction. The disturbance calculated was based off of the width of the largest equipment that will be traveling off road while following a pre-designated, surveyed route.

Access to activities on National Forest System lands will be gained from US Highway 60, Forest Road 357, Forest Road 8, Forest Road 650, Forest Road 3713, Forest Road 252, and Forest Road 172 (Figures 1 and 2). Approximately 34.48 linear miles (56.47 acres) of existing Forest Service roads, 2.27 linear miles (3.94 acres) of previously disturbed areas proposed to be used as temporary access roads, and 5.83 linear miles (7.07 acres) of short-term temporary access roads on National Forest System lands will be used to gain access to the activity sites. Approximately 13.07 linear miles (17.05 acres) of the proposed access roads will require improvements and maintenance (Table 7). The current Forest Service Road Maintenance Levels within the proposed Baseline Activities areas are shown on Figure 7.

National Forest System classification road types are as follows:

- <u>Level 1 (Closed to motor Vehicle use)</u> roads may be of any type, class or construction standard, and may be managed at any other maintenance level during the time they are open for traffic; however, while maintained at Level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.
- <u>Level 2 (High-clearance Vehicles)</u> roads are open for use by high-clearance vehicles and have low traffic volumes and speeds. These roads typically are local and connect collector roadways, have at-grade drainage treatment, are not subject to the requirements of the Highway Safety Act, do not provide surface smoothness, and are not suitable for passenger cars.
- <u>Level 3 (Suitable for Passenger Cars)</u> roads typically have low speeds and a single lane with turn-outs and spot surfacing. These roads have low to moderate traffic volumes, typically connect to arterial and collector roads, and may include some dispersed recreation roads.

- <u>Level 4 (Suitable for Passenger Cars/Moderate Degree of User Comfort)</u> roads provide a moderate degree of user comfort and convenience at moderate travel speeds. These roads typically may connect to county roads; are usually considered collector roads; can be double-lane, aggregate-surfaced and dust-abated; and have culverts for drainage treatment.
- <u>Level 5 (High Degree of User Comfort)</u> roads provide a high degree of user comfort and convenience. These roads provide the highest traffic volumes and speeds; are usually arterial or collector roadways; and are normally double-lane, paved facilities. Some may be aggregate-surfaced and dust-abated.

Temporary access roads are defined in this Plan as a road or trail that is not a forest road or trail and is not included in a forest transportation atlas.

3.4.1 Proposed Short-Term Temporary Access Roads within National Forest System Lands

Access to sites not served by existing roads will be gained by use of short-term temporary access roads. The majority of these short-term temporary access roads are relatively small in length (less than 150 feet) and provide access from the existing road to the proposed Baseline Activity site. No cut, fill or any other road construction activity will be required for these short-term temporary access roads. Short-term temporary access routes were GPS surveyed and selected based on their ease of access and avoidance of vegetation and cultural resource sites. Disturbance will be limited to a 10 foot width. Personnel access after completion of the drilling and piezometer installation will be gained by foot. Table 5 lists and describes the proposed short-term temporary access roads and Figures 2 and 7 display their location.

Road	Length (Feet)	Length (Miles)	Acres	Current Surface Condition
Road to GT-2	70.00	0.01	0.02	Sonoran Desertscrub
Road to GT-5	20.00	0.00	0.00	Sonoran Desertscrub
Road to GT-6	70.00	0.01	0.02	Sonoran Desertscrub
Road to GT-12	40.00	0.01	0.01	Sonoran Desertscrub
Road to GT-25	100.00	0.02	0.02	Sonoran Desertscrub
Road to GT-28	60.00	0.01	0.01	Sonoran Desertscrub
Road to GT-29	40.00	0.01	0.01	Sonoran Desertscrub
Road to GT-30	50.00	0.01	0.01	Sonoran Desertscrub
Road to GT-32	80.00	0.02	0.02	Sonoran Desertscrub
Road to GT-33	1,840.00	0.35	0.42	Sonoran Desertscrub
Road to GT-38	5,100.00	0.97	1.17	Sonoran Desertscrub

Table 5. Proposed Short-term Temporary Access Roads within National Forest System lands.

Road	Length (Feet)	Length (Miles)	Acres	Current Surface Condition	
Road to GT-39	5,650.00	1.07	1.30	Sonoran Desertscrub	
Road to GT-40	4,340.00	0.82	1.00	Sonoran Desertscrub	
Road to TP-1	70.00	0.01	0.02	Sonoran Desertscrub	
Road to TP-2	1,750.00	0.33	0.40	Sonoran Desertscrub	
Road to TP-3	130.00	0.02	0.03	Sonoran Desertscrub	
Road to TP-4	370.00	0.07	0.08	Sonoran Desertscrub	
Road to TP-5	140.00	0.03	0.03	Sonoran Desertscrub	
Road to TP-6	150.00	0.03	0.03	Sonoran Desertscrub	
Road to TP-7	40.00	0.01	0.01	Sonoran Desertscrub	
Road to TP-8	250.00	0.05	0.06	Sonoran Desertscrub	
Road to TP-9	430.00	0.08	0.10	Sonoran Desertscrub	
Road to TP-10	140.00	0.03	0.03	Sonoran Desertscrub	
Road to TP-11 (and TP-32)	620.00	0.12	0.14	Sonoran Desertscrub	
Road to TP-12 (and TP-13)	3,710.00	0.70	0.85	Sonoran Desertscrub	
Road to TP-15	110.00	0.02	0.03	Sonoran Desertscrub	
Road to TP-16	70.00	0.01	0.02	Sonoran Desertscrub	
Road to TP-17	70.00	0.01	0.02	Sonoran Desertscrub	
Road to TP-19	90.00	0.02	0.02	Sonoran Desertscrub	
Road to TP-21	20.00	0.00	0.00	Sonoran Desertscrub	
Road to TP-22	420.00	0.08	0.10	Sonoran Desertscrub	
Road to TP-23 (and TP-24)	400.00	0.07	0.09	Sonoran Desertscrub	
Road to TP-26	750.00	0.14	0.17	Sonoran Desertscrub	
Road to TP-27	90.00	0.02	0.02	Sonoran Desertscrub	
Road to TP-28	30.00	0.01	0.01	Sonoran Desertscrub	
Road to TP-29	180.00	0.03	0.04	Sonoran Desertscrub	
Road to TP-30	30.00	0.01	0.01	Sonoran Desertscrub	
Road to TP-31	30.00	0.00	0.01	Sonoran Desertscrub	
Total:	30,810	5.83		•	
Total Acreage:	7.07	Acres*			

*Acreage calculation is based off of a 10 foot disturbance path.

Short-term temporary access roads are proposed to be used only to gain access to sites and to remove the equipment when done performing the specific activity. Each short-term temporary

access road will typically not be used for more than approximately two days. Once work at a site has been completed all physical evidence of the short-term temporary access road will be reclaimed immediately so as to leave no trace of the short-term temporary access road's existence (See Section 5.4). Once reclamation measures have been completed, access to any monitoring that may be required at sites whose prior access was via short-term temporary access roads will be gained via foot. At the end of the authorization period short-term temporary access roads will be used for abandonment and closure of piezometers and then reclaimed immediately.

3.4.2 Existing Forest Service Roads and Previously Disturbed Areas Proposed to be used as Temporary Access Roads

An extensive road network exists in the area of the proposed Baseline Activities. Figure 2 displays all roads that Resolution is proposing to use for the duration of the Baseline Activities. Resolution will use existing roads to the maximum extent practical.

Currently there are a number of roads in the Baseline Activities area that have been created by public users of National Forest System lands. Since these roads were not created under approval and guidance from the Tonto National Forest, they have not been incorporated into the Tonto National Forest road network. As a result, they are not maintained on any regular basis. However, frequent use of these roads by the public has kept the roads in a drivable condition. Many of the roads are in a condition that is equivalent to Forest Service Level-2 (High Clearance Vehicles). In order to reduce surface disturbance (by not having to create new roads), Resolution will use and maintain these previously disturbed areas as temporary access roads and maintain them to a Level-2 High Clearance Vehicle status for the duration of the Baseline Activities. Table 6 further describes each of these previously disturbed areas proposed to be used as temporary access roads by Resolution.

Previously Disturbed Area	Width (Feet)	Length (Feet)	Length (Miles)	Acres	Previously Disturbed Area Description and Condition
Leading from Forest Road 293 to GT-13	10	222	0.04	0.05	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Connecting Forest Road 8 to Drill Site DS-D and GT-26	10	230	0.04	0.05	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.

Table 6. Previously Disturbed Areas Proposed to be Used as Temporary Access Roads.

Resolution Copper Mining, LLC Baseline Hydrologic & Geotechnical Data Gathering Activities

Previously Disturbed Area	Width (Feet)	Length (Feet)	Length (Miles)	Acres	Previously Disturbed Area Description and Condition
Connecting Forest Road 1903 to GT-36	10	354	0.07	0.08	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Leading from Forest Road 252 to GT-37	10	1,921	0.36	0.44	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Leading from Forest Road 1916 to GT-41	10	1,172	0.22	0.27	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Connecting Forest Road 1917 to Forest Road 1918	10	2,565	0.49	0.59	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Connecting Forest Road 8 to TP-20	10	331	0.06	0.08	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Connecting Forest Road 2398 to TP-17	8	36	0.01	0.01	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Connecting Forest Road 293 to Forest Road 8 and leading to Drill Site DS- E	10	1,787	0.34	0.41	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Connecting Forest Road 252 to Forest Road 1907	10	3,399	0.64	0.78	Unpaved and unmaintained and has been in existence since at least 1992 (State of Arizona Aerial Imagery). Road is currently in a drivable condition for high clearance vehicles. Road condition is subject to change with seasonal fluctuations.
Total:		12,017	2.27	2.76	

3.4.3 Road Improvements

Approximately 17.05 acres (13.07 miles) of existing roads and previously disturbed areas to be used as temporary access roads will require improvements in order to safely access Baseline Activities areas. Table 7 describes the sections of road which will require improvements in order to safely be traveled on by heavy equipment. Road improvements include widening the roadway to a width of 20 feet and the widening of turns to allow access for all equipment. Widening of the roadway and widening of turns will require cut and fill. Cut slopes will be constructed to a slope no greater than 0.5:1 and fill slopes will be constructed to a slope no greater than 1:1. Road widening may also require some removal of bedrock and minor slope stabilization. For detailed information on proposed road improvements, please see Appendix B (Plan Views and Profiles of Proposed Access Road Improvements).

	Forest Service	Proposed Maintenance Level During Baseline Hydrologic & Geotechnical Data	Acres of Disturbance ³	
Road	Road Maintenance Level ^{1,2}	Gathering Activities Plan of Operations Implementation ²	Linear Feet	Acres
Forest Road 252	Level 2 - High clearance Vehicles	Repair and maintain road segments that currently meet the Level 2 Maintenance standard if they are damaged or adversely affected by planned activities and improve road segments where this current condition is not met to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	21,850	5.03
Forest Road 518	Level 2 - High- clearance Vehicles	Repair and maintain road segments that currently meet the Level 2 Maintenance standard if they are damaged or adversely affected by planned activities and improve road segments where this current condition is not met to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	8,551	1.96

Table 7. Proposed Improvements to Existing Roads within National Forest System Lands.

	Forest Service	Proposed Maintenance Level During Baseline Hydrologic & Geotechnical Data	Acres of Disturbance ³	
Road	Road Road Maintenance Level ^{1,2} Gathering Activities Plan of Operations Implementation ²		Linear Feet	Acres
Forest Road 1903	Level 2 - High- clearance Vehicles	Repair and maintain road segments that currently meet the Level 2 Maintenance standard if they are damaged or adversely affected by planned activities and improve road segments where this current condition is not met to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	6,291	1.44
Forest Road 1904	Level 2 - High- clearance Vehicles	Repair and maintain road segments that currently meet the Level 2 Maintenance standard if they are damaged or adversely affected by planned activities and improve road segments where this current condition is not met to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	3,331	0.76
Forest Road 1907	Level 2 - High- clearance Vehicles	Improve road segments to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	5,266	1.21
Forest Road 1908	Level 2 - High- clearance Vehicles	Improve road segments to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	1,183	0.27
Forest Road 1909	Level 2 - High- clearance Vehicles	Improve road segments to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	1,090	0.25
Forest Road 1918	Level 2 - High- clearance Vehicles	Improve road segments to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	386	0.09

	Forest Service	Proposed Maintenance Level During Baseline Hydrologic & Geotechnical Data	Acres of Disturbance ³	
Road	Road Maintenance Level ^{1,2}	Gathering Activities Plan of Operations Implementation ²	Linear Feet	Acres
Forest Road 2359	Level 2 - High- clearance Vehicles	Repair and maintain road segments that currently meet the Level 2 Maintenance standard if they are damaged or adversely affected by planned activities and improve road segments where this current condition is not met to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	3,954	0.91
Forest Road 2364	Level 2 - High- clearance Vehicles	Repair and maintain road segments that currently meet the Level 2 Maintenance standard if they are damaged or adversely affected by planned activities and improve road segments where this current condition is not met to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	3,220	0.74
Forest Road 2360	Level 2 - High- clearance Vehicles	Improve road segments to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	1,165	0.27
Forest Road 2387	Level 2 - High- clearance Vehicles	Improve road segments to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	2,322	0.53
Forest Road 3713	Level 2 - High- clearance Vehicles	Improve road segments to generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	2,797	0.64
Connecting Forest Road 293 to Forest Road 8 and leading to Drill Site DS-E	Temporary Access Road	Improve road segments to generally achieve the Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	1,787	0.82

	Forest Service	Proposed Maintenance Level During Baseline Hydrologic & Geotechnical Data	Acres of Disturbance ³	
Road	Road Maintenance Level ^{1,2}	Gathering Activities Plan of Operations Implementation ²	Linear Feet	Acres
Connecting Forest Road 252 to Forest Road 1907	Temporary Access Road	Improve road segments to generally achieve the Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities.	3,399	1.56
Total Proposed Road Improvement Disturbance:			66,592	17.05

¹ Data provided as a shapefile by the TNF on November 5, 2013 (TontoRATM_09122013.shp).

² Forest Service Transportation Management Maintenance Standards are defined in FSH 7709.58, 10, 12.3.

Access roads will be graded/bladed as required for drill rigs and support vehicles to traverse them safely. In certain places, the road may need to be widened slightly to accommodate the equipment and drill rigs. In order to minimize disturbance, berms will not be constructed unless required for safety reasons. Road maintenance will not add or remove any materials from the drainage channels. Damage to vegetation will be minimized to the extent practicable.

Since the terrain is steep and rocky within proposed activity areas, boulders may narrowly constrict some portions of existing roads or the curve radii may be too small for the drill rigs, these conditions have formed the basis for road selection for access to Baseline Activity sites. Additionally, roads for access were also selected to minimize overall disturbance. For example, Forest Road 1907 and Forest Road 1903 both provide access to monitoring well site DS-H (as well as DS-J, DS-I, DS-P and geotechnical sites GT-17, GT-18 and GT-36). However, Forest Road 1907 is the preferred way to access those sites due to less overall disturbance. Improving the entire length of Forest Road 1903 to a condition to allow equipment access to those sites would create excessive disturbance due to the sharp curves and existing conditions of Forest Road 1903. As a result, accessing monitoring well site DS-H using Forest Road 1907 and traveling south on Forest Road 1903 is the preferred route because it will create less overall surface disturbance. The use of dozers, hammer-hoes, or track hoes will be required to modify these constrictions. Access road improvements will be minimized to the greatest extent practicable. Based on the current understanding of conditions along the proposed access routes, cuts and fills will be balanced onsite in a manner that minimizes disturbance. Plan views of proposed access route improvements with 2012 aerial base mapping and 3-foot contour intervals are provided in Appendix B.

Public access to proposed activity areas will be managed by crew members during roadway improvements and maintenance. To the extent practicable, roadway activities proposed as part of this plan will be conducted in a manner that will allow continued use by the public. No road closures are expected to take place. All signing for access management will comply with the guidelines in the Manual on Uniform Traffic Control Devices (FSM 7103.3) for signs and markers.

Additionally, once hydrological testing and monitor well drilling operations are complete, access roads (excluding short-term temporary access roads) will be utilized by light vehicles to gain access to monitor wells for data collection purposes, and will be maintained if necessary. Road maintenance includes evening the grade of the road surface to remove high and low areas and repairing eroded sections of road by placing compact fill.



3.5 Equipment Required for Operations

A list of equipment is displayed within Table 2 (similar equipment may be used, depending on which drilling contractor is selected). Equipment lists for each individual site are also provided in Appendix A.

3.6 Total Estimated Disturbance Acres

The total area of the Baseline Activities, including access using existing road surfaces, is approximately 75.40 acres. Proposed new construction disturbance will occur on approximately 33.63 acres, all on National Forest System lands.

An estimated 33.63 acres on National Forest System lands will be disturbed for proposed drilling operations, geotechnical test trench/piezometer installation, test trenches, contractor laydown yards and existing access road improvements (Table 8). The proposed activities will require disturbance of approximately 4.21 acres for the placement of drill pads on new drill sites, approximately 0.27 acre for the geotechnical drill holes (no drill pad required), approximately 1.28 acres for geotechnical test trenches, approximately 2.19 acres for contractor laydown yards, approximately 7.07 acres to account for disturbance caused by equipment traveling along short-term temporary access roads (this accounts for damage done to vegetation caused as a result of the tracked drill rig traveling across the desert landscape) over approximately 5.83 miles, approximately 3.94 acres for the improvement and/or maintenance of previously disturbed areas proposed to be used as temporary access roads, and approximately 14.67 acres for the improvement of approximately 12.26 miles of existing roads for access.

All Baseline Activities will be completed using existing Forest Service roads, previously disturbed areas proposed to be used as temporary access roads and short-term temporary access roads on Forest Service lands. Disturbance for existing forest roads and previously disturbed areas proposed to be used as temporary access roads that will be improved were calculated using a conservative approach to estimate the maximum possible cut and fill boundary of the proposed improvements minus the existing disturbance of the roadway. The width of the roadways was calculated based on 2012 aerial imagery with 3-foot contour intervals. Disturbance for proposed short-term temporary access roads was estimated using a 10-foot disturbance width, which will adequately provide access for the widest equipment listed in Table 2. These short-term temporary access roads will require no road construction. Damage to vegetation will be minimized to the extent practicable.

Table 6. Estimated Distui barce Acres					
	Disturbance	Description of Disturbance	Estimated Acres		
	Area		of Disturbance		
National Forest	t System lands				
	Drill Site DS-A	80ft X 100ft drill pad plus grading/fill area	0.24		
	Drill Site DS-B	80ft X 100ft drill pad plus grading/fill area	0.22		
	Drill Site DS-C	80ft X 100ft drill pad plus grading/fill area	0.30		
	Drill Site DS-D	80ft X 100ft drill pad plus grading/fill area	0.21		
	Drill Site DS-E	80ft X 100ft drill pad plus grading/fill area	0.20		
	Drill Site DS-F	80ft X 100ft drill pad plus grading/fill area	0.26		
	Drill Site DS-G	80ft X 100ft drill pad plus grading/fill area	0.29		
	Drill Site DS-H	80ft X 100ft drill pad plus grading/fill area	0.52		
Monitoring	Drill Site DS-I	80ft X 100ft drill pad plus grading/fill area	0.32		
Wall Site	Drill Site DS-I	80ft X 100ft drill pad plus grading/fill area	0.20		
wen Site	Drill Site DS-J	80ft X 100ft drill pad plus grading/fill area	0.32		
	Drill Site DS-K	Soft X 100ft drill ged plus grading/fill area	0.23		
	Drill Site DS-L	80ft X 100ft drill pad plus grading/fill area	0.22		
	Drill Site DS-M	80ft X 100ft drill pad plus grading/fill area	0.23		
	Drill Site DS-N	80ft X 100ft drill pad plus grading/fill area	0.21		
	Drill Site DS-O	80ft X 100ft drill pad plus grading/fill area	0.21		
	Drill Site DS-P	80ft X 100ft drill pad plus grading/fill area	0.33		
		Subtotal	4.21 acres		
	GT-1	16ft X 27ft tracked rig plus 488sq ft for	0.01		
-		equipment			
	GT-2	16ft X 27ft tracked rig plus 488sq ft for	*0.00		
		equipment			
	GT-3	16ft X 27ft tracked rig plus 488sq ft for	*0.00		
		equipment			
	GT-4	16ft X 27ft tracked rig plus 488sq ft for	0.01		
		equipment			
	GT-5	16ft X 27ft tracked rig plus 488sq ft for	0.01		
		equipment			
	GT-6	16ft X 27ft tracked rig plus 488sq ft for	0.01		
		equipment			
Geotechnical	GT-7	16ft X 27ft tracked rig plus 488sq ft for	*0.00		
Drill Holes		equipment			
	GT-8	16ft X 27ft tracked rig plus 488sq ft for	0.01		
		equipment			
	GT-12	16ft X 27ft tracked rig plus 488sq ft for	0.01		
	0112	equipment	0.01		
	GT-13	16ft X 27ft tracked rig plus 488so ft for	0.01		
	01 15	equipment	0.01		
	GT-14	16ft X 27ft tracked rig plus 488sq ft for	*0.00		
		equipment	0.00		
	GT-15	16ft X 27ft tracked rig plus 488sa ft for	*0.00		
		equipment	0.00		
	GT-16	16ft X 27ft tracked rig plus 488sa ft for	0.01		
	01-10	acuinment	0.01		
	l	equipment			

Table 8. Estimated Disturbance Acres

	Disturbance Area	Description of Disturbance	Estimated Acres of Disturbance
National Fores	t System lands		
	GT-17	16ft X 27ft tracked rig plus 488sq ft for	*0.00
		equipment	
	GT-18	16ft X 27ft tracked rig plus 488sq ft for	*0.00
		equipment	
	GT-19	16ft X 27ft tracked rig plus 488sq ft for	*0.00
		equipment	
	GT-20	16ft X 27ft tracked rig plus 488sq ft for	*0.00
		equipment	
	GT-21	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
	GT-22	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	0.01
	GT-23	16ft X 2/ft tracked rig plus 488sq ft for	0.01
		equipment	*0.00
	GT-24	16ft X 2/ft tracked rig plus 488sq ft for	*0.00
	CT 25	equipment	0.01
	61-25	1611 X 2/11 tracked rig plus 488sq 11 for	0.01
	СТ 26	16ft V 27ft treaked rig plus 488sg ft for	*0.00
	01-20	equipment	0.00
	GT-27	16ft X 27ft tracked rig plus 488sa ft for	*0.00
	01 27	equipment	0.00
	GT-28	16ft X 27ft tracked rig plus 488sa ft for	0.01
	01 20	equipment	0.01
	GT-29	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
	GT-30	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
	GT-31	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
	GT-32	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
	GT-33	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
	GT-34	16ft X 27ft tracked rig plus 488sq ft for	*0.00
		equipment	
	GT-35	16ft X 27ft tracked rig plus 488sq ft for	*0.00
		equipment	0.01
	01-30	10ft X 2/ft tracked rig plus 488sq ft for	0.01
	CT 27	equipment	0.01
	01-3/	ron A 2/n tracked rig plus 488sq ft for	0.01
	GT 28	type: 16ft V 27ft trocked rig plue 488eg ft for	0.01
	01-30	equipment	0.01
	GT-39	16ft X 27ft tracked rig plus 188sa ft for	0.01
	01-37	equipment	0.01
L		equipment	

	Disturbance	Description of Disturbance	Estimated Acres
National Forest	t System lands		of Distui bance
	GT-40	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
	GT-41	16ft X 27ft tracked rig plus 488sq ft for	0.01
		equipment	
		Subtotal	0.27 acres
	TP-1	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-2	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-3	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-4	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-5	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-6	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-7	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-8	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-9	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-10	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-11	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-12	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-13	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-14	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-15	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-16	50ft X 20ft trench plus a 5ft perimeter buffer	.04
Test Trenches	TP-17	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-18	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-19	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-20	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-21	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-22	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-23	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-24	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-25	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-26	Soft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-27	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-28	Soft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-29	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-30	Soft X 20ft trench plus a 5ft perimeter buffer	.04
	TP-31	50ft X 20ft trench plus a 5ft perimeter buffer	.04
	1P-32	Subtetal	1.04
		Sublotal	2 10 acres
Laydown Yard		support the proposed activities	2.17 acres
Temporary Ac	ress Roads	Access to geotechnical sites with the use of a	7 07 acres
(Short-term)	Cos Ivaus	tracked rig along 5.83 miles of land	7.07 acres
Existing Access	Road	Road dressing/improvement along 12.09 miles	14 67 acres
Improvements**			1.107 40105

	Disturbance Area	Description of Disturbance	Estimated Acres of Disturbance
National Forest	System lands		
Previously Dist	urbed Areas	Road dressing/improvement along 2.27 miles	3.94 acres
Proposed to be	Used as	of existing user-created roads that are not a part	
Temporary Acc	cess Roads	of the Forest Service road network.	
Total Disturba	nce		33.63 acres

* These sites are collocated on drill pads with proposed monitoring wells, therefore, the acreage is counted once only in the hydrologic monitor well category.

** Improvements to Forest Road 1904 and Forest Road 252 heading northwest and west from GT-1 are proposed for improvement to allow easier access to the western half of the project area, thereby reducing the total number of miles traveled on Forest Service Roads.

3.7 Schedule of Activities

Activities will be scheduled generally based on their proximity to major access routes that serve the area (US Highway 60). In compliance with mitigation measure MM-5, to the extent possible, Baseline Activities will be scheduled to occur in areas that do not have established populations of invasive species prior to conducted activities in areas with existing, established populations of invasive plant species. Scheduling will also be dependent upon contractor and equipment availability. However, it is likely that no more than three drill rigs (one rig for geotechnical work and two rigs for hydrological well drilling) will be operating at any one time. Once drilling commences at a site it will be continuous until completion of the hole. For geotechnical drill sites drilling may be as short in length as one work day. If issues are encountered while performing geotechnical drilling there may be a need to switch to a 24 hours a day, 7 days a week schedule. For hydrological drill sites, drilling will be continuous (24 hours a day, 7 days a week) until the hole is completed.

The schedule for phasing and abandonment of each site and associated access routes is provided in Appendix A. This schedule is based on the current understanding of the planned activities and assumes that there will not be any seasonal limitations that will have any impact on construction, drilling, or other proposed activities. Table 9 displays general timelines for the proposed work to occur.

Hydrological/Geotechnical Testing and Monitoring Activity	Activity & Occupancy Periods	Authorization Period
Hydrological Monitor Well	Approximately 25 weeks of drilling activity	Two years from the
Construction (DS-A, DS-B, DS-C,	during a maximum 2 year occupancy period for	approval of the proposed
DS-D, DS-E, DS-F, DS-G, DS-H, DS-	each well.	Plan of Operations
I, DS-J, DS-K, DS-L, DS-M, DS-N,		
DS-O, DS-P)		
Geotechnical Drilling/Piezometer	Approximately 40 weeks of drilling activity (1	Two years from the
Installation	hole per week) during a maximum 1 week	approval of the proposed
	occupancy period per geotechnical hole.	Plan of Operations
Geotechnical Test Trenches	Approximately 14 weeks of surface works	Two years from the
	activity.	approval of the proposed
		Plan of Operations

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1 anic 7. 11	yui uiugicai	a ococcimica	i Data Gathering	ACHVILLOI	Jui auton ant	a Author Mation	i ci iou

Hydrological Testing and Monitoring	Throughout the authorization period for testing	Ten years from approval
Activities for Monitor	and monitoring purposes.	of the proposed Plan of
Wells/Piezometers		Operations
Drill Site Construction for	N/A	Ten years from approval
Hydrological Monitoring Wells		of the proposed Plan of
		Operations
Road Maintenance and Drill Site	N/A	Ten years from approval
Access for Hydrological Testing and		of the proposed Plan of
Monitoring and Abandonment of		Operations
Piezometers and Monitor		
WellsReclamation		

4.0 ENVIRONMENTAL PROTECTION MEASURES

Resolution will employ specific environmental protection measures (EPMs) as part of the Baseline activities. These are presented below under the applicable heading.

4.1 Air Quality

4.1.2 Dust Emissions

Minimal impacts to air quality are expected due to light travel, road construction and drilling activities along existing dirt roads. The following EPMs will reduce impacts:

AQ-1: Fugitive dust-suppression techniques will be used as necessary, such as applying water during road construction and Baseline Plan activities.

AQ-2: Water will be used in the drilling process to control fugitive dust production from the drill.

AQ-3: Construction and service vehicles will drive slowly (15 mph or less) on dirt roads and adjust their speed as conditions dictate, to minimize creating a dust trail.

AQ-4: To the extent practicable and consistent with the efficient and safe implementation of the Baseline Plan, Resolution will limit project-related traffic on NFS lands.

To minimize dust, unpaved roads will be watered as necessary during periods of regular use by Resolution employees or contractors. The frequency of dust suppression activities is dependent upon wind and moisture conditions. During windy and dry conditions a water truck may need to make regular cycles over active roads and pads (during construction) up to four times per day. Resolution will also minimize land disturbance during site preparations, minimize soil and nonnative noxious weed track-out by washing or cleaning truck wheels before leaving construction sites, and revegetate disturbed land not used. Before equipment is mobilized to the site, it will be washed to minimize soil and noxious weed transport.

4.1.3 Air Emissions at Drilling and Test Trench Sites

AQ-5: Drill rigs, drilling equipment, pumps and other mobile and stationary sources of air emissions at drilling and test trench sites will be operated within manufacturer specifications and in accordance with applicable regulations to reduce air pollutant emissions. Total diesel fuel used for drilling activities will be tracked and monitored. Engines utilized in operations will be equipped with the pollution control equipment provided by the manufacturer (e.g., catalytic converters and mufflers). Additionally, pollution-control equipment will be inspected prior to arrival on NFS lands to ensure that it is in good working order, and will be maintained in accordance with manufacturer specifications.

4.2 Water Quality

The Baseline Activities require water for dust suppression and drilling processes. Water for these activities will be from potable sources supplied from Arizona Water Company water and obtained from the Superior West Plant Site.

Drill sites will be served by:

- Tank and water truck combinations filled with Arizona Water Company water sourced from the Superior West Plant Site.
- Geotechnical sites, GT-25, GT-29, GT-33, GT-38, GT-39 and GT-40 will be served with a water tank included on a tracked rig.

The quantity of water needed for Baseline Activities varies by activity type. The groundwater testing and monitoring wells will use air assisted reverse circulation drilling. Water will mostly be required for dust control of cyclone rock fragments from drilling activities and also for circulation as required. If water and air alone are not enough to effectively remove and transport drill cuttings up to surface, bentonite and/or polymer may be added. For collection of water samples for chemical analysis, air lift pumping methods will be used.

At the beginning of each drilling cycle for groundwater testing and monitoring wells, approximately 500 to 2,000 gallons per day of water will be required for drilling. Water will be provided by water generated during drilling activities and supplemented with water from Arizona Water Company Water. After two to three days of drilling, water will be recycled through the drill process and supplemental water will not be required. The water is recycled during the drilling process using a cyclone to separate solid rock chips from water. The water will be diverted to an onsite storage tank where it will then be recycled back into the drilling process. During peak periods of Baseline Activities, water required for active drill rigs plus water for dust control will result in an estimated 10,000 gallons per day of water being used by the Hydrologic & Geotechnical Testing and Monitoring Activities.

Drill cuttings (and associated polymer and bentonite) will be collected in large storage tanks (9,000 gallon capacity) at hydrological sites and in tanks placed within the footprint of each geotechnical drill site. For geotechnical sites, where tanks are not practicable, temporary settling pits may be constructed. The tanks and/or settling pits would be used during drilling operations to hold drill cuttings that are brought to surface using the air lift method. Resolution will collect cuttings generated during drilling activities and remove the materials from National Forest System lands. These materials will be disposed of at a permitted facility in accordance with applicable State of Arizona law.

If excessive material is produced, the tanks or settling pits may be pumped out and the contents properly disposed of off of National Forest System lands in accordance with applicable Arizona

law. Because of the in-place system of evaporation and infiltration pits, Resolution will obtain authorization under the AZPDES De Minimis General Permit from ADEQ for aquifer testing operations. Any discharges of water will be in compliance with the Arizona Department of Environmental Quality's (ADEQ's) Arizona Pollutant Discharge Elimination System (AZPDES) De Minimis General Permit for well development activities. Water bars and straw bales will be used as needed to prevent erosion.

The Forest Service will be provided with all information gathered.

A construction Stormwater Pollution Prevention Plan (SWPPP) prepared in accordance with the regulations of the AZPDES Stormwater Construction General Permit (CGP) is provided in Appendix E. Runoff and sediment discharged from areas disturbed to construct drill pads will be controlled with erosion control features such as wattles, silt fence, berms, straw bales, and other Best Management Practices (BMPs) for stormwater management. Applicable sediment and erosion control features used for grading and erosion control purposes will be certified noxious weed free. Sediment control features, such as berms and silt fencing, will be used at the downgradient toe of fill slopes in order to catch sediment and keep it from entering drainages. Sediment control features will also be used downgradient of temporary stock piles excavated for test trenching activities. Road engineering will avoid drainage channel bottoms to the greatest extent possible. Water bars will be installed to minimize erosion on steep sections of roadway. If maintenance is necessary, personnel may periodically grade the road surface. The stormwater system design, erosion-control features, and limited maintenance constitute BMPs for the roadways.

As indicated throughout this plan, the only activities occurring in potentially jurisdictional waters are road construction or maintenance on National Forest System roads. Pursuant to 33 CFR § 323.4(a)(6), these activities are exempt from permitting requirements under Section 404 of the Clean Water Act. Riparian vegetation will be avoided to the extent practicable by drilling and data collection activities and well, borehole, and trench construction will occur outside the Ordinary High Water Mark.

The strategic installation of bentonite seals and professional drilling practices will prevent potential impacts of the drilling program to the existing groundwater aquifer system. Down the hole, the annular space between the larger bore hole and the smaller casing is filled with bentonite clay or neat cement as the sealant material, while cement is used as the surface casing pursuant to Arizona Department of Water Resources (ADWR) requirements. This creates an impermeable seal from the surface to the next confining layer that keeps any potential contaminants from traveling down the outer sidewalls of the casing or borehole and into the aquifer. Wells will be capped with either an engineered well cap or seal that vents air through a screen into the well, but keeps insects, small animals, and unauthorized persons from accessing the well. All wells and boreholes will be completed and abandoned in accordance with State of Arizona well abandonment rules (Arizona Administrative Code Rule R12-15-816) and ARS 45, Chapter 2, Article 10, as administered by ADWR, to prevent impacts to the existing groundwater system. Additionally, Terms and Conditions of Approval TCA-3, TCA-4, and TCA-5 require that all wells and boreholes be plugged with cement or bentonite grout placed from the bottom of the drill hole or well to depth of 2 feet below the ground surface, that a professional geologist or engineer registered in the state of Arizona and approved by the Forest Service be engaged to conduct independent third-party construction quality assurance (CQA) oversight during plugging of all geotechnical drill holes and hydrological testing and monitoring wells, and that the Forest Service be notified at least 24 hours prior to plugging of geotechnical drill holes and hydrological testing and monitoring of the plugging activities by a Forest Service minerals administrator. Copies of Arizona Well Drill Reports, Well Log Forms and Well Abandonment, Completion Reports, and CQA report will be provided to the Forest Service.

The following measures summarize the environmental protection measures that will be taken as part of the Baseline Activities:

WQ-1: The Baseline Plan activities will require water for dust suppression on roads and drilling processes. Water for these activities will come from potable private water sources.

WQ-2: Drill sites are located within the Phoenix Active Management Area and Resolution will comply with established Arizona Department of Water Resources (ADWR) reporting requirements.

WQ-3: In accordance with ADWR requirements, the strategic installation of bentonite seals and professional drilling practices will minimize the potential effects of drilling activities to the existing groundwater aquifer system.

WQ-4: Resolution will collect excess cuttings and mud generated during drilling activities, and will remove the materials from NFS lands. These materials will be disposed of in accordance with applicable state law.

WQ-5: A construction Stormwater Pollution Prevention Plan will be prepared in accordance with the regulations of the *Arizona Pollution Discharge Elimination System Stormwater Construction General Permit.* Runoff and sediment discharged from areas disturbed to construct drill sites will be controlled with erosion control features such as wattles, silt fence, berms, straw bales, and other best management practices for stormwater management.

WQ-6: Materials used to construct applicable sediment and erosion control features (e.g., straw bales) will be certified noxious weed free.

WQ-7: Sediment control features, such as berms and silt fencing, will be used on fill slopes to catch sediment and keep it from entering drainages.

WQ-8: Sediment control features will be used on temporary stockpiles excavated for test trenching activities to catch sediment and keep it from entering drainages.

WQ-9: Road maintenance and construction will avoid drainage channel bottoms to the greatest extent possible. Water bars will be installed to minimize erosion on steep sections of roadway.

WQ-10: Upon completion of drilling and monitoring, drill holes will be abandoned pursuant to Arizona administrative Code R12-15-816(g), and Arizona Revised Statutes (ARS) 45, Chapter 2, Article 10, as administered by ADWR. The drill sites will be re-graded to pre-Baseline activities conditions. An approved Forest Service seed mix will be applied and raked into the soil of disturbed areas. Copies of Arizona Well Drill Reports, Well Log Forms, and Well Abandonment and Completion Reports will be provided to the Forest Service.

4.3 Solid Wastes

SW-1: Solids from drilling (e.g., drill cuttings, rock and water) shall be removed from National Forest System lands and disposed of in accordance with applicable sections of ARS §§ 27-514. Storage tanks shall be pumped of any remaining drilling solids, water and/or muds and be removed from drill sites within five calendar days of completed work at each drill site.

SW-2: A portable toilet will be placed at each active drill site and serviced periodically by a contractor. All other wastes, such as paper and food waste will be stored in garbage sacks and removed from the sites daily.

4.4 Scenic Values, Recreation and Other Uses

The following measures summarize the specific environmental protection measures that will be taken as part of the Baseline Activities:

SVR-1: Good housekeeping practices, timely reclamation of disturbed areas, and minimization of disturbance areas will protect scenic values.

SVR-2: Recreation access will be maintained and no road closures will be necessary during the Baseline Plan activities.

SVR-3: For any proposed use of previously disturbed areas to be used as temporary access roads on NFS lands, once activities specified Plan are complete, Resolution will reclaim roads consistent with the Forest Service's Travel Management Planning objectives.

SVR-4: Lights used for night work at drill sites and the laydown areas will be oriented to the work areas or shielded to minimize night light effects on recreational users.

SVR-5: The drilling equipment will be surrounded by tanks, compressors, a portable driller's office, large containers, and topography which may act as barriers to reduce noise levels.

4.5 Biological Resources

Sonoran desert tortoise (*Gopherus morafkai*) have the potential to occur within the Baseline Activities Area. Any Sonoran desert tortoise encountered during construction or testing and monitoring activities will be avoided and allowed to move out of the way (see BR-2 below). Proposed Baseline Activities will comply with ESA regulations. If encountered, the Sonoran desert tortoise will be handled according to the biological monitoring plan contained within Appendix G.

- At unoccupied drill sites that have open storage tanks for solids from drilling, substantial barriers such as cattle fencing will be used to prevent cattle and wildlife from entering.
- During drilling activities the perimeter of the drill pad will be barricaded. After drilling is completed, wells will be equipped with a locking well vault to prevent insects, small animals and unauthorized persons from accessing the wells.
- If a well vault for a piezometer or monitoring well site is located nearby a Forest Service road, bollards will be placed near the well vault to reduce the risk of damage of the well.

All seed mixes to be used in reclamation will be certified weed free of seeds listed on the TNF weed list. All equipment, with the exception of vehicles used for transportation to and from reclamation sites, will be cleaned prior to use on the project. Equipment cleaning will occur on Resolution owned property or on contractor owned facilities before being mobilized to National Forest System lands. Cleaning will remove all dirt, plant parts and material that could carry noxious weed seeds. Only equipment cleaned and inspected will be allowed to operate in Baseline Activities project area. Cleaning will occur off National Forest System lands.

There will not be any open settling pits at unoccupied drill sites to ensure that wildlife and cattle could not become trapped. Drilling operations at each site are anticipated to be continuous, however, and wildlife will not likely approach active rigs.

For fire prevention measures, the 2013 Fire Restriction Response Plan (Appendix D) will be posted and implemented at each drill site. This plan will be used in conjunction with the fire restrictions and provisions of the Tonto National Forest Fire Plan. This may include shutdown to comply with red-flag conditions unless measures to minimize the risk of fire are employed and agreed to prior to fire seasons. Resolution employees and their contractors will take care to always thoroughly extinguish all smoking materials. Litter will be cleared from any ignition sources.

The following measures summarize the specific environmental protection measures that will be taken as part of the Baseline Activities:

BR-1: At unoccupied drill sites that have open storage tanks for solids from drilling, substantial barriers such as cattle fencing will be used to prevent cattle and wildlife from entering.

BR-2: Sonoran desert tortoises will be avoided and not handled unless necessary. If encountered within or near a work zone, and it is determined necessary to move them out of harm's way, the Arizona Game and Fish Department's *Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects*, Revised October 23, 2007, will be followed.

BR-3: In the event that a Sonoran desert tortoise is injured, the Tonto National Forest's Minerals Biologist, Mark Taylor, will be contacted at (480) 610-3304 or (602) 225-2246.

BR-4: Project activities will comply with the *Biological Resources Monitoring Plan for Resolution Copper Mining, LLC Plan of Operations: Baseline Hydrologic and Geotechnical Data Gathering Activities on Tonto National Forest,* dated December 2015.

In addition, prior to construction activity a biological monitor shall survey the proposed Baseline Activities areas for Migratory Birds, and flag any occupied nest sites for avoidance.

4.6 Cultural Resources

A Class III cultural resources survey was conducted on the proposed Baseline Activities area starting on January 28, 2013 through May 31, of 2013. The area was surveyed in the field by qualified archaeologists from WestLand Resources to define the boundaries of those cultural sites that occur within the proximity of any ground disturbing activities. The archaeologists walked parallel transects spaced at 15-meter intervals, back and forth, at drill sites, geotechnical sites, and test trench locations until 250 foot by 250-foot blocks at the drill sites and geotechnical locations and 150-foot by 150-foot blocks at the test trench had been surveyed. Access roads to be improved follow existing roads, and 100-foot wide survey corridors were provided by the two archaeologists walking parallel transects 15 meters apart, one on either side of the existing road.

A Class III cultural resources survey report has been completed and was submitted to the Forest Service under separate cover. This report includes detailed plan views of proposed activities that identify eligible cultural resources site locations with respect to ground-clearing activities.

The following measures summarize the specific environmental protection measures that will be taken as part of the Baseline Activities:

CR-1: Ground-disturbing activities will occur outside known National Register of Historic Places (NRHP) sites and NRHP-eligible sites, and thus such sites will be avoided.

CR-2: A cultural resources monitor will be present during construction near (within 50 meters [164 feet]) NRHP- or NRHP-eligible sites.

CR-3: Resolution will follow applicable laws and regulations regarding cultural resources while conducting Baseline activities (e.g., National Historic Preservation Act, Native American Graves Protection Act, and Archaeological Resources Protection Act).

CR-4: If previously unidentified cultural resources are encountered during construction activities, work will cease at the location and the Forest Service will be contacted for instruction before work will continue at that location.

4.7 Public Safety

PS-1: Public access to the Baseline Activities areas will be managed during roadway improvements and maintenance. To the extent practicable, roadway activities in the Plan will be conducted in a manner that will allow continued use by the public.

PS-2: Signing for roadway access management will comply with the guidelines in the *Manual on Uniform Traffic Control Devices* (FSM7103.3) for signs and markers.

4.8 Fire Prevention

FP-1: For fire prevention measures, the *Fire Restriction Response Plan* (Appendix D) will be posted and implemented at each drill site. The *Fire Restriction Response Plan* will be used in conjunction with any Forest Service issued Emergency Fire Restriction Orders.

FP-2: Resolution employees and its contractors will take care to thoroughly extinguish smoking materials. Litter will be cleared from ignition sources.

4.9 Hazardous Substances/Petroleum Production/Drilling Materials

Resolution has prepared a Spill Prevention, Control, and Countermeasures (SPCC) Plan (Appendix F) covering the proposed Activities and locations for submittal to the Forest Service. The SPCC Plan details good engineering practices used to prevent releases when handling and storing petroleum products.

No extremely hazardous substances, as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Superfund Amendments Reauthorization Act (SARA), and Emergency Planning and Community Right-To-Know Act (EPCRA), will be used in any of the activities described in this Plan. At the active drill sites, small secondary containment structures will be used to store one or two 5-gallon containers of hydraulic oil, a 5gallon container of diesel, two 5-gallon containers of gasoline, tubes of grease, a 5-gallon bucket of grease, and other miscellaneous small containers such as spray lubricants typically found on drill sites. Fifty-gallon drums for storing used oil and oily rags will be placed in secondary containment structures within the drill site. Large quantities of fuel associated with the rig and mud-mixing equipment will be held in fuel tanks, all within secondary containment structures. An adequate supply of fire extinguishers will be placed at these containment structures, and each active rig will maintain enough spill supplies for any incidental releases. During drilling operations, drill rigs will be parked on top of plastic sheeting overlain by absorbent material. Plastic and absorbent materials will also be used under other gas or diesel motors, or other equipment that may leak oil, as needed. Refuse containers designated for disposal of absorbent materials will be located at each drill rig. This material will be disposed of offsite in accordance with applicable laws and regulations. The following measures summarize the specific environmental protection measures that will be taken as part of the Baseline Activities:

HS-1: No extremely hazardous substances, as defined by the Comprehensive Environmental Response, Compensation, and Liability Act, Superfund Amendments Reauthorization Act, and Emergency Planning and Community Right-to-Know Act, will be used in the activities described in the Plan.

HS-2: Resolution will follow the Spill Prevention, Control, and Countermeasures (SPCC) Plan (refer to Appendix F of the Plan). The SPCC Plan details engineering practices used to prevent releases when handling and storing petroleum products.

HS-3: At the active drill sites, containment structures will be used to store oil, oily rags, containers of hydraulic oil, diesel fuel, and other miscellaneous small containers typically found on drill sites.

HS-4: Fuel associated with drill rig and mud-mixing equipment will be held in double-walled fuel tanks or within secondary containment structures.

HS-5: Fire extinguishers will be available at containment structures.

HS-6: Each active drill rig will maintain sufficient spill clean-up supplies for unforeseen releases.

HS-7: During drilling operations, drill rigs will be parked on top of plastic sheeting overlain by absorbent material. Plastic and absorbent materials will also be used under other gas or diesel motors, and other equipment that may leak oil, as needed.

HS-8: Refuse containers designated for disposal of absorbent materials will be located at each drill rig. This material will be disposed of off-site in accordance with applicable laws and regulations.

4.10 Noise

A Baseline Activities Noise Study (BANS) was completed by WestLand in 2014. As described therein, while the Forest Service does not have noise limits applicable to the Proposed Action, Pinal County sets limits on sound-producing activities within the county in Ordinance 050306-
ENO (as amended by 0316111-ENO-01). Under the Proposed Action, noise-producing activities will occur and create the potential for noise effects.

5.0 **RECLAMATION**

5.1 Hydrologic Testing & Monitoring Well Sites

Resolution will notify the Forest Service prior to the commencement of reclamation activities. Following the completion of drilling, all materials, including aggregate base, equipment, pipe, lubricants and other products, portable restrooms, core, plastic sheeting, and any other supplies will be removed from the site. Solids and desiccated drilling muds in the storage tanks will be properly disposed of off National Forest System lands. These inert materials will be disposed of in accordance with applicable laws and regulations. As each site is completed, the storage tanks will then be removed. For sites that will be abandoned, the boreholes will be closed in accordance with ADWR protocols and Terms and Conditions of Approval TCA-3, TCA-4, and TCA-5. Then, each drill site will be ripped to reduce compaction, recontoured and seeded in accordance with Forest Service guidance using approved seed mixes of certified native weedfree species. If the initial seeding effort is unsuccessful, up to two additional seedings will be attempted. Signage will be removed. For sites that will continue to be used long-term for scheduled groundwater monitoring, it may be possible to reclaim a portion of the drill site while still maintaining access to and parking at the monitoring well. The same procedure will be followed for partial site reclamation as described above, except that the borehole (monitor well) will not be closed. For partially reclaimed drill pads, access to the monitoring well will be obtained via foot. At the time of closure of the monitor well, the borehole will be abandoned in accordance with ADWR regulations and Terms and Conditions of Approval TCA-3, TCA-4, and TCA-5 and the remainder of the site will be reclaimed.

Stormwater BMP's such as water bars, culverts and erosion-control features will be repaired or removed as necessary and as specified by the Forest Officer.

5.2 Geotechnical Drill & Piezometer Sites

Following the completion of all drilling, solids and desiccated drilling muds will be disposed of off of National Forest System lands. These inert materials will be disposed of at a permitted facility in accordance with applicable state and federal regulations. Disturbed areas will be reseeded in accordance with Forest Service guidance using approved seed mixes of certified weed-free species. Three re-seeding efforts will be conducted once annually and applied at a timeframe determined by the forest. At the time of closure of the piezometer, the borehole will be abandoned in accordance with ADWR regulations and Terms and Conditions of Approval TCA-3, TCA-4, and TCA-5 and the remainder of the site will be reclaimed.

5.3 Geotechnical Test Trench Sites

Test trenches will be backfilled immediately after completion. The excavated soils will be placed in the trench in 2-foot thick layers and compacted by tamping with the excavator bucket and then will be returned to pre-disturbance conditions and elevations. All reclaimed areas will be reseeded in accordance with Forest Service guidance using approved seed mixes of certified weed-free species. Three re-seeding efforts will be conducted once annually and applied at a timeframe determined by the forest.

5.4 Roads

As determined by the Forest Officer, the sections of the existing access roads that are to be "reclaimed" will generally be reclaimed by rigging/roughing and seeding (up to three times) with an appropriate seed mix and placement of rocks or other protective materials. Areas of reseeding will be scarified (ripped) prior to seeding to break up compaction. All roads will be recontoured to pre-disturbance conditions and elevations. Stormwater BMP's such as water bars, culverts, and erosion-control features, will be repaired or removed as necessary and as specified by the Forest Officer.

5.5 Drill Holes

Drilling and drill hole abandonment will be conducted in accordance with Arizona Administrative Code (AAC) R12-15 and Arizona Revised Statutes (ARS) Title 45, Chapter 2, Article 10, as administered by the ADWR and applicable terms and conditions of approval. In general, the procedures for each type of drill hole are provided in Table 10.

Туре	Purpose	Abandonment Timing	Abandonment Procedures
Hydrological	Hydrological	Intended for long-term	Wells completed to specifications will be
Testing &	baseline	monitoring/ dry wells	maintained as long-term monitoring locations until
Monitoring	characterization.	will be abandoned	the end of the authorization period, at which point
Wells		according to plan	 holes will be plugged in accordance with ADWR standards and Terms and Conditions of Approval TCA-3, TCA-4, and TCA-5. In the event of a lost hole or insufficient data from a well, the selected well will be abandoned in accordance ADWR standards and the Additional Terms and Conditions of Approval (TCA-3, TCA-4 and TCA-5). If Resolution chooses to maintain the holes beyond the authorization period, additional authorization would be required.
Geotechnical	Geotechnical	After initial testing drill	Once selected for abandonment, or at the end of
Drill Holes	baseline	holes that are not	the authorization period, these holes will be
	characterization.	necessary for further study will be abandoned according to plan.	abandoned in accordance with ADWR standards and consistent with the Additional Terms and Conditions of Approval (TCA-1, TCA-2 and TCA-3)

Table 10. Resolution Copper Mining Drill Hole Abandonment Procedures.

5.6 Proposed Short-term Temporary Access Routes

Proposed short-term temporary access roads will be reclaimed by repositioning vegetation, ripping/roughing with hand tools and seeding (up to three times) with an appropriate seed mix and the placement of rocks or other protective materials to prevent access. Areas of reseeding will be scarified (ripped) by hand prior to seeding to break up compaction.

5.7 Appurtenances

Pumps, signs, and any other items used in Baseline Activities will be removed from Forest Service Land as activities are completed.

5.8 Bond

As part of this Plan, proposed drill sites, geotechnical drill holes and test trenches will be reclaimed. Reclamation activities as approved by the Forest Service have been bonded by Resolution Copper Mining, LLC in accordance with Forest Service requirements at 36 CFR §228.13.

6.0 FOREST SERVICE EVALUATION AND SIGNATURES

6.1 Forest Service Evaluation of the Plan of Operations

6.1.1 Required Mitigation Measures, Species-specific Conservation Measures and Terms and Conditions of Approval

- 1. Resolution will comply with all terms/conditions/specifications stipulated in the Plan of Operations No. POO-2013-031200-020, dated August 24, 2016, and associated reclamation bond calculations specifications. Any changes or modifications made to the Plan of Operations are subject to review and approval by the Forest Service.
- Resolution will contact and coordinate upcoming schedules with personnel at the Globe Ranger District office, (928) 402-6200 and Mesa Ranger District office, (480) 610-3300. Information to be coordinated with the Forest Service may include but is not limited to the following: construction of drill sites, mobilization to and from drill sites, road improvements, mitigation measure implementation, and reclamation.
- 3. The reclamation bond will be reviewed annually and adjusted at the discretion of the Forest Service to compensate for completed reclamation work, changes in equipment rental rates, increased scope of operations, etc.
- 4. Resolution shall comply with the following mitigation measures:

MM - 1: Wells located within a few hundred feet of drill pads, test trenches, construction laydown yards, roadway improvements, and short-term temporary access roads, will be flagged.

MM - 2: Settling pits will be lined if tanks are not used for short-term storage of the drill cuttings.

MM - 3: Saguaro, barrel, pincushion, hedgehog, ocotillo, and agave species will be avoided where practicable. If it is determined that any of these plants need to be moved to conduct Baseline activities, they will be transplanted away from project-related activities and will be used for reclamation efforts.

MM - 4: Seed mixes to be used in reclamation will be certified weed free of seeds listed on the Forest Service's noxious weed list, and contain only species native to the project area. Seed mixes will be developed from a native species seed list approved by the forest. Three re-seeding efforts will be conducted once annually and applied at a timeframe determined by the forest.

MM - 5: To the extent possible, Baseline activities will be scheduled to occur in areas that do not have established populations of invasive plant species prior to conducting activities in areas with existing, established populations of invasive plant species.

MM - 6: To minimize soil and noxious weed transport, equipment will be cleaned prior to use on NFS lands. Cleaning will remove dirt, plant parts, and material that could carry noxious weed seed. Only equipment cleaned and inspected will be allowed to operate in the project area.

MM - 7: Baseline activities will be restricted to approved activity areas to conserve intact Sonoran desert tortoise habitat.

MM – **8**: Overhanging banks along drainages or side-slopes and/or rock out-crops will be avoided, as practicable to minimize disturbance to Sonoran desert tortoise habitat.

 $\mathbf{MM} - 9$: Pre-construction surveys will be conducted for Sonoran desert tortoise and gila monster before ground disturbing activities start. A biological monitor will monitor for Sonoran desert tortoise, gila monster, and migratory birds during construction and reclamation activities. The monitor will flag Sonoran desert tortoise and gila monster shelter sites/burrows for avoidance by project activities. These flagged avoidance areas will be maintained as appropriate during construction. In the event a burrow cannot be avoided, it will be inspected and any tortoises discovered in the burrow will be relocated outside of project activity areas.

MM – **10**: A biological monitor will inspect open pits or trenches for Sonoran desert tortoise and gila monster prior to backfilling activities and will be responsible for relocating these species out of harm's way. If a tortoise is detected, it will be moved in accordance with the Arizona Game and Fish Department's *Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects*, Revised October 23, 2007.

In addition, prior to construction activity, a biological monitor shall survey the proposed construction areas for migratory birds, and flag any occupied nest sites for avoidance.

MM – **11**: Project crews will be informed of the potential to encounter Sonoran desert tortoises and gila monster within the project area. Work crews will check below equipment prior to moving, and cover and/or backfill holes that could potentially entrap these species. If these species are encountered, work crews will stop work until the biological monitor has relocated these species out of harm's way.

MM - 12: In the event that Baseline activities are modified in a manner that will result in an effect to a listed species or designated critical habitat, or if a new species was listed or critical habitat was designated which may be affected by Baseline activities, all work shall cease and consultation under Section 7 of the Endangered Species Act with the United States Fish and Wildlife Service will be initiated.

MM – **13**: To protect cultural resources, proposed geotechnical borings GT-9, GT-10, GT-11 and the associated temporary access routes will not be approved.

MM – **14**: To protect cultural resources, proposed geotechnical boring GT-31 will be moved 675 feet north along existing road FR-518.

MM – **15**: To protect cultural resources, proposed groundwater monitoring well DS-B will be moved 80 feet north.

MM - 16: Ensure construction and drilling equipment are properly maintained and feature, as appropriate, factory-installed or approved exhaust mufflers, air intake filters, hoods, enclosures, and other means to minimize noise from engine operation.

5. Resolution shall comply with the following species-specific conservation measures:

SSCM-1: A qualified biological monitor will be present during all surface disturbing activities and will monitor for the presence of western yellow-billed cuckoos.

SSCM-2: No noise generating or surface disturbing activities (i.e. road construction, trenching, drill site preparation or installation of geotechnical drill holes or hydrological testing and monitoring wells) will be conducted prior to the completion of the 2016 protocol surveys.

SSCM-3: In the event that western yellow-billed cuckoos are detected, no noise generating or surface disturbing activities will be conducted between June 1 and September 30.

SSCM-4: In the event that western yellow-billed cuckoos are detected, routine monitoring of existing wells or piezometers would be permitted during June 1 and September 30.

SSCM-5: If western yellow-billed cuckoos are found in 2016 during protocol surveys, then surveys would be conducted again in 2017 (or the following year if the proposed action is postponed).

- 6. Resolution shall comply with the following terms and conditions of approval:
 - A. If a bond is required, it must be furnished before approval of the Plan of Operations.
 - B. Information provided with this Plan marked confidential will be treated in accordance with the agency's laws, rules, and regulations.
 - C. Approval of this Plan does not constitute certification of ownership to any person named herein and/or recognition of the validity of any mining claim named herein.
 - D. Approval of this Plan does not relieve me of my responsibility to comply with other applicable state or federal laws, rules, or regulations.
 - E. If previously undiscovered cultural resources (historic or prehistoric objects, artifacts, or sites) are exposed as a result of operations, those operations will not proceed until notification is received from the Authorized Officer that provisions for mitigation unforeseen impacts as required by 36 CFR 228.4(e) and 36 CFR 800 have been complied with.

Activity Type	Approval Period
Monitoring and Reclamation of	Ten years from the approval of the
Hydrological Testing and	proposed Plan of Operations
Monitoring Wells	
Construction and Installation of the	Two years from the approval of the
Hydrological Testing and	proposed Plan of Operations
Monitoring Wells	
Geotechnical Test Trenches	Two years from the approval of the

F. This Plan of Operations has been approved for the following periods:

Activity Type	Approval Period
	proposed Plan of Operations
Road Maintenance and Access to	Ten years from the approval of the
the Hydrological Testing and	proposed Plan of Operations
Monitoring Wells	
Installation and Instrumentation of	Two years from the approval of the
Aquifer Testing	proposed Plan of Operations
Use of Laydown Yards	Two years from the approval of the
	proposed Plan of Operations

A new or revised Plan must be submitted in accordance with 36 CFR part 228, subpart A, if operations are to be continued after the above-referenced time periods.

- G. Portable and mobile drill rigs shall meet the current non-road diesel engine rules for Tier 2, Tier 4 transitional or Tier 4 emission standards as these standards phase in over time.
- H. Drillers and other site workers shall limit, to the extent practicable, nighttime use of the laydown area. Drillers and other site workers shall pick up necessary supplies from the laydown area at the beginning of the night shift to minimize the need to return during the night. In the event that the laydown area must be utilized during the night for unforeseen circumstances, Resolution shall notify the Forest Service within 24 hours after the use occurs, provide rationalization for the necessary use, and provide a plan to avoid such use in the future.
- I. All geotechnical drill holes and hydrological testing and monitoring wells shall be plugged with cement or bentonite grout placed from the bottom of the drill hole or well to a depth of 2 feet below the ground surface. Plugging of all geotechnical drill holes and hydrological testing and monitoring wells shall be consistent with Arizona Administrative Code R12-15-816, the Arizona Department of Water Resources Well Abandonment Handbook, and the ASTM International Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities (ASTM D5299-99).
- J. The operator shall engage a professional geologist or engineer registered in the state of Arizona and approved by the Forest Service to conduct independent third-party construction quality assurance (CQA) oversight during plugging of all geotechnical drill holes and hydrological testing and monitoring wells. A report documenting the plugging methods and CQA

activities shall be prepared by the third-party geologist or engineer for each geotechnical drill hole and hydrological testing and monitoring well, and shall be submitted to the Forest Service within 60 days after completion of the plugging activities.

K. The Forest Service shall be notified at least 24 hours prior to plugging of geotechnical drill holes and hydrological testing and monitoring wells to provide for field inspection and monitoring of the plugging activities by a Forest Service minerals administrator.

6.1.2 Bond

Reclamation of disturbances connected with this Plan of Operations is covered by Reclamation Surety Performance Bond No.016-050-848_dated April 26, 2016, signed by <u>Resolution Copper</u> <u>Mining LLC</u> (Principal) and Liberty Mutual Insurance Company (Surety), for the penal sum of) <u>\$1,452,060.</u>

Only those activities covered by the current bond will be approved for implementation.

This Reclamation Performance Bond is a guarantee of faithful performance with the terms and conditions listed below, and with the reclamation requirements agreed upon in the Plan of Operations. This Reclamation Performance Bond also extends to and includes any unauthorized activities conducted in connection with this operation.

The bond amount for this Reclamation Performance Bond was based on a bond calculation worksheet. The bond amount may be adjusted during the term of this proposed Plan of Operations in response to changes in the operations or to changes in the economy. **6.3 Operating Plan Acceptance**

I/We have reviewed and agreed to comply with all conditions in this Plan of Operations including the required Mitigation Measures, Species-specific Conservation Measures and Terms and Conditions of Approval.

I/We understand that the bond will not be released until the Authorized Officer in charge gives written approval.

Resolution Copper Mining, LLC by Resolution Copper Company, as Manager and not on its own behalf

Andrew Taplin

(Name)

aner 100 2.

Signature of Operator (or Authorized Representative)

6.4 Operating Plan Approval

Torres Momas A.

(Name)

Signature of Authorized Officer

Deputy Forast Supervisor

(Title)

08\$24/2016

(Date)

(mm/dd/yy)

Project Director

(Title)

08/24/2016

(Date)

(mm/dd/yy)

7.0 **DEFINITIONS**

Air assisted reverse circulation method – Drilling method that utilizes high-pressure air to cool the drill bit and remove drill cuttings from the borehole. Cuttings are carried quickly to the surface through the inner steel tubing. No water or drilling mud is introduced to the formation during drilling.

Aquifer hydraulic parameters – A term for the measured characteristics of an aquifer that quantify an aquifer's potential to transport and store water. These parameters are established using various aquifer testing, measuring, and monitoring methods.

Aquifer – An underground rock formation composed of such materials as sand, soil, or gravel that can store groundwater and supply it to wells and springs. In aquifers, groundwater occurs in sufficient quantities to be used for drinking water, irrigation, and other purposes.

Baseline – Baseline Hydrological and Geotechnical Data Gathering Activities.

Borehole – Any long or deep drill hole, often associated with a diamond drill.

Constant Head Guelph Permeameter – involves measuring the steady-state rate of water infiltration into soil from a cylindrical borehole in the soil, in which a constant depth of water is maintained. Typical borehole width is 2.4 inches. The test can be conducted in boreholes as deep as 12 feet. Boreholes are constructed with a hand auger. Measurements can be made in 0.5 to 2 hours and require less than one gallon of water per test.

Drill rig – A machine that creates boreholes and/or shafts to sample sub-surface mineral deposits, to test rock, soil, and groundwater physical properties, and to install tunnels or wells.

Fugitive dust – Particles lifted into the air and caused by man-made and natural activities such as the movement of soil, vehicles, equipment, and wind.

Hydraulic conductivity – A property of soil or rock that describes the ease with which water can move through pore spaces or fractures. Conductivity depends on the intrinsic permeability of the material and on the degree of saturation.

Inert material – Material which is passively resistant to any change, particularly a material which is relatively unaffected by the action of heat or water.

Infiltration Test – The ring infiltrometer apparatus typically consist of a cylindrical ring approximately 1 foot in diameter and 1 foot in height driven about 2 inches into the soil surface. Water is ponded within the ring above the soil surface. The volume of water needed to maintain a constant depth within the ring is measured. The test is terminated when the water addition rate has stabilized. The ring is then removed, and the depth of water infiltration is determined either visually or with a hand operated soil probe.

Packer Test - Packer testing is a technique in which one or more inflatable bladders, or packers, are used to isolate different regions of a borehole for hydraulic testing or water sampling. A series of such tests allows definition of the vertical distribution of water quality and hydraulic conductivity in an aquifer.

Permeability – The capacity of a porous rock, sediment, or soil to transmit a fluid, such as water.

Piezometer – Instrument for measuring the pressure or depth of groundwater.

Reverse Circulation Drilling Method – Air-assisted reverse circulation drilling utilizes highpressure air to cool the drill bit and remove drill cuttings from the borehole. Cuttings are carried quickly to the surface through the inner steel tubing.

Settling pits – A location within a hydrological drill site disturbance area that will be used during drilling operations to hold drill cuttings that are brought to the surface.

Short-Term Hydrological Aquifer Test – The mechanics of aquifer pumping tests are such that water is pumped (a) from a well screened in a particular water-bearing zone (perforation zones), (b) for a certain amount of time, and (c) at a specific pumping rate. For this reason, these tests are often referred to as pumping tests. The impact of ground water extraction on one or more water level surfaces, or drawdown, is measured in the pumped well. Subsequently, the hydraulic properties of the aquifer--specifically transmissivity, hydraulic conductivity, and storage coefficients—can be estimated from the drawdown observations.

Slug Test – Slug tests are conducted by instantaneously introducing into or removing from a well, a known volume of water, and then monitoring the return of the water level within the well to its original level. The effects of changing the water level within the well should be transmitted through the well screen and filter pack to the water-bearing zone of interest in a manner that indicates the hydraulic properties of that zone. The resulting rise or fall of water level within the well is recorded and the measurements analyzed by one or more methods.

Standard Penetration Test (SPT) – Standard Penetration Test is a common in situ testing method used to estimate the relative density of soils and approximate shear strength parameters. SPT involves driving a standard thick-walled sample tube into the ground at the bottom of a borehole by blows from a slide hammer with standard weight and falling distance. The sample tube is driven 150 mm into the ground and then the number of blows needed for the tube to penetrate each 150 mm (6 in) up to a depth of 450 mm (18 in) is recorded.

Storage coefficient – Volume of groundwater an aquifer releases from or takes into storage per unit surface area.

Stratigraphy – The study of rock layers, especially their distribution, environment of deposition, and age.

Transducer – Water level (or height of water in a well) can be measured with many types of sensors including pressure transducers. The pressure transducer is placed in the well and the amount or height of water in the well exerts a proportional amount of pressure on the sensor via trapped air in the well. This then produces an output of pressure-equivalent voltage.

Transmissivity – The ability of an aquifer to transmit groundwater.

Unit densities – A density of one gram per cubic centimeter or one gram per milliliter; the density of water at 39.2 degrees Fahrenheit (4 degrees Celsius).

Water bar – A ditch or hump that diverts excess water off the surface to avoid or minimize soil erosion.