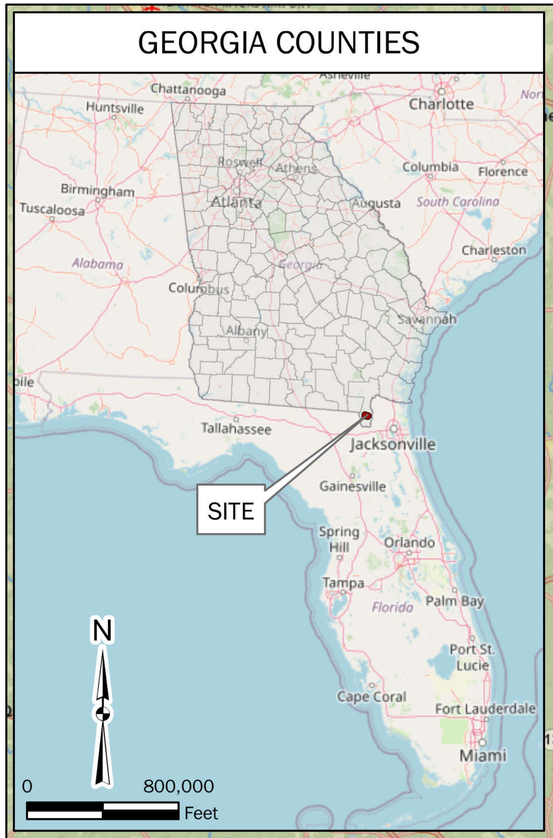

Pearson
Blackshear
SALTILLA RIVER
Satilla River
WAYCROSS-WARE CO AIRPORT
Waycross
46 m
HOMERVILLE AIRPORT
Homerville
GEORGIA
68 m
SUWANEE RIVER
OKEFENOKEE NATIONAL WILDLIFE REFUGE
47 m
Folkston
Kingsland
Hilliard
19 m
Fernandina Beach
FERNANDINA BEACH MUNI AIRPORT
TWIN PINES MINERALS PROP. PERMIT LOCATION
57 m
TRAIL RIDGE
St. MARYS RIVER
FLORIDA
Jasper
Madison
70 m
Suwannee River
Withlacoochee River
MOODY AIR FORCE BASE ANNEX
50 m
BIG GUM SWAMP
Live Oak
Macclenny
51 m
Lake City
JACKSONVILLE INTL AIRPORT
BLOUNT ISLAND COMMAND
FISC JACKSONVILLE
NS MAYPORT
MAYPORT NS
CRAIG MUNI AIRPORT
Jacksonville
WHITEHOUSE NOLF
NOLF WHITEHOUSE
CECIL FIELD NAVAL AIR STATION (CLOSED)
HERLONG AIRPORT
CECIL FLD
NAS JACKSONVILLE
JACKSONVILLE NAS
Jacksonville Beach
Ponte Vedra Beach
N
0
50,000
Feet

24-hour Emergency Contact:
Mark Fowler, (205) 435-0001

Site Located At:
Approx. 30.52388°N, -82.116688°W

TTL

SAUNDERS DEMONSTRATION MINE

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

INSET BASEMAP: Open Street Map; BASEMAP: National Geographic World Map (See Service Layer Credits).

DRAWN BY: DEK
CHECKED BY: SGR
DRAWING DATE: 6/18/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE: 1 in = 25,000 ft

SAUNDERS DEMONSTRATION MINE
SURFACE MINING LAND USE PLAN

Twin Pines Minerals, LLC

TWIN PINES MINERALS, LLC
PROPOSED HEAVY MINERALS MINE
SAINT GEORGE, CHARLTON COUNTY, GEORGIA

Prepared for:

Twin Pines Minerals, LLC
2100 Southbridge Parkway, Suite 540
Birmingham, AL 35209

Prepared by:

TTL, Inc.
2743B Gunter Park Drive West
Montgomery, Alabama

TTL Project No. 000180200804.00

June 19, 2020

TTL

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ATTACHMENTS

List of Figures

SURFACE MINING LAND USE DEVELOPMENT PLAN
TWIN PINES MINERALS, LLC
SAUNDERS MINE
CHARLTON COUNTY, GEORGIA

I. INTRODUCTION

Twin Pines Minerals, LLC (TPM) is submitting this Surface Mining Permit Application and associated Land Use Development Plan to secure a mining permit to conduct the proposed heavy mineral sands (HMS) mining demonstration project at the proposed Saunders Mine site located near St. George, Charlton County, Georgia. The HMS sedimentary deposits occupy a portion of a relict beach ridge along Trail Ridge in Charlton County. The proposed mining project consists of approximately 1,041.7 acres (898-acre mining area) as depicted on the U.S. Geological Survey (USGS) 7.5-minute Topographic Maps of Moniac and Saint George, Georgia (**Figure 1**). **Figure 2** is an aerial photograph depicting the site location and adjacent property owners. The TPM project includes the extraction of the high-quality HMS reserves in a safe, cost effective, and environmentally sound manner for export by truck and rail to national and international customers. The principal heavy minerals to be extracted in this proposed HMS operation are zircon, titanium minerals (ilmenite, leucoxene, rutile), and staurolite.

This document is intended to provide supplemental information to the Surface Mining Land Use Plan (SMLUP) Form.

II. PURPOSE AND NEED

The purpose of this demonstration mining project proposed by TPM is to gather data required to evaluate a groundwater hydrology model completed during the development of this project. This evaluation is necessary to demonstrate that HMS mining can be accomplished in an environmentally sensitive area with negligible impact to the site and surrounding resources. An additional purpose is to develop a high-quality HMS reserve to produce HMS concentrate products including titanium mineral concentrates and zircon concentrates to meet global demands in a safe, cost effective, and environmentally sound manner.

The TPM mining plan and the associated groundwater and surface water monitoring plan will be used to confirm the ability of HMS mining to be conducted within close proximity to sensitive environmental resources. As the economic locations for mining HMS within the United States are becoming scarce, it is vital that new mines be developed in such a manner as to minimize environmental impacts. TPM has completed extensive geologic and hydrogeologic evaluations of the Saunders Tract which culminated with the production of a groundwater hydrology model demonstrating that mining can be safely conducted within the demonstration area with negligible impact to the site, the surrounding area, and the Okefenokee Swamp. Small scale projects, such as the one proposed, that can demonstrate sound environmental practices for extracting heavy mineral resources in environmentally sensitive locations, represents good stewardship of the environment.

HMS deposits contain the primary ores of titanium dioxide (TiO2) for the pigment industry and zircon (ZrSiO2) used in refractory products. TiO2 is primarily obtained from mining and processing the minerals ilmenite, rutile, and leucoxene. Leucoxene, not technically a mineral, is a higher quality derivative of ilmenite resulting from the preferential weathering and leaching of iron therefore increasing the TiO2 percentage to greater than 70 percent. Zircon is recovered as a co-product from the processing of HMS deposits.

III. MINE INFORMATION

The proposed mining area consists of one mining block (Saunders Tract) bound by Georgia Hwy 94 to the south, Trail Ridge Road to the east, and surveyed boundaries on the north and west. The approximately 1,041.7-acre permitted area will generally consist of the approximately 898-acre mining area, wet processing plant, material transport road, and dry processing plant, as shown on the Site Layout Map (**Figure 3**). TPM expects to mine approximately 25-40 acres per month once all infrastructure is in place and produce an HMS concentrate on-site. Mineral sands, titanium minerals - ilmenite, leucoxene and rutile, zircon, and staurolite occur in the upper 50 ft of sand in the Trail Ridge physiographic landform, which is an ancient beach ridge in Charlton County. After the HMS products have been separated, the final products will be containerized, bulk shipped or loaded on truck or rail dependent upon customer requirements.

The center of the site is located near latitude 30.523804 and longitude -82.118589. According to the USGS Topographic Map, the elevation at the site ranges from approximately 120 to 175 ft above mean sea level. The proposed mine site has historically been used for silviculture operations.

IV. OPERATOR AND OWNER INFORMATION

Twin Pines Minerals, LLC will be the operator of the Saunders Mine site. The Saunders Mine site property is owned by Trail Ridge Land Company (which is owned by Twin Pines Minerals); TIAA Timberlands I, LLC; and joint private owners Rodney & Sidney Bell and Eli & Sharon Padgett.

V. GENERAL MINING INFORMATION

TPM expects to begin construction upon obtaining the required authorizations and mining operations are expected to be conducted for a 6-year period. The proposed mining operation is expected to provide approximately 200 direct jobs and additional supporting subcontractor jobs. An estimated mining production timeline is provided as **Figure 4A**. A progression of site clearing time line is included as **Figure 4B.**

TPM is committed to protecting the environment and minimizing impacts to local citizens. Current work at the site includes the initial environmental screening to evaluate baseline conditions, developing an effective water management strategy, and identifying other environmental and operational concerns. The northern boundary of the site is located approximately 2.7 miles southeast from the nearest boundary of the Okefenokee Swamp National Wildlife Refuge, providing a substantial buffer of protection for this sensitive resource. TPM reclamation plans are to restore land uses to the original pre-mining conditions, planted pine, or natural conditions which existed prior to conversion to timber silviculture land usage. The reclamation process will

begin immediately after mining in individual dragline cuts has been completed. Within 1 to 2 weeks of mining, the drag line cuts will be refilled with sand tailings. Thereafter, topsoil will be replaced to stabilize the reclaimed area and vegetative cover will be replanted within an 18-24-month period, depending on the planting season.

The proposed mining operation is designed to be water-efficient by recycling and recirculating water to minimize the amount required from the Upper Floridan Aquifer (UFA). Water will not be withdrawn from any natural surface water body. Water within the active mining pit is anticipated to be withdrawn only during upset conditions, i.e. equipment maintenance/failure, after hurricane. When possible, water withdrawn from the mining pit will be used for make-up water at the Pre-Concentration Plant (PCP) and Wet Concentration Plant (WCP).

TPM will operate the mine to be a low-impact neighbor to nearby residents. The active mining area will be designed so it will be surrounded by an approximately 5-foot high berm and buffers to minimize potential disturbances (noise and dust). TPM has been in contact with area stakeholders, including Charlton County, Georgia EPD, and concerned citizens during the planning process for the proposed mining operation.

TPM has developed a mineral sand mining technique using a dragline excavator, conveyor system for materials transport, and land-based permanent processing plants. This mining technique is different from conventional "wet mining", which utilizes a dredge and floating concentrator to mine and process heavy mineral-bearing sands. In general, a dragline is a more efficient method for moving bulk material where long mining cuts and pits can be utilized. Employing elongated cuts allows for simultaneous mining the mineral sands and tailings placement to occur in the same pit. This process will allow reclamation to occur at a faster rate as backfilling and rough grading may occur up to +/-500 ft behind the dragline dig face. This should allow reclamation to begin within days of mining, where typical methods take several months to greater than a year.

The dragline method involves a large crane-like earthmoving machine equipped with a bucket to scoop material. The large-capacity bucket swings from cables on the end of the boom, scooping material that is then moved to adjacent areas. Draglines are electrically powered and run by two employees, an operator and an oiler. When mining is occurring, measures must be taken to protect the areas adjacent to the mine property. Berms are constructed to ensure that muddy water does not leave the mine property and affect local waterways.

A conveyor system is utilized to transport mined material to the PCP and WCP. Haul trucks will be used to transport the HMS concentrate from the WCP to the Mineral Separation Plant. The locations of the mineral processing plants are depicted on **Figure 3.** The mineral processing plants are situated so that mineral processing activities are located close to the mining areas, which decreases material transport distances and energy demands. Recycled process water ponds will also be constructed adjacent to the processing plant creating an efficient method for process water reuse and recirculation. **Figure 5** depicts the Mine Water Balance, the process water flow diagram for the proposed mining operation.

Mining will commence after the topsoil has been removed from the designated 100 ft dragline mining cut and conveyor system area within the Saunders Tract mining area. Once the topsoil removal process has been completed, the conveyor system will be installed. The dragline excavator will then excavate and temporarily stockpile the mined material. The material will then be transferred onto the conveyor

system for transport to the processing plant. After processing, the tailings will be temporarily stockpiled adjacent to the processing plant. The tailings will then be transported back to the open mining cut via a tailings conveyor system. The reclamation area will then be recontoured, covered with topsoil and revegetated to meet reclamation standards. The operation is a continuous process and while the dragline is operating, backfilling of the cut is occurring as well.

Mine Progression

The mining sequence will be divided into separate phases. These phases are described as follows:

Site Preparation

- Clearing
- Topsoil removal
- Construction of permanent processing plants and infrastructure

Mining

- Excavation
- Heavy Mineral Sand processing

Reclamation

- Tailings placement
- Tailings contouring to mimic per-mining topography
- Topsoil return
- Vegetation planting

Site Preparation

To initiate mining activities, the project area will be delineated by survey markers, boundary markers, and flagging in the field to indicate the locations of permanent infrastructure and mining boundaries. A pre-mining survey based off of LiDAR will be used to create a topographic surface that will serve as a guide for design elevations for all post-mining reclamation. All merchantable timber will be harvested prior to beginning of mining activities. Timber will be harvested on average 4 to 6 months prior to initiating operations. Timber that is not merchantable and timber scraps will be removed by TPM and all areas within the limits of clearing and mining will be root raked, windrowed, and burned with Division of Forestry and/or county permits. Clearing will only be conducted in areas where active mining will be conducted within 2 weeks, to maintain a minimal amount of disturbed land at one time.

The first step of the clearing process with be clearing for the feed conveyor along a 50 ft corridor along the north section of the initial mining area and clearing for the construction of the permanent facilities. Once clearing for the feed conveyor is completed, clearing for the Tails conveyor and berm to the south will be performed. Once the areas have been cleared, the permanent facilities and infrastructure will be constructed/installed along with the berms, stormwater controls, and other best management practices for sediment control.

The permanent facilities will consist of an interior road system, wet processing facility, and dry processing facility, described further in the next section. Recycled process water pond(s) will be constructed adjacent to the processing plant. TPM will also install a two deep make up water wells to provide make-up water during times of need as seen on **Figure 3.**

The feed and tailings conveyors will be constructed for the entire length of the mining corridor to near the eastern boundary of the mine area, where they will turn to the north towards the mineral processing plant, located near the northeastern portion of the mining area. The berms will be constructed along the perimeter of the disturbed area to mitigate erosion and contain stormwater. Generally, one foot of topsoil within each mining cell will be removed by heavy equipment and transported to the berms/topsoil storage piles around the perimeter of the mining area. Additionally, silt fencing and hay bales will also be utilized in appropriate locations for additional erosion control.

The topsoil storage piles/mining perimeter berms will serve to prevent stormwater runoff and muddy water within the active cut from leaving the site as well as preserve "seed banks" for native vegetation and a planting medium for later reclamation. Topsoil removal will be conducted 2 weeks in advance of mining activities. The topsoil storage piles will be stabilized with an internal three horizontal to one vertical (3H:1V) slope and an external four horizontal to one vertical (4H:1V) slope and seeded to prevent erosion. As noted previously, silt screens and hay bales will be utilized along the outside of the topsoil storage piles to control post construction erosion.

The first step in the mining process will be rough clearing of the mining corridor ahead of the dragline. The mining corridor will be approximately 450 ft north to south which will allow for mining of 3 pits before relocating the feed/tailings conveyors. This corridor will be cleared immediately ahead of the dragline. This clearing will extend +/-500 ft ahead of the mining and progress as the dragline advances. The clearing of this 450 ft north to south corridor is required to facilitate the advancement of the apron feeder and mobile conveyors as mining progresses to the east in the initial pit.

Excavation, Processing, and Tailings Return

Excavation of the mining cuts will commence after the topsoil is removed. The mining process proceeds as follows: The dragline moves through the mining area excavating approximately 100-foot wide by 50-foot deep cuts, in an east to west or west to east direction as shown on **Figure 6A.** A mining cut profile/cross-section is included as **Figure 6B.** Mining rates are anticipated to vary from approximately 100-200 ft of pit length excavation per day. The excavated material is stockpiled nearby. It is then transferred to an apron feeder which feeds to a screen. This removes roots and other large objects. The material is then transferred to a pit/feed conveyor system. The oversized organic material will be placed near the screen area for future deposit into the mining pit during the reclamation process. The pit/feed conveyor system feeds a mainline feed conveyor system. The mainline feed conveyor system will incline (or feed a stacker conveyor) and then feed the trommel (screen). The trommel feeds the PCP.

In the PCP, spiral centrifuges concentrate and separate the heavy mineral sands from the lighter clays and quartz sand and then feeds the WCP. The WCP further reduces and separates the material for processing. Process water is recovered from the tailings and heavy minerals sands via a series of dewatering screens and cyclones throughout the process. Humate is also separated from the process

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SURFACE MINING LAND USE DEVELOPMENT PLAN (1)
TWIN PINES MINERALS
ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY: DEK
CHECKED BY: WW
DRAWING DATE: 6/18/2020
REVISION DATE: N/A
TTL JOB NO.: 000180200804.00
APPROX. SCALE:

water as slimes within the WCP and it is temporarily stored before being transported back to and placed in the mined pit area for reclamation. TPM will maintain three lined process water ponds and one lined process water overflow pond to maintain the adequate volume needed operate the WCP. Two deep Upper Floridan Aquifer make up water wells will be used to supply makeup water as needed to maintain adequate process water reserves.

The HMS concentrate material from the WCP is transported to the Mineral Separation Plant (MSP), via dump truck. Water needed for processing will also be provided by the makeup water wells. Once water has been used in the mineral processing it will be pumped to the WCP to be used in the processing of sands.

The MSP further separates the valuable and non-valuable mineral products such as zircon, titanium minerals (ilmenite, leucoxene, rutile), and staurolite etc. After products have been separated, the final products will be containerized, bulk shipped or loaded on truck or rail dependent upon customer requirements.

The tailings from the PCP/WCP area will be temporarily stockpiled. Tailings and slimes will then be loaded onto the mainline tails conveyor system. The mainline tails conveyor system will convey material onto a reclamation conveyor. The reclamation conveyor deposits the tailings back into the mined pit area for reclamation.

Reclamation

As part of reclamation, the tailings and slimes are transported from their stockpiles to the open mined area where they are deposited/backfilled. The backfilled areas will then be recontoured using bulldozers to the approximate pre-mining LiDAR topographic data (via onboard GPS technology and/or survey crew GPS technology). After the tailings are contoured and levels reach approximate pre-mining topography, the topsoil will be replaced to its original thickness. The area will then be re-graded and contoured to mimic pre-mining contours, based upon the pre-mining survey. The operation is a continuous process, while the dragline is operating, backfilling of the pit is occurring as well. A cross-section view of the dragline cut and backfill, perpendicular to the direction of the dragging movement, is shown in **Figure 6B.** A detailed discussion of the reclamation process is provided in **Section VII.**

VI. INFORMATION ON OTHER PERMITS

Other permits being applied for include United States Army Corps of Engineers (USACE) Individual Permit, National Pollutant Discharge Elimination System (NPDES) Permits, Groundwater Extraction Permit, and an Air Permit.

VII. PERFORMANCE CRITERIA FOR MINING PLAN AND MINING ACTIVITIES

SMLUP drawings show property to be mined, the limits of the affected acreage, the natural drainage features and water disposal, the initial mining and overburden areas, the erosion and sedimentation controls, the ingress/egress areas, the direction and schedule of mining advancement, the area to be left undisturbed, and final reclamation.

Mining operations will be performed in a manner that will minimize erosion and sedimentation. Prior to initiating mining activities, TPM will implement the erosion and sedimentation prevention plan as described in the SMLUP. Depicted in the SMLUP are the placement/location of silt fencing and other necessary erosion control measures. **Figures 7A, 7B, 7C, and 7D** depict erosion control notes. Existing drainage patterns at the site are shown on **Figure 8.** The facility will operate under a DNR-EPD General Permit No. GAR050000 Stormwater Discharges Associated with Industrial Activities.

Containment/diversion and process pond berms will be constructed in accordance with the Manual for Erosion and Sedimentation Control in Georgia. Design water levels will be set to provide a minimum of 3 ft of freeboard within the containment berms and process water pond berms. Process water pond berms will be constructed from compacted sub-soil material on un-mined lands or compacted sand tailings.

Containment berms shall be constructed as depicted in typical cross-sections (**Figure 6C**). Crests will be sloped to the inside and be graded level. The top and exterior slope and toe of all berms will be grassed with quick-growing/germinated grasses. Silt fencing shall be installed along a 15-foot setback along the exterior toe of the outer berms, and in all areas where deemed necessary for erosion control. Silt fencing shall be armored with stacked hay bales abutting the fence perpendicular to the direction of stormwater flow.

Following completion of construction of auxiliary erosion and sedimentation control structures, areas shall be vegetated with seed (millet rye) as soon as possible. Effort shall be made to utilize natural existing vegetation in those areas where buffers are proposed or where practical.

Construction of auxiliary erosion and sedimentation control structures including diversion, dikes, or berms shall be constructed to retain, direct, and control surface water runoff from affected areas into designed sediment control structures. All surface water discharge shall be controlled and released in a non-erosive velocity onto stabilized areas or into stabilized channels.

- No permanent land form changes or permanent mining support structures are proposed.
- Protective barriers, such as berms or other similar structures will be placed between jurisdictional waters of the U.S. A minimum setback of 25 ft will be maintained between barrier berms and adjacent un-impacted wetlands or streams.
- The proposed mining activity lies within areas designated as Zone A on the Flood Insurance Rate Map. **Figure 9** shows the floodplain areas in the vicinity of the proposed mine. The Zone A areas are isolated depressions within the site. No structures are proposed to be placed within these areas, and mining activities will not impact the overall floodway.
- The proposed mining operation will include the temporary alteration of streams and wetlands. A copy of the USACE Individual Permit application, which describes the impacts and associated mitigation is provided as Exhibit B to this Plan.
- TPM will obtain all required permits and maintain compliance with the Rules and Regulations of the State of Georgia. TPM will obtain a DNR-EPD General Permit No. GAR050000 for stormwater discharges. The stormwater management system will be inspected regularly as required by the permit. Any deficiencies noted will be corrected immediately.
- No properties listed on the National Register of Historic Places are located within one mile of any portion of the proposed mining operation. In the event historic or archaeological resources are identified in the future, work shall cease and proper authorities shall be notified. A copy of the Cultural Resources assessment is included as an attachment to the USACE Individual Permit Application.
- Activities within the proposed mine shall adhere to air quality requirements including the National Ambient Air Quality Standards (NAAQS) and Mine Safety and Health Administration (MSH) regulations. If these parameters are anticipated to be exceeded, a dust control or air quality abatement plan will be implemented. Mining activities will be conducted in compliance with all applicable audible element regulations.
- TPM will post an identification sign at the entrance to the mine. The sign will include the Operator's name, Mine name, and Permit Number (**Figure 7D**).

VIII. PERFORMANCE CRITERIA FOR RECLAMATION

Reclamation activities shall begin within 1 to 2 weeks of the beginning of mining with the placement of sand tails into the active mining pit as it advances. The reclamation will progress following the proposed mining progression plan and will be completed in a timely manner. Final site reclamation will be completed within 24 months following the completion of mining. Following completion of all mining activities, all structures, equipment, and material associated with the operation shall be removed (**Figure 10**). Backfilling of mined areas will use overburden, spoil material, and stockpiled topsoil.

To ensure long term reclamation success TPM intends to observe hydrologic regimes post-mining to determine which areas will be planted to trees and which areas will be managed as treeless wet meadows similar to the wet prairie or seepage slope community types (FNAI Natural Community Classification Guide 2010). In a pine flatwoods landscape, small differences in elevation (just a few centimeters) and soil saturation can produce quite different plant communities. The best assurance of successful reclamation is to work with current (i.e. post-mining) conditions. TPM expects that areas designated as mesic pine flatwoods will have similar surface hydrology post-mining, so those areas will likely be replanted to pine. Areas currently designated as wetlands will likely remain wetlands post-mining, although specific wetland community goals (e.g. trees versus treeless) will need to be established as post-mining conditions dictate. Areas currently designated as wet pine flatwoods will likely be a mosaic of fine-scale elevational and hydrologic conditions, some of which may be appropriate sites for tree planting, and some of which will be more successful as wet meadows.

The goal of reclamation will be to produce functional communities that are resistant to the invasion of exotic species as quickly as possible. We will begin observing hydrologic regimes, soil characteristics and plant community development immediately after the mining pit is backfilled. TPM expects plant communities to develop from the seedbank in the topsoil (which will be preserved and replaced) and we will address issues with community development as they arise (e.g. invasive species control, native 'weedy' species dominance). We expect to determine which areas will be planted with trees within one-year post-mining. Trees will be planted in late fall/winter which is common forestry practice and best ensures planting success. Active growing season varies by plant species, but many species are dormant for some period in the winter.

TPM does not anticipate using fertilizers because pine flatwoods systems and their embedded wetlands are naturally nutrient deficient; the addition of fertilizers would degrade rather than enhance reclamation by encouraging exotic and native 'weedy' species.

Timing of stable, mature growth of plant communities post-mining is also somewhat unpredictable as there will be multiple potential successional trajectories (see Chapter 9 The Dynamic Nature of Ecological Systems: Multiple States and Restoration Trajectories by Suding and Gross, in Foundations of Restoration Ecology, eds. Falk, Palmer and Zedler). Species turnover rates will undoubtedly be high in the first 2-3 years, but we expect some stabilization after that. Some systems are in a state of dynamic equilibrium in which species turnover will continue to occur into the foreseeable future; they are still functioning ecosystems. Mature meadows may be established in a relatively short period of time (< 10 years), whereas pines may not reach maturity for 30-40 years.

Estimated final contours will approximate pre-mining contours; wetlands will remain wetlands and uplands will remain uplands. T-Model and Trail Ridge Roads will remain post-mining.

Erosion control measures shall remain in place until adequate vegetative cover has been established. The operator will restore all grades to mimic pre-mining topography and be blended into the existing landscape. Reclamation shall mimic approximate pre-mining topography and restore surface water flow to approximate pre--mining drainage basins. Constructed slopes shall not exceed 3:1. No highwalls will remain.

Reclamation objectives are depicted on the reclamation plan sheet of this submittal and will be adhered to unless circumstances dictate amendments to the plan. Reclamation objectives for the proposed mining activity include re-establishment of vegetation and post-mining topography, which will mimic pre-mining topography.

Specific requirements that TPM, LLC will adhere to are:

A. Grade all peaks, ridges, and valleys resulting from surface mining and backfill all pits and trenches resulting from same in a manner to minimize any hazardous effects of mining adjacent to any State or county maintained public road.

B. Backfill all affected lands as stated in the Reclamation Objective of this Plan utilizing overburden, spoil material, and/or borrow from affected (permitted) land unless approval from the Division is obtained to utilize other materials. Sound engineering principles shall be applied to ensure that affected lands, as reclaimed, meet the intended use.

C. Apply immediate erosion control measures to protect the topsoil cover until an adequate vegetative cover is established. Erosion control measures may include scarifying the land surface parallel to contours.

D. There will be no highwalls remaining on site.

E. All affected land shall be graded to mimic pre-mining topography and blended into the existing landscape, unless otherwise amended.

F. Constructed slopes shall not exceed three horizontals to one vertical (3:1) except where may be approved otherwise in this Plan. Fill and cut slopes shall be designed and constructed to prohibit slumping or shear failures. Prior to final grading, all slopes will be blended in with the original existing topography. Slope grades shall be uniform. Mechanical or vegetative or both stabilization measures shall be employed as soon as practical to prevent erosion.

G. Overburden, spoil or refuse, when used as backfill material, for berm or other construction, will be segregated as necessary, emplaced and compacted in accordance with sound engineering practices to provide for the purpose intended. All new landform structures created with the use of overburden (spoil) or refuse materials shall be constructed in a manner to protect against failure, subsidence and/or erosion and will be permanently stabilized upon completion of construction.

H. No lakes or ponds are proposed as part of the reclamation plan.

I. Any proposal for the construction of wetlands as a reclamation objective shall be consistent with accepted practices utilizing the best available technology (BAT) and include the best management practices (BMP's) to attain the desired result. A copy of the Corps of Engineers Individual Permit Application, which includes site reclamation, is attached to this Plan

J. The Operator will file a Final Reclamation Report and Request for Release upon completion of reclamation responsibilities on affected acreage.

IX. GROUNDWATER- AND SURFACE-WATER MONITORING PLANS

Twin Pines developed groundwater and surface water monitoring plans to assess the groundwater and surface water levels and quality throughout the life of the mining operation. The plans were submitted as part of the USACE Individual Permit Application and are outlined in the following sections.

Groundwater and Surface-Water-Level Monitoring

Currently, there are five piezometers (PZ-15, PZ-16S, PZ-16D, PZ-28S, and PZ-28D,) installed within the proposed mine footprint (**Figure 11**). There are an additional 19 piezometers located within 2,000 ft of the proposed mine footprint. In addition to the above-referenced monitoring points, 62 piezometers were installed within the larger project study area. Combined, each of these 86 piezometers are equipped with Rugged Troll pressure transducers and have been recording background groundwater-level data for a period of between six months and one year. These piezometers will continue to be monitored throughout the period of mining and during post mining.

An additional 100 shallow 1.5-foot deep piezometers were installed inside the proposed mine footprint to monitor groundwater levels within wetlands. These shallow "wetlands" piezometers are also equipped with Rugged Troll pressure transducers and will be monitored during pre-mining, active mining and post-mining periods (**Figure 12**).

A total of 23 staff gauges were installed to evaluate surface water elevations across the project study area (**Figure 13**). Each staff gauge segment measures approximately 3.3 ft in length and is mounted to a metal fence post or pressure-treated wood post so that the base of the gauge was positioned at ground surface. TTL installed In-Situ, Inc. Rugged Troll 200 non-vented data logger/cable combinations at the 23 staff gauge locations across the project study area. The data loggers were installed at each staff gauge with the transducers tip positioned at the approximate ground surface. Each data logger/cable combination has been recording background surface-water-level data for a period of between six months and one year. These staff gauges will continue to be monitored throughout the period of mining and during post mining.

Weather Stations

TPM personnel installed three HOBO rain gauge data loggers at the site in November 2018. The three rain gauge locations (RG01, RG02, and RG03) were installed at the northern, central, and southern portions of the project study area (**Figure 13**). The data loggers for each rain gauge record the accumulation of precipitation in units of hundredths of an inch. Rain gauge data is manually downloaded in the field by TPM representatives on a monthly or bi-monthly basis. During the proposed course of mining, rain gauge data will continue to be manually downloaded in the field once every two weeks.

Proposed Configuration of Piezometers

As part of this monitoring plan, new piezometers will be installed within the mining footprint for the collection of groundwater data. Prior to the start of mining, a site grid will be established to assist in the placement of these new piezometers. **Figure 15** shows the approximate locations of proposed piezometers within the mine footprint. A new piezometer will be installed approximately every 2,000 ft in an east-west direction and every 1,000 ft in the north-south direction. The spacing will provide five rows of piezometers (approximately 23 piezometers), covering an area of roughly 898 acres, or one piezometer every 39 acres. This spacing was developed to provide for monitoring of the predicted steady-state drawdowns due to the moving mine, which has an estimated cone of depression of approximately 1,000 ft wide and 2,000 ft long (**Figure 16**).

The 23 new piezometers will be identified at MPZ-01 through MPZ-23. In addition to these 23 proposed piezometers, four existing piezometers (PZ30D, PZ14, PZ57D, and PZ44) located within 2,000 ft of the mine footprint will also be included in the monitoring program. Monitoring of these piezometers will be initiated prior to the start of mining.

Piezometer Construction

Each of the 23 new piezometers will be constructed to a depth of approximately 50 ft below land surface (bls) using a sonic drill rig (**Figure 17**). Fifty feet is the maximum depth of mining. During installation of the new piezometers, soil cores will be continuously collected and described by an on-site geologist. Boring and well construction logs will be prepared for each newly constructed piezometer.

Each piezometer will be constructed with 40 ft of 0.010-inch slotted, 2-inch diameter, threaded-joint, schedule 40 PVC installed from a depth of 10 to 50 ft bls. From the top of the screen to approximate land surface will be cased with solid 2-inch diameter, schedule 40 PVC riser. The natural formation sand will be allowed to settle around the screen to provide a natural pack to a depth of approximately eight feet bls. A two-foot thick bentonite pellet seal will be placed above the top of the natural filter sand. The remaining annular space above the bentonite seal will be grouted to land surface using a cement/bentonite grout. A metal, flush-mount, bolt-down, protective cover will be installed over the piezometer at land surface to include a 2-foot x 2-foot x 4-inch thick concrete pad. Each piezometer will be fitted with a Rugged Troll transducer in order to continuously monitor groundwater levels.

Sequencing of Piezometer Installation Relative to Progression of Mining

Once initiated, mining will advance at an estimated rate of about 100-200 ft per day and piezometers within the mine footprint will periodically be excavated and reinstalled during the mining progression. The general procedures for the removal and reinstallation piezometers is discussed below:

- Within one or two days of the advancing mine face reaching a piezometer, the transducer will be removed and the piezometer will subsequently be excavated by the advancing drag-line excavator,
- Within approximately five to seven days of mining, the open excavation pit will be backfilled with post-processed soils,
- Within five to ten days of backfilling the excavation, a replacement piezometer will be installed in the approximate location of above-referenced excavated piezometer and,
- The replacement piezometer will be fitted with the Rugged Troll transducer that was removed from the previous piezometer in order to continue monitoring of groundwater levels.

Using this approach for the removal and reinstallation of piezometers, will aid in maintaining the full complement of piezometers within the mine boundary. This same methodology will be applied for the excavation and reinstallation of the shallow "wetlands" piezometers.

Proposed Surface-Water Monitoring Locations

Nine surface water locations are proposed to be monitored in the same general manner as previously installed staff gauges. Six additional staff gauges will be installed and equipped with Rugged Troll pressure transducers. These locations are shown on **Figure 18**.

Frequency of Water-Level Monitoring

As previously stated, water levels will be recorded using Rugged Troll pressure transducers. The transducers will generally be programmed to record water-level measurements at the following intervals; however, the frequency of measurements may be changed as necessary during the life of the mine.

Shallow "Wetland" Piezometers

- Transducers installed, in the shallow 1.5-foot-deep piezometers for monitoring water levels within existing wetlands, will record water-level measurements at 6-hour intervals.

Remaining Piezometers

- Transducers installed, in the row of 50-foot-deep piezometers located within 1,000 ft of the active excavation and within the mining footprint, will record water-level measurements at 10-minute intervals.
- Transducers installed, in the row of 50-foot-deep piezometers located greater than 1,000 ft from the active excavation but within the mining footprint, will record water-level measurements at one-hour intervals.
- Transducers installed, in the remaining piezometers outside of the mining footprint, will record water-level measurements at 6-hour intervals.

Surface Water Transducers

- Transducers installed at staff gauges will record water-level measurements at 6-hour intervals.

Initially, transducer data will be downloaded twice per week to evaluate water levels within and adjacent to the proposed mine. The frequency of transducer data downloading may be adjusted as needed during the life of the mine.

Groundwater- and Surface-Water Quality Monitoring Plan

Frequency of Groundwater/Surface-Water Quality Monitoring

Water-quality samples will be collected once prior to the start of mining (background) from the 23 new piezometers, four existing piezometers, and nine surface-water locations. The monitoring locations are listed below:

- Newly installed piezometers (MPZ-01 through MPZ-23) (**Figure 15**),
- Piezometers PZ30D, PZ14, PZ57D, and PZ44 (**Figure 11**),
- Wetland Monitoring Points WSP-01 through WSP-03 (**Figure 18** and,
- Stream monitoring points MSW-01 though MSW-06 (**Figure 18**).

The following is a schedule for the frequency of water-quality sampling:

- One sampling event performed prior to initiation of mining.
- Four quarterly monitoring events beginning three months after mining is initiated
- Semi-annual sampling thereafter until the end of mining unless a notable change in water quality occurs.
- Semi-annual monitoring of post mining conditions for an estimated period of six years (estimated duration of mining).

Based on the results of water-quality data monitoring and the progression of the mine, the frequency of water-quality data sampling and number of monitoring locations may periodically be adjusted (i.e. increased or decreased) during the life of the mine.

Post-Mining Monitoring

Twin Pines estimates that it will take about six years to mine the entire 898 acres. Post-mining monitoring will be performed for a period equal to the period of mining, and will consist of the monitoring of water levels in the piezometers on a continuous basis. This monitoring will include a manual download of the pressure transducers once every quarter during the post-mining period. Water-quality samples will be collected semi-annually for analysis of the constituents specified in this monitoring plan.

Water-Quality Sample Collection and Analysis of Data

To ensure that water-quality samples are collected properly, a Sampling and Analysis Plan (SAP) has been prepared. The SAP addresses well preparation, sample collection, chain-of-custody, analytical procedures, and field and laboratory quality assurance/quality control (QA/QC).

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SURFACE MINING LAND USE DEVELOPMENT PLAN (2)

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

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APPROX. SCALE:

Groundwater sampling procedures, chain of custody, field parameter measurement, and field QA/QC will be performed in general accordance with the Region 4 US Environmental Protection Agency (EPA), Science and Ecosystem Support Division Operating Procedure, Groundwater Sampling (SESDPROC-301-R4), effective April 26, 2017. Surface water sampling procedures and field QA/QC will be performed in general accordance with the Region 4 US Environmental Protection Agency (EPA), Science and Ecosystem Support Division Operating Procedure, Surface Water Sampling (SESDPROC-201-R4), effective December 16, 2016. Low-level mercury sampling will be performed in general accordance with EPA Method 1669.

Sample Collection Procedures

Equipment Decontamination

Any reusable sampling equipment that may contact the interior of the piezometer, groundwater, or surface water will be decontaminated in the field immediately prior to use, or in the office/lab and protected using aluminum foil and/or plastic. For sampling events requiring non-dedicated sampling equipment, decontamination procedures will consist of rinsing the equipment once with distilled or deionized water, brushing the equipment with a phosphate free laboratory-quality detergent, and finally rinsing the equipment with distilled or deionized water.

Water Level Measurement – (Piezometers Only)

Prior to purging and sampling, water-level measurements will be made at each piezometer by utilizing a dedicated or portable water-level indicator, tape, or other suitable measuring device capable of achieving an accuracy of 0.01 foot. The depth to water in each piezometer will be measured on the same day and prior to purging. The measuring device will be used in accordance with the manufacturer's recommendations and/or directions. Measurements of the depth to water from the top of the piezometer casing will be to the nearest 0.01 foot, and the value will be recorded. Total depths will be measured at each piezometer and recorded.

Piezometer Purging

Prior to the collection of groundwater samples, each piezometer will be purged to ensure that fresh aquifer water is being sampled. Purging of each piezometer will be completed using either a peristaltic or electric submersible pump. Due to the depths of the proposed piezometers and the high groundwater tables at the site (i.e. excessive purge volumes), low-flow purging procedures may be utilized. During low-flow purging, the pump or tubing intake will be located within the screened interval and at a depth that will remain under water at all times. During low-flow purging:

- The pumping rate will be set at a speed that produces minimal and stable drawdown within the well,
- The pumping rate will be measured using a graduated cylinder or bucket and a stop watch,
- The groundwater level, pumping rate, and field parameters (pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity) will be monitored and recorded every 5 to 10 minutes (or as appropriate),
- The field parameters will be measured using a calibrated multi-parameter instrument and flow-through cell,

- Purging will be considered complete and sampling will begin when the field measured parameters have stabilized. Stabilization is considered complete when three consecutive readings are within the following limits:
  - **Turbidity** – 10% for values greater than 10 NTU,
  - **Dissolved Oxygen** – Varies no more than 0.2 mg/L or 10% saturation,
  - **Oxidation**-Reduction Potential – Varies no more than 20 millivolts,
  - **Specific Conductance** – Varies no more than 5%,
  - **pH** – Varies no more 0.1 unit

Sample Collection and Preservation – Piezometers

Groundwater sampling is the process of obtaining, containerizing, and preserving a groundwater sample after the purging process is complete. Appropriate devices to be used to collect groundwater samples from piezometers include: peristaltic or electric submersible pumps. Alternative sampling devices/methods may be utilized if the alternative device/method is approved for use in EPA field sampling guidance literature.

During sample collection, each piezometer will be sampled with equipment and methodologies that minimize the potential for alteration or contamination of the sample and that are capable of obtaining a sample representative of the formation ground water. Care will be taken to avoid placing clean sampling equipment on the ground or on any contaminated surface. Additionally, personnel who contact sampling equipment that may contact the interior of the monitoring well or the ground water will wear new powderless latex or nitrile gloves. Gloves will be changed between sample locations to avoid cross-contamination.

Field personnel responsible for sample collection will record, at a minimum, the following:

- Date, time and technician's name
- Piezometer number and well depth
- Well casing material and inside diameter
- Static water level prior to purging
- Sampling equipment used
- Volume of water purged prior to sampling
- Sample container numbers, types, sizes, and preservatives
- pH, specific conductance, dissolved oxygen, oxidation-reduction potential, and temperature of water samples
- Comments about sample color, odor, and unusual characteristics
- Comments about weather conditions
- Comments about accessibility and condition of well

Groundwater collected from each piezometer will be slowly discharged into laboratory provided sample containers of the appropriate size and type, and with the preservatives appropriate for the analytical tests required. The sample container will be labeled with the following information:

- Site name,
- Collected date and time,
- Sampler's name,
- Analysis required, and
- Preservative, if any

The laboratory will specify the preservation methods based on knowledge of methods and procedures approved by the Georgia EPD or EPA.

Sample Collection and Preservation – Surface Water

Surface water samples will be collected directly into the laboratory provided container from the surface water body or by decanting the water sample from a collection device such as an unpreserved laboratory provided plastic container. The field sampler will face upstream if there is a current and collect the sample without disturbing the bottom sediment. Alternative sampling devices/methods may be utilized if the alternative device/method is approved for use in EPA field sampling guidance literature. Water quality samples collected for low-level mercury analysis (EPA Method 1631E) will be collected in general accordance with EPA Method 1669.

Each surface water sample will be sampled with equipment and methodologies that minimize the potential for alteration or contamination of the sample. Care will be taken to avoid placing clean sampling equipment on the ground or on any contaminated surface. Additionally, personnel who contact sampling equipment will wear new powderless latex or nitrile gloves. Gloves will be changed between sample locations to avoid cross-contamination.

Field personnel responsible for sample collection will record, at a minimum, the following:

- Date, time and technician's name
- Sample location identifier
- Sampling equipment used
- Sample container numbers, types, sizes, and preservatives
- pH, specific conductance, dissolved oxygen, oxidation-reduction potential, and temperature of water samples
- Comments about sample color, odor, and unusual characteristics
- Comments about weather conditions
- Comments about accessibility and condition of the sample locations

Surface water samples will be collected into laboratory provided sample containers of the appropriate size and type, and with the preservatives appropriate for the analytical tests required. The sample container will be labeled with the following information:

- Site name,
- Collected date and time,
- Sampler's name,
- Analysis required, and
- Preservative, if any

The laboratory will specify the preservation methods based on knowledge of methods and procedures approved by the Georgia EPD or EPA.

Sample Shipment

Upon completion of sampling each piezometer and/or surface water monitoring point, each laboratory provided container will be sealed, labeled and placed in an iced cooler for preservation and transport to a Georgia EPD approved laboratory for analysis. Chain of custody forms will be completed in the field at the time of sampling of each well. Samples will be transported to the laboratory via courier or shipped for overnight delivery using FedEx or UPS delivery.

Laboratory Analysis

Water-quality samples will be analyzed for the constituents listed below. The analytical list may be revised during the life of the mine. Sampling will be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136.

pH	Aluminum, Total	Selenium, Total
BOD5	Antimony, Total	Silver, Total
COD	Arsenic, Total	Tin, Total
Color	Cadmium, Total	Titanium, Total
Fluoride	Chromium, Total	Zinc, Total
Nitrate-Nitrite	Cobalt, Total	Zirconium
Nitrate	Copper, Total	Ammonia, Nitrogen
Nitrite	Iron, Total	Total Kjeldahl Nitrogen
Nitrogen, Total Organic (as N)	Lead, Total	Alkalinity, Total
Oil & Grease	Magnesium, Total	Alkalinity, Bicarbonate
Phosphorus (as P), Total	Manganese, Total	Alkalinity, Carbonate
Sulfate (as SO4)	Mercury, Total	Total Hardness
Sulfide	Molybdenum, Total	Total Cyanide
Sulfite (as SO3)	Nickel, Total	Uranium
Alfa, Total	Radium, Total	Thorium
Beta, Total	Radium 226, Total	

Quality Assurance and Quality Control

A quality-assurance and quality-control program (QA/QC) will be part of the sampling protocol and a requirement of the laboratory chosen to provide analytical services. At a minimum, field QA/QC per sampling event will require the collection of an equipment-rinsate blank if equipment is field cleaned and re-used on-site. Additional QA/QC sampling such as field or trip blanks may also analyzed as deemed necessary.

The laboratory QA/QC program will be a written program and will describe the accuracy and completeness of the laboratory data; the documentation of procedures for calibration and maintenance of laboratory equipment, for analysis of samples, for computing and validating test data, and for chain-of-custody control; and the control and security of all documentation. Laboratory QA/QC standards will be initiated with the receipt of samples and will be maintained throughout the record-keeping period.

Chain-of-Custody Control

The chain-of-custody program will allow tracing the possession of and the handling of individual samples from the time of field collection through the completion of laboratory analysis.

Evaluation of Analytical Data

Results of the field measured and analytical groundwater data will be tabulated for each monitoring event. The data will be analyzed for trends and compared to applicable groundwater protection and in-stream water quality standards. The purpose of the trend analysis will be to evaluate if concentrations are declining, remaining level or constant (no discernable change), or increasing.

Groundwater- and Surface-Water-Monitoring Reporting

A report summarizing mining activities and water-level and water-quality data will be prepared and submitted to the applicable regulatory authorities on a quarterly basis for the first year and on an annual basis thereafter. These reports will include groundwater contour maps, results of water-quality analysis for the period of monitoring and trend graphs of concentrations. Water-level and water-chemistry data will be evaluated to determine the success of initial mining operations and methods. Groundwater-level data will be compared with groundwater levels predicted by the groundwater models. Water-chemistry data will be evaluated against current groundwater and surface water quality standards.

X. ADDITIONAL OPERATOR SUBMISSIONS

- Bonding – Bonding will be completed upon approval of this application for surface mining.
- Annual Permit Status Report – An annual status report will be prepared by the Operator and submitted to the Division as required.
- Amendments to Plan – The Operator will submit any future proposed changes in this proposed plan to the Division for approval.
- Change of Ownership of Mining Operation – Should a change in Operator ownership of this mining operation occur, the new owner(s) will submit a new application and anew bond wining sixty days from the date of consummation of the ownership change.

XI. ATTACHMENTS

Exhibit A	Figures
Exhibit B	USACE Individual Permit Application
Exhibit C	NOI for GAR 050000 (pending submittal and will be provided once submittal has been completed)

SURFACE MINING LAND USE DEVELOPMENT PLAN (3)

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

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DRAWING DATE: 6/18/2020
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TTL JOB NO.: 000180200804.00
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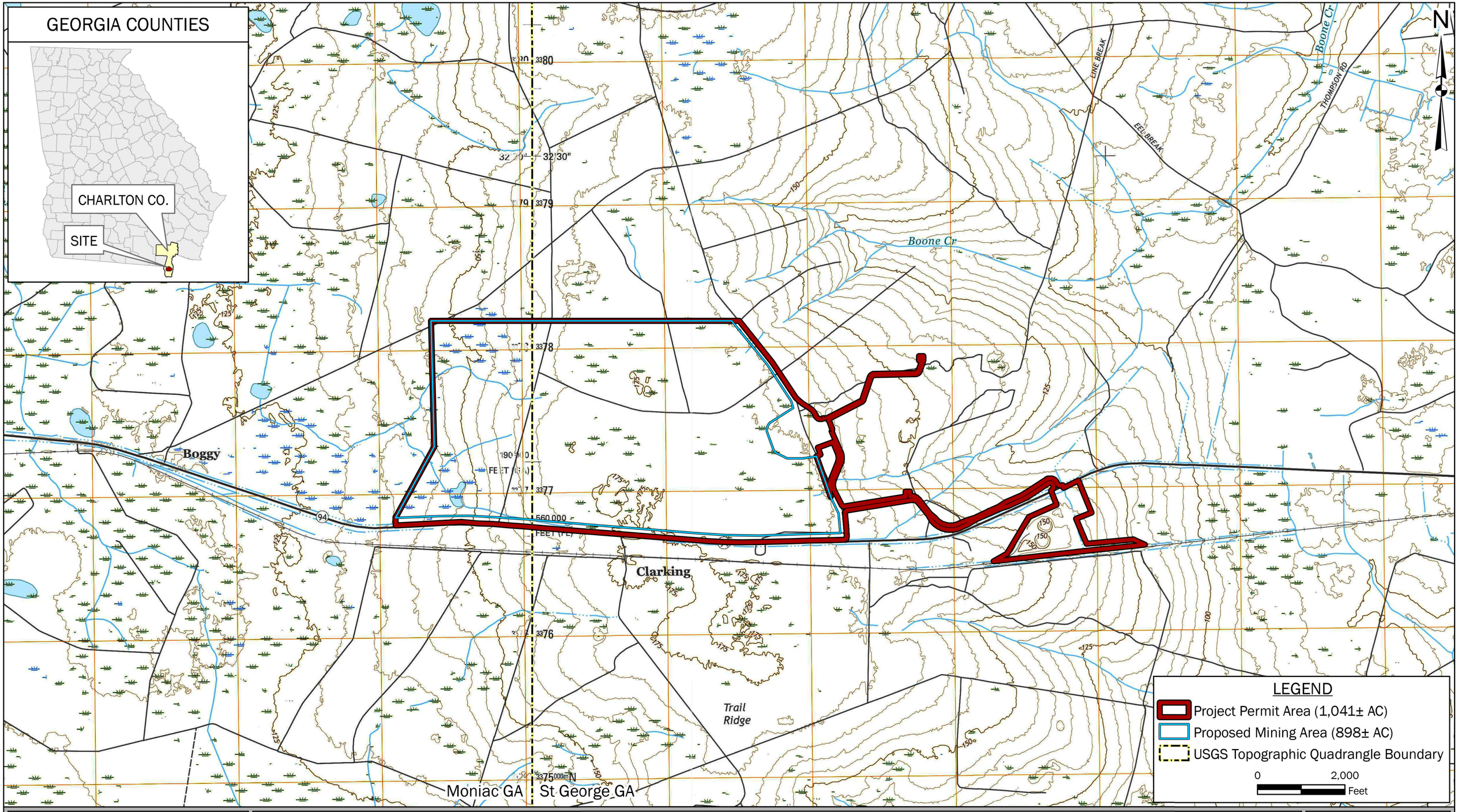

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FIGURE 1: SITE LOCATION & TOPOGRAPHIC MAP

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: USGS 7.5 Minute Quadrangle Map, Florida & Georgia, (West) Moniac 2017 (10-ft Contour Interval), (East) Saint George 2017 (5-ft Contour Interval).

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DRAWING DATE: 6/18/2020
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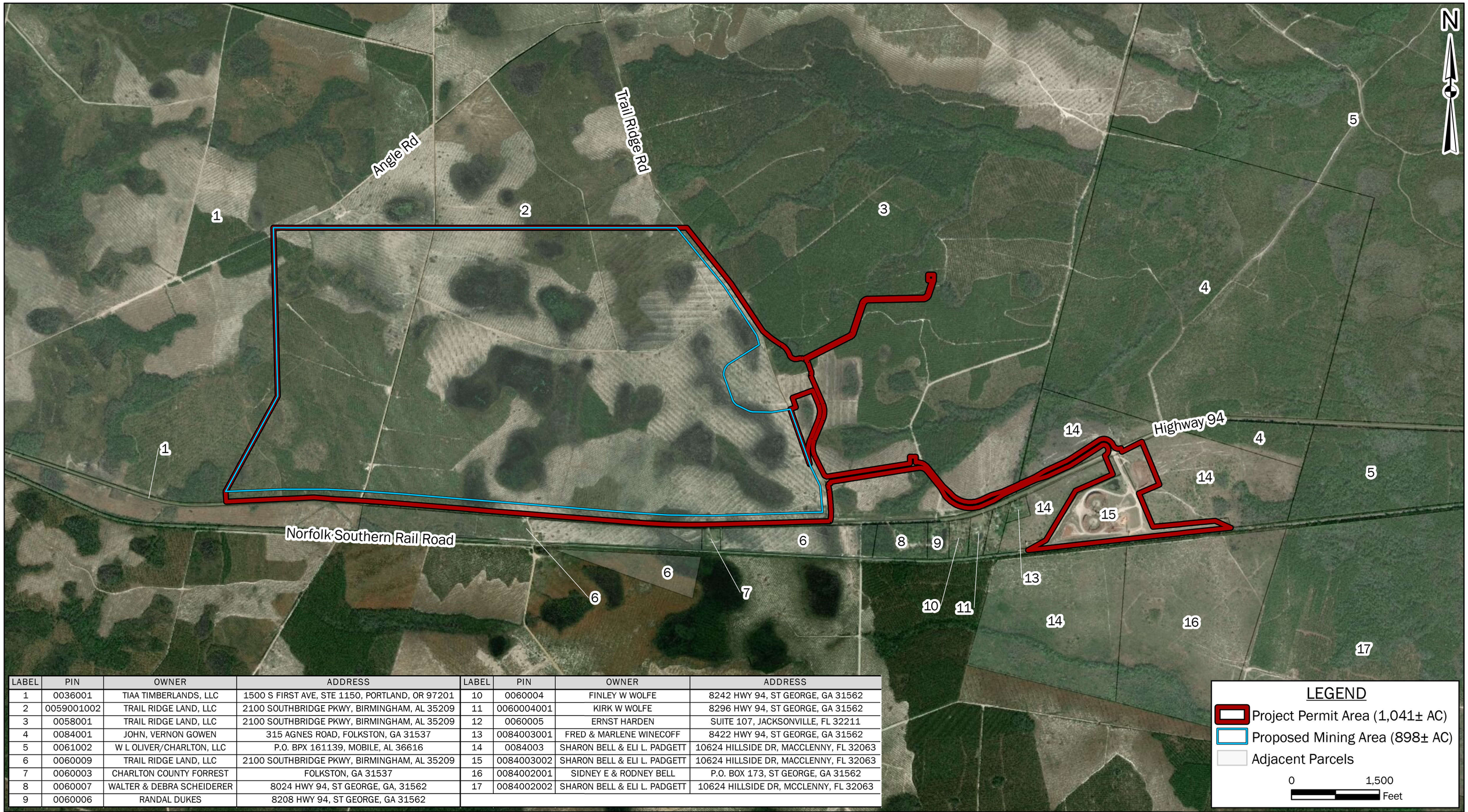
APPROX. SCALE: 1 in =1,000 ft



LABEL	PIN	OWNER	ADDRESS
1	0036001	TIAA TIMBERLANDS, LLC	1500 S FIRST AVE, STE 1150, PORTLAND, OR 97201
2	0059001002	TRAIL RIDGE LAND, LLC	2100 SOUTHBRIDGE PKWY, BIRMINGHAM, AL 35209
3	0058001	TRAIL RIDGE LAND, LLC	2100 SOUTHBRIDGE PKWY, BIRMINGHAM, AL 35209
4	0084001	JOHN, VERNON GOWEN	315 AGNES ROAD, FOLKSTON, GA 31537
5	0061002	W L OLIVER/CHARLTON, LLC	P.O. BPX 161139, MOBILE, AL 36616
6	0060009	TRAIL RIDGE LAND, LLC	2100 SOUTHBRIDGE PKWY, BIRMINGHAM, AL 35209
7	0060003	CHARLTON COUNTY FORREST	FOLKSTON, GA 31537
8	0060007	WALTER & DEBRA SCHEIDERER	8024 HWY 94, ST GEORGE, GA, 31562
9	0060006	RANDAL DUKES	8208 HWY 94, ST GEORGE, GA 31562

LABEL	PIN	OWNER	ADDRESS
10	0060004	FINLEY W WOLFE	8242 HWY 94, ST GEORGE, GA 31562
11	0060004001	KIRK W WOLFE	8296 HWY 94, ST GEORGE, GA 31562
12	0060005	ERNST HARDEN	SUITE 107, JACKSONVILLE, FL 32211
13	0084003001	FRED & MARLENE WINECOFF	8422 HWY 94, ST GEORGE, GA 31562
14	0084003	SHARON BELL & ELI L. PADGETT	10624 HILLSIDE DR, MACCLENNY, FL 32063
15	0084003002	SHARON BELL & ELI L. PADGETT	10624 HILLSIDE DR, MACCLENNY, FL 32063
16	0084002001	SIDNEY E & RODNEY BELL	P.O. BOX 173, ST GEORGE, GA 31562
17	0084002002	SHARON BELL & ELI L. PADGETT	10624 HILLSIDE DR, MCCLENNY, FL 32063

LEGEND

Project Permit Area (1,041± AC)

Proposed Mining Area (898± AC)

Adjacent Parcels

0 1,500 Feet

TTL

FIGURE 2: ADJACENT PROPERTIES & AERIAL PHOTOGRAPH

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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APPROX. SCALE: 1 in = 750 ft

NOTES
- Access road to be installed between proposed berm and proposed mining area.
- Undisturbed buffer to be located between the proposed berm and Highway 94.
- See Figure 6 for plan view, cross-sections and details of the typical dragline mining operation.
- See Figure 7 for all related construction notes and details.

N

Angle Rd

Trail Ridge Rd

Sd1-S

E: 666970
N: 193221

E: 674027
N: 193222

Parking &
Offices

Wet Plant

Pumping Well
Location

Sd1-S

Stockpile

Haul Road
(Between Wet &
Dry Plants)

Sd1-S

Ponds

Pumping Well
Location

Stormwater
Drainage
Pond

E: 667044
N: 190346

Substation

Highway 94

Portable
Conveyors

E: 681786
N: 189572

Weigh Scales &
Truck Loading

E: 682085
N: 188840

Stockpiles

3

Parking

2

Zircon Plant

Fuel
Storage

E: 666165
N: 188545

Stockpile
Locations

1

E: 683303
N: 188102

E: 676467
N: 188217

E: 679845
N: 187723

Tails
Stockpile

Norfolk Southern Rail Road

Sd1-S

Train
Loadout

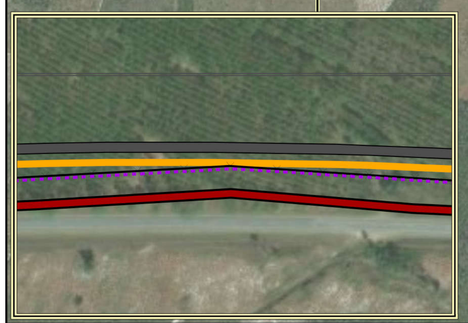
Feed
Conveyor

Tails
Conveyor

Outfall
WW001

Co

Mineral Separation
(Dry) Plant Location



LEGEND

- Project Permit Area (1,041± AC)
- Proposed Mining Area (898± AC)
- 1-Year Estimated Mining Block
- Treatment Basin & Open Channel
- Proposed Site Plan
- 20' Wide Access Road
- Proposed Safety Berm
- Construction Buffer
- Silt Fence
- Chip Mill Well Location
- USACE Verified Wetland
- USACE Verified Stream
- Stormwater Pond

0 1,200 Feet

TTL

FIGURE 3: PROPOSED SITE LAYOUT

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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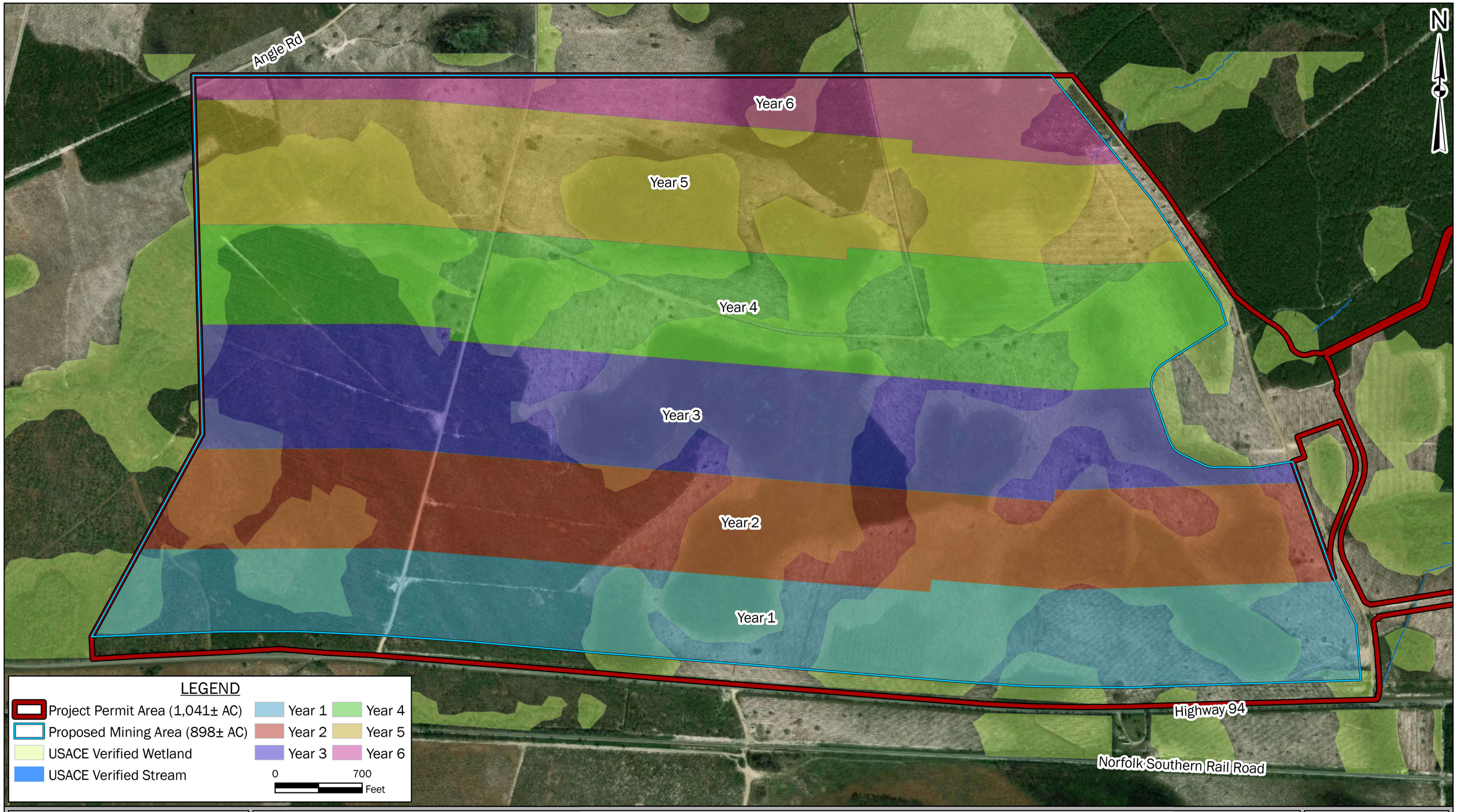

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FIGURE 4A: ESTIMATED PROGRESSION OF MINING

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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APPROX. SCALE:	1 in = 350 ft

Angle Rd

Highway 94

Norfolk Southern Rail Road

N

LEGEND

- Project Permit Area (1,041± AC)
- Proposed Mining Area (898± AC)
- USACE Verified Wetland
- USACE Verified Stream
- Estimated Mining Schedule (By Year)
- Head Feed Conveyor Clearing (Rough)
- Tails Feed Conveyor/Berm/Road Clearing (Rough)
- Mining Clearing Row 1 (Rough/Grubbing)
- Mining Clearing Row 2 (Rough/Grubbing)
- Clearing Timeline Direction

0 700 Feet

TTL

FIGURE 4B: ESTIMATED PROGRESSION OF LAND SURFACE CLEARING

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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TTL JOB NO.:	000180200804.00
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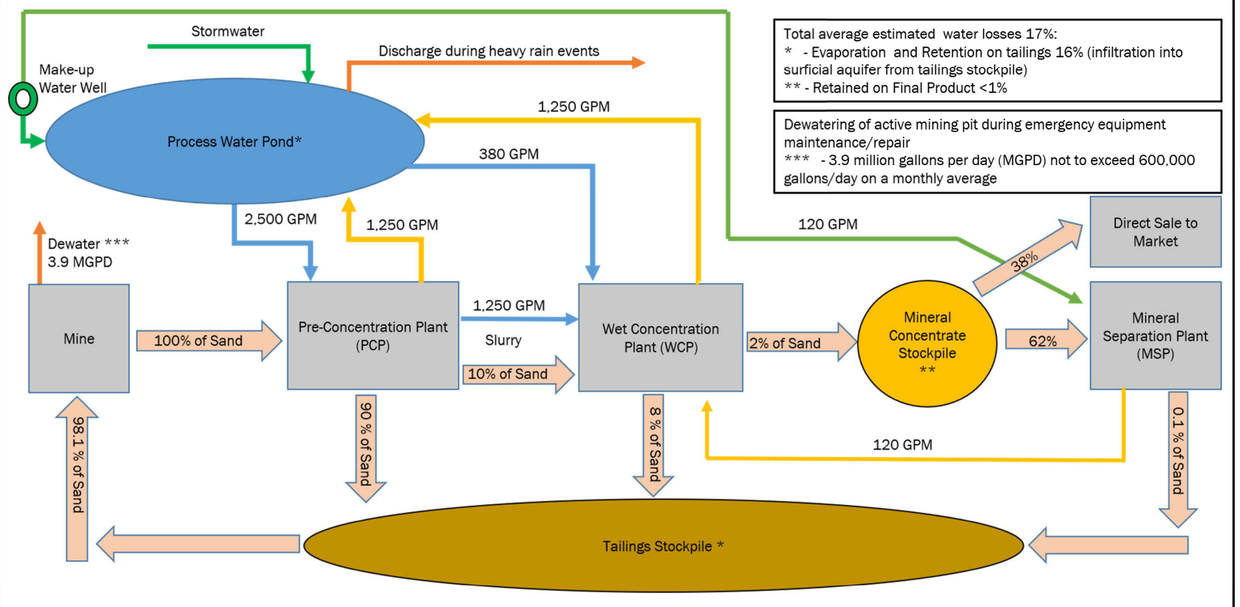

TTL	FIGURE 5: PROCESS FLOW DIAGRAM TWIN PINES MINERALS ST. GEORGE, CHARLTON COUNTY, GEORGIA

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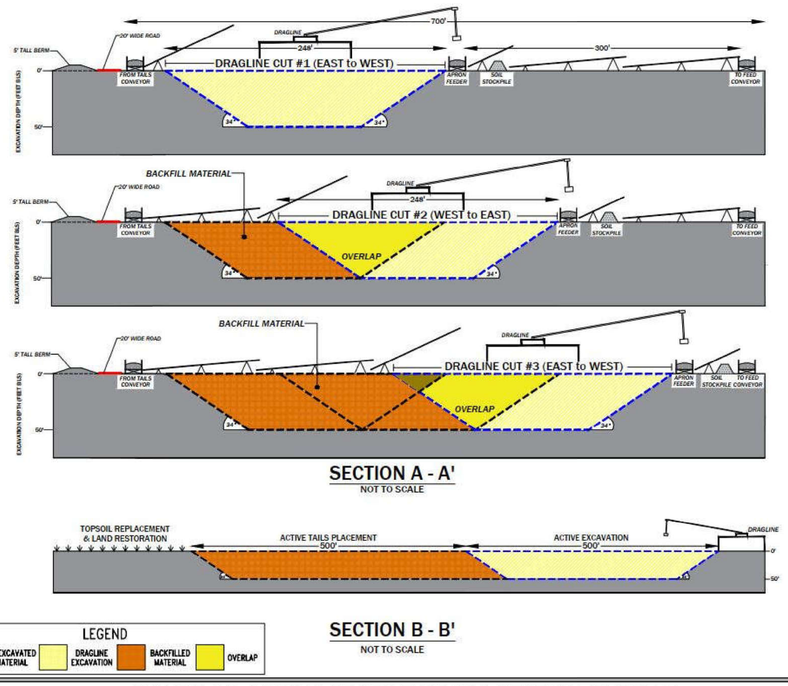

SECTION A - A'
NOT TO SCALE

SECTION B - B'
NOT TO SCALE

TTL	FIGURE 6B: MINING PROFILE/CROSS-SECTION (TYPICAL) TWIN PINES MINERALS ST. GEORGE, CHARLTON COUNTY, GEORGIA

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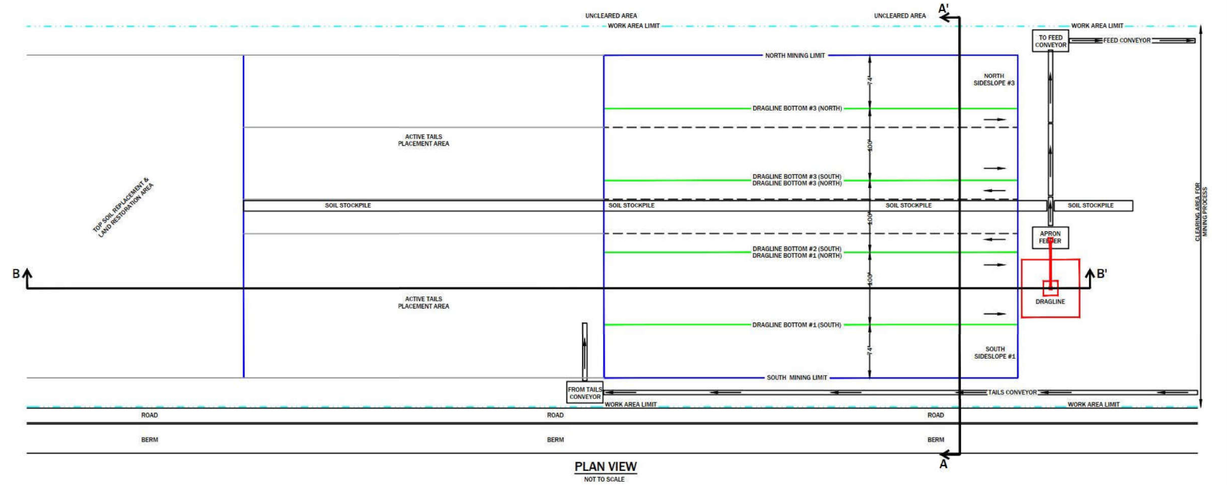

PLAN VIEW
NOT TO SCALE

TTL	FIGURE 6A: MINING PLAN VIEW (TYPICAL) TWIN PINES MINERALS ST. GEORGE, CHARLTON COUNTY, GEORGIA

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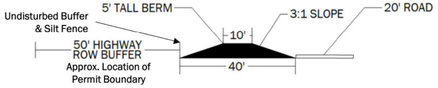
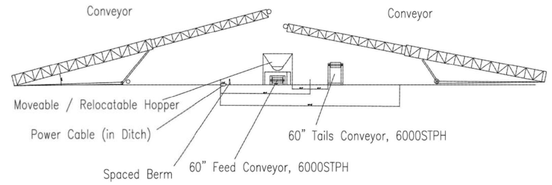


EXCAVATION PERIMETER & SAFETY BERM (Typ.)
NOT TO SCALE



CONVEYOR DETAIL (Typical)

TTL	FIGURE 6C: MINING DETAILS (TYPICAL) TWIN PINES MINERALS ST. GEORGE, CHARLTON COUNTY, GEORGIA

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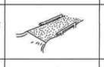
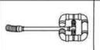
GEORGIA
UNIFORM CODING SYSTEM

FOR SOIL EROSION AND SEDIMENT CONTROL PRACTICES

GEORGIA SOIL AND WATER CONSERVATION COMMISSION

STRUCTURAL PRACTICES

CODE	PRACTICE	DETAIL	MAP SYMBOL	DESCRIPTION
Cd	CHECKDAM			A small temporary barrier or dam constructed across a swale, drainage ditch or area of concentrated flow.
Ch	CHANNEL STABILIZATION			Improving, constructing or stabilizing an open channel, existing stream, or ditch.
Co	CONSTRUCTION EXIT			A crushed stone pad located at the construction site exit to provide a place for removing mud from tires thereby protecting public streets.
Sd1	SEDIMENT BARRIER			A barrier to prevent sediment from leaving the construction site. It may be sandbags, bales of straw or hay, brush, logs and poles, gravel, or a silt fence.
Sd3	TEMPORARY SEDIMENT BASIN			A basin created by excavation or a dam across a waterway. The surface water runoff is temporarily stored allowing the bulk of the sediment to drop out.
Sk	FLOATING SURFACE SKIMMER			A buoyant device that releases/drains water from the surface of sediment ponds, traps, or basins at a controlled rate of flow.
St	STORMDRAIN OUTLET PROTECTION			A paved or short section of riprap channel at the outlet of a storm drain system preventing erosion from the concentrated runoff.

VEGETATIVE PRACTICES

CODE	PRACTICE	DETAIL	MAP SYMBOL	DESCRIPTION
Ds1	DISTURBED AREA STABILIZATION (WITH MULCHING ONLY)		Ds1	Establishing temporary protection for disturbed areas where seedlings may not have a suitable growing season to produce an erosion retarding cover.
Ds2	DISTURBED AREA STABILIZATION (WITH TEMP SEEDING)		Ds2	Establishing a temporary vegetative cover with fast growing seedings on disturbed areas.
Ds3	DISTURBED AREA STABILIZATION (WITH PERM SEEDING)		Ds3	Establishing a permanent vegetative cover such as trees, shrubs, vines, grasses, or legumes on disturbed areas.
Ds4	DISTURBED AREA STABILIZATION (SODDING)		Ds4	A permanent vegetative cover using sods on highly erodable or critically eroded lands.
Du	DUST CONTROL ON DISTURBED AREAS		Du	Controlling surface and air movement of dust on construction site, roadways and similar sites.

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FIGURE 7A: EROSION CONTROL DETAILS

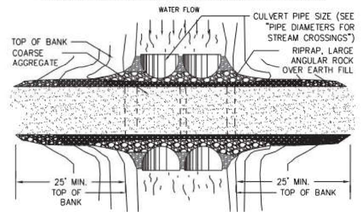
TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

Sr-C CONFIGURATION OF TEMPORARY CULVERT CROSSINGS

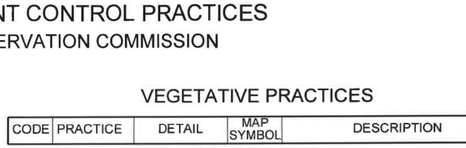
(SECTIONS – NOT TO SCALE)

TYPICAL CULVERT CROSSING PLAN (NOT TO SCALE)



NOTES:
1. THIS TYPE OF CROSSING CAN BE INSTALLED IN BOTH A WET OR DRY WEATHER STREAM CONDITION WHERE THE DRAINAGE AREA EXCEEDS 10 ACRES.
2. REMOVE DURING CLEANUP.

Wt WATERWAY WITH STONE CENTER DRAIN AND V-SECTION SHAPED BY MOTOR GRADER



WATERWAY WITH STONE CENTER DRAIN AND ROUNDED SECTION SHAPED BY BULLDOZER

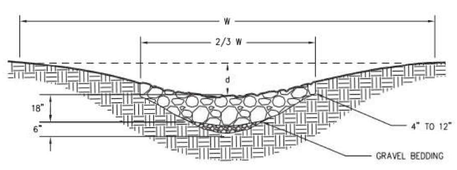


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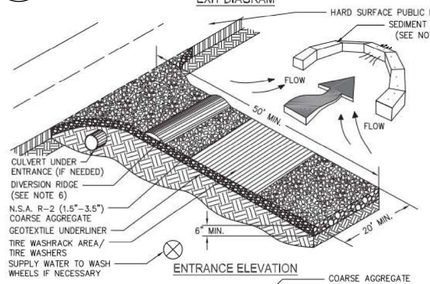
FIGURE 7C: CULVERT CROSSING & WATERWAY DETAILS

TWIN PINES MINERALS

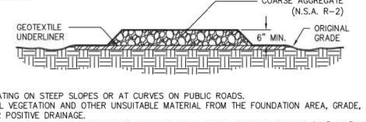
ST. GEORGE, CHARLTON COUNTY, GEORGIA

Co CRUSHED STONE CONSTRUCTION EXIT

EXIT DIAGRAM



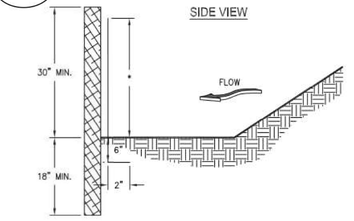
ENTRANCE ELEVATION



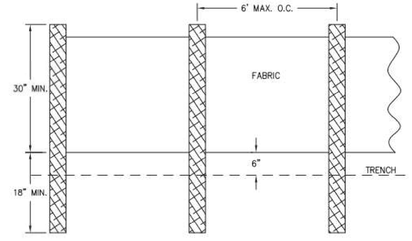
NOTES:
1. AVOID LOCATING ON STEEP SLOPES OR AT CURVES ON PUBLIC ROADS.
2. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE.
3. AGGREGATE SIZE SHALL BE IN ACCORDANCE WITH NATIONAL STONE ASSOCIATION R-2 (1.5"-3.5" STONE).
4. GRAVEL PAD SHALL HAVE A MINIMUM THICKNESS OF 6".
5. PAD WIDTH SHALL BE EQUAL FULL WIDTH AT ALL POINTS OF VEHICULAR EGRESS, BUT NO LESS THAN 20'.
6. A DIVERSION RIDGE SHOULD BE CONSTRUCTED WHEN GRADE TOWARD PAVED AREA IS GREATER THAN 2%.
7. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES.
8. WHEN WASHING IS REQUIRED, IT SHOULD BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN (DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE ENTRANCE TO A SEDIMENT CONTROL DEVICE).
9. WASHRACKS AND/OR TIRE WASHERS MAY BE REQUIRED DEPENDING ON SCALE AND CIRCUMSTANCE. IF NECESSARY, WASHRACK DESIGN MAY CONSIST OF ANY MATERIAL SUITABLE FOR TRUCK TRAFFIC THAT REMOVE MUD AND DIRT.
10. MAINTAIN AREA IN A WAY THAT PREVENTS TRACKING AND/OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

Sd1-S SILT FENCE - TYPE NON-SENSITIVE

SIDE VIEW



FRONT VIEW



NOTES:
1. USE STEEL OR WOOD POSTS OR AS SPECIFIED BY THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.
2. HEIGHT (*) IS TO BE SHOWN ON THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.

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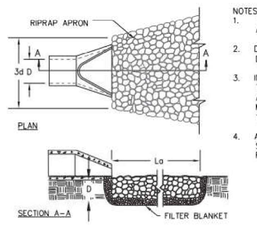
FIGURE 7B: CONSTRUCTION ENTRY/EXIT & SILT FENCE DETAILS

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

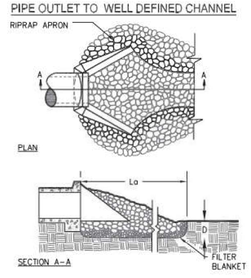
St RIPRAP OUTLET PROTECTION

PIPE OUTLET TO FLAT AREA – NO WELL DEFINED CHANNEL



NOTES:
1. La IS THE LENGTH OF THE RIPRAP APRON.
2. D = 1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESSHAN 6".
3. IN A WELL-DEFINED CHANNEL, EXTEND THE APRON UP THE CHANNEL BANKS TO AN ELEVATION OF 6" ABOVE THE MAXIMUM TAILWATER DEPTH OR TO THE TOP OF THE BANK (WHICHEVER IS LESS).
4. A FILTER BLANKET OR FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIPRAP AND THE SOIL FOUNDATION.

PIPE OUTLET TO WELL DEFINED CHANNEL



EROSION CONTROL NOTES:

1. THE ESCAPE OF SEDIMENT FROM THE SITE SHALL BE PREVENTED BY THE INSTALLATION OF EROSION AND SEDIMENT CONTROL MEASURES AND PRACTICES PRIOR, OR CONCURRENT WITH LAND DISTURBING ACTIVITIES.
2. EROSION CONTROL MEASURES WILL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED TO CONTROL OR TREAT THE SEDIMENT SOURCE.
3. ANY DISTURBED AREA LEFT EXPOSED FOR PERIOD GREATER THAN 14 DAYS SHALL BE STABILIZED WITH MULCH OR TEMPORARY SEEDING.
4. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL CONFORM WITH THE GUIDELINES OF THE "MANUAL FOR EROSION AND SEDIMENT CONTROL."
5. FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM) PANEL _____ DATED _____, INDICATES NO SPECIAL FLOOD HAZARD AREAS WITHIN THE PROJECT AREA.
6. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO ANY OTHER CONSTRUCTION/MINING ACTIVITY AND MAINTAINED UNTIL PERMANENT GROUND COVER IS ESTABLISHED.
7. DURING CONSTRUCTION AND MINING ACTIVITIES, THE OPERATOR SHALL MAINTAIN CAREFUL SCHEDULING AND PERFORMANCE TO ENSURE THAT LAND STRIPPED OF IT'S NATURAL GROUND COVER IS EXPOSED ONLY IN SMALL QUANTITIES, AND PROTECTION IS ESTABLISHED.
8. SEDIMENT AND EROSION CONTROL MEASURES MUST BE CHECKED AFTER EACH RAIN EVENT. EACH DEVICE IS TO BE MAINTAINED OR REPLACED IF SEDIMENT ACCUMULATION HAS REACHED HALF THE CAPACITY OF THE DEVICE. ADDITIONAL DEVICES MUST BE INSTALLED IF NEW CHANNELS HAVE DEVELOPED.
9. OPERATOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE PROPER FUNCTIONING.

[OPERATOR'S NAME]
[MINE NAME]
[PERMIT NUMBER]
[CONTACT INFORMATION]

IDENTIFICATION SIGN (Typical)

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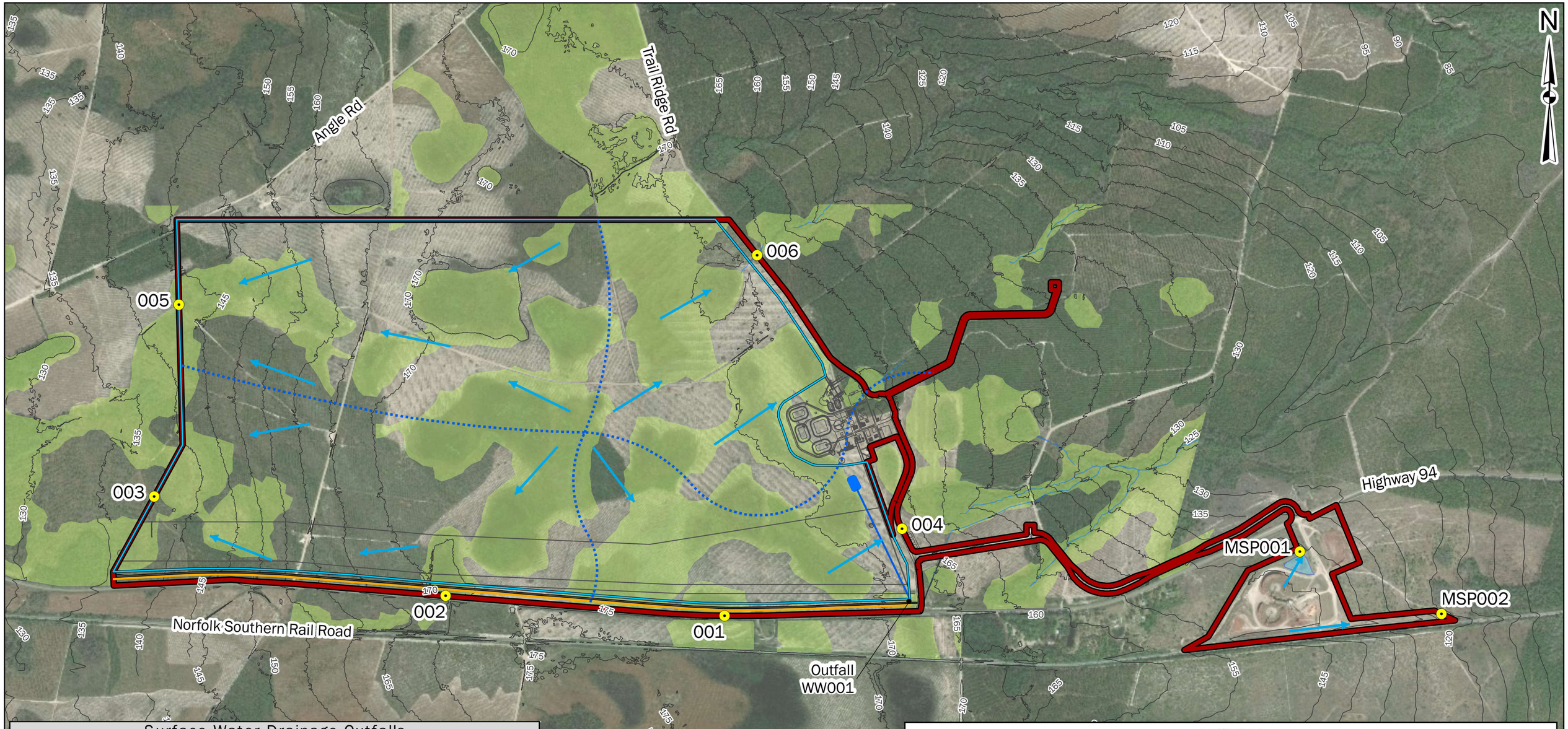
FIGURE 7D: RIP-RAP DETAILS & EROSIONAL CONTROL NOTES

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA



Surface Water Drainage Outfalls					
ID	Latitude	Longitude	ID	Latitude	Longitude
001	30.517381	-82.110128	004	30.520431	-82.102924
002	30.518087	-82.121451	005	30.528322	-82.132264
003	30.521581	-82.133267	006	30.530052	-82.108792
MSP001	30.519618	-82.086782	MSP002	30.517430	-82.081036

Wastewater Outfall		
ID	Latitude	Longitude
WW001	30.517976	-82.102609

LEGEND

- Project Permit Area (1,041± AC)
- Proposed Mining Area (898± AC)
- 20' Wide Access Road
- Proposed Safety Berm
- Treatment Basin & Open Channel
- 5 ft Elevation Contour
- Drainage Divide
- Flow Direction
- Drainage Outfalls
- USACE Verified Wetland
- USACE Verified Stream
- Stormwater Pond

0 1,200 Feet

TTL

FIGURE 8: EXISTING DRAINAGE PATTERNS & OUTFALLS

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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APPROX. SCALE: 1 in = 600 ft

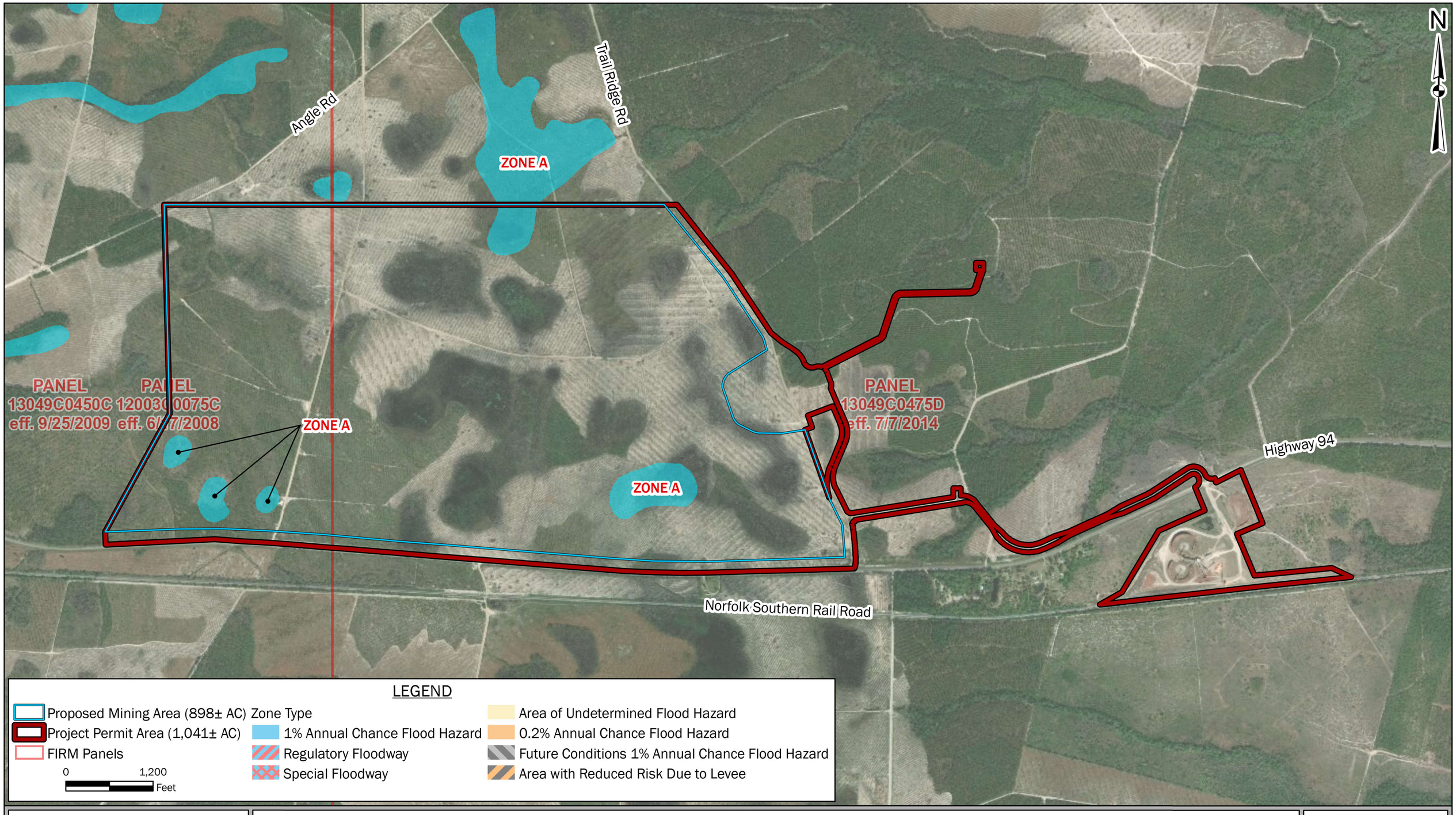

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FIGURE 9: FEMA FLOOD HAZARD & FIRM PANEL MAP

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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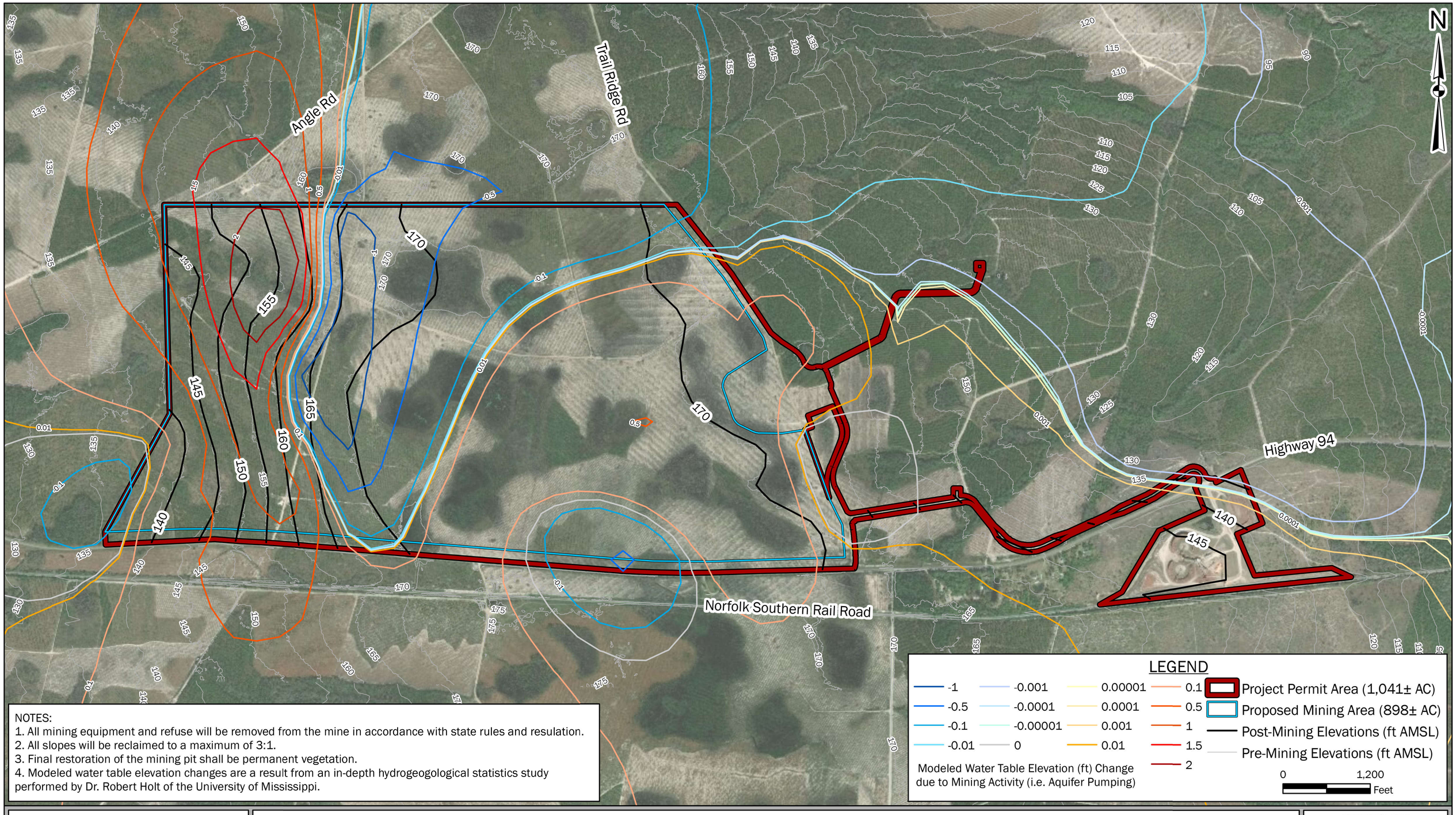

NOTES:
1. All mining equipment and refuse will be removed from the mine in accordance with state rules and resulation.
2. All slopes will be reclaimed to a maximum of 3:1.
3. Final restoration of the mining pit shall be permanent vegetation.
4. Modeled water table elevation changes are a result from an in-depth hydrogeogological statistics study performed by Dr. Robert Holt of the University of Mississippi.

LEGEND

-1	-0.001	0.00001	0.1
-0.5	-0.0001	0.0001	0.5
-0.1	-0.00001	0.001	1
-0.01	0	0.01	1.5
			2

Modeled Water Table Elevation (ft) Change due to Mining Activity (i.e. Aquifer Pumping)

- Project Permit Area (1,041± AC)
- Proposed Mining Area (898± AC)
- Post-Mining Elevations (ft AMSL)
- Pre-Mining Elevations (ft AMSL)

0 1,200 Feet

TTL

FIGURE 10: POST-MINING RESTORATION PLAN & MODELED WATER TABLE ELEVATION CHANGE

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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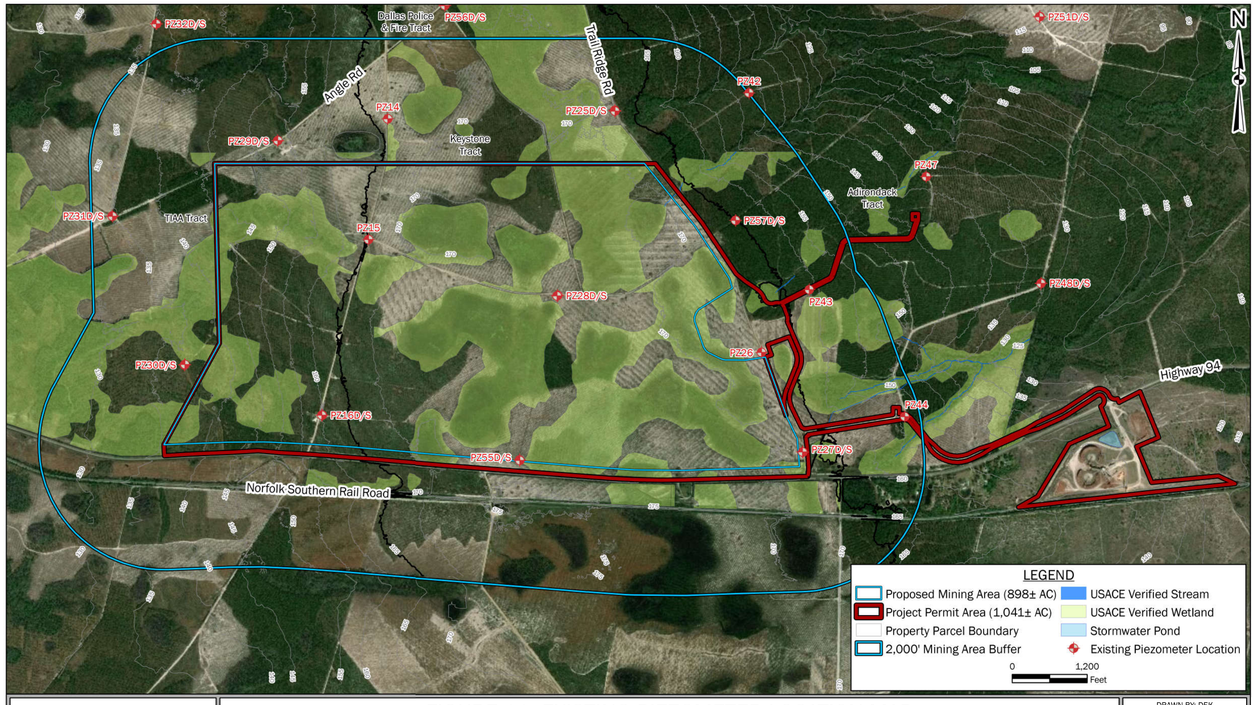

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FIGURE 11: EXISTING PIEZOMETER LOCATION MAP

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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APPROX. SCALE:	1 in = 1,200 ft

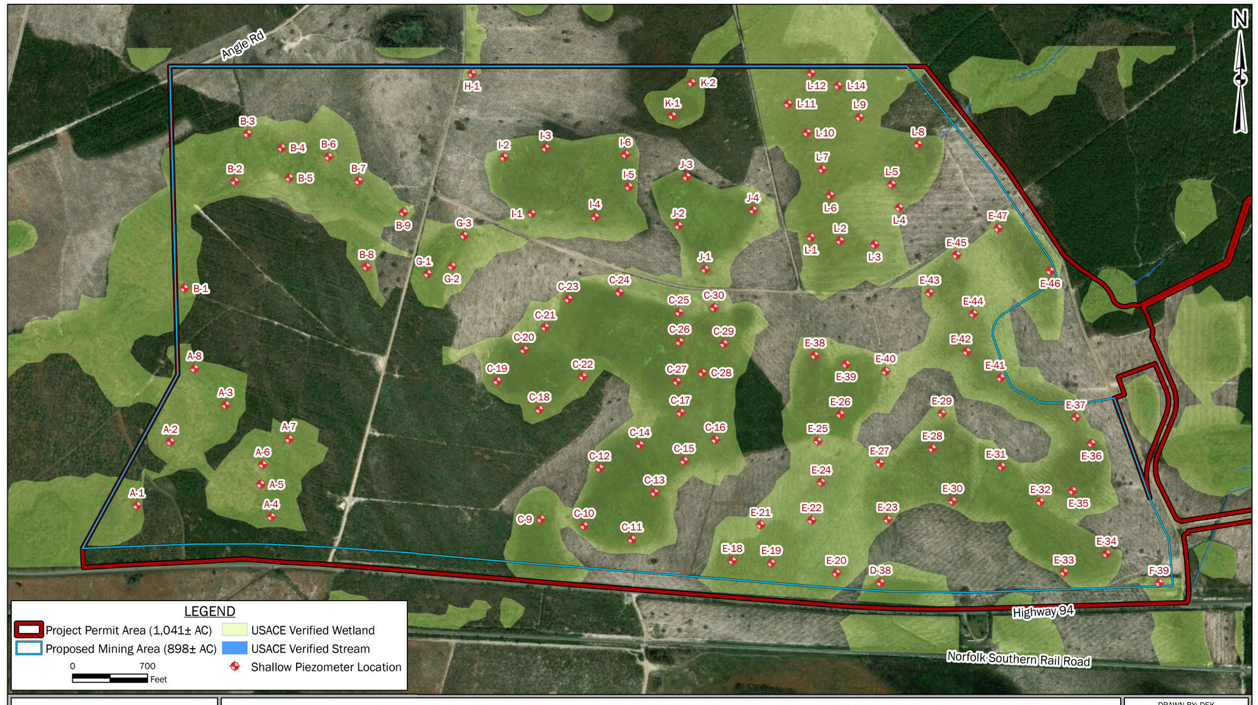

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FIGURE 12: EXISTING SHALLOW "WETLANDS" PIEZOMETER LOCATION MAP

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

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APPROX. SCALE:	1 in = 700 ft

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FIGURE 13: STAFF GAUGE LOCATION MAP

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution).

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APPROX. SCALE:	1 in = 3,000 ft

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FIGURE 14: RAIN GAUGE LOCATION MAP

TWIN PINES MINERALS

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BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution).

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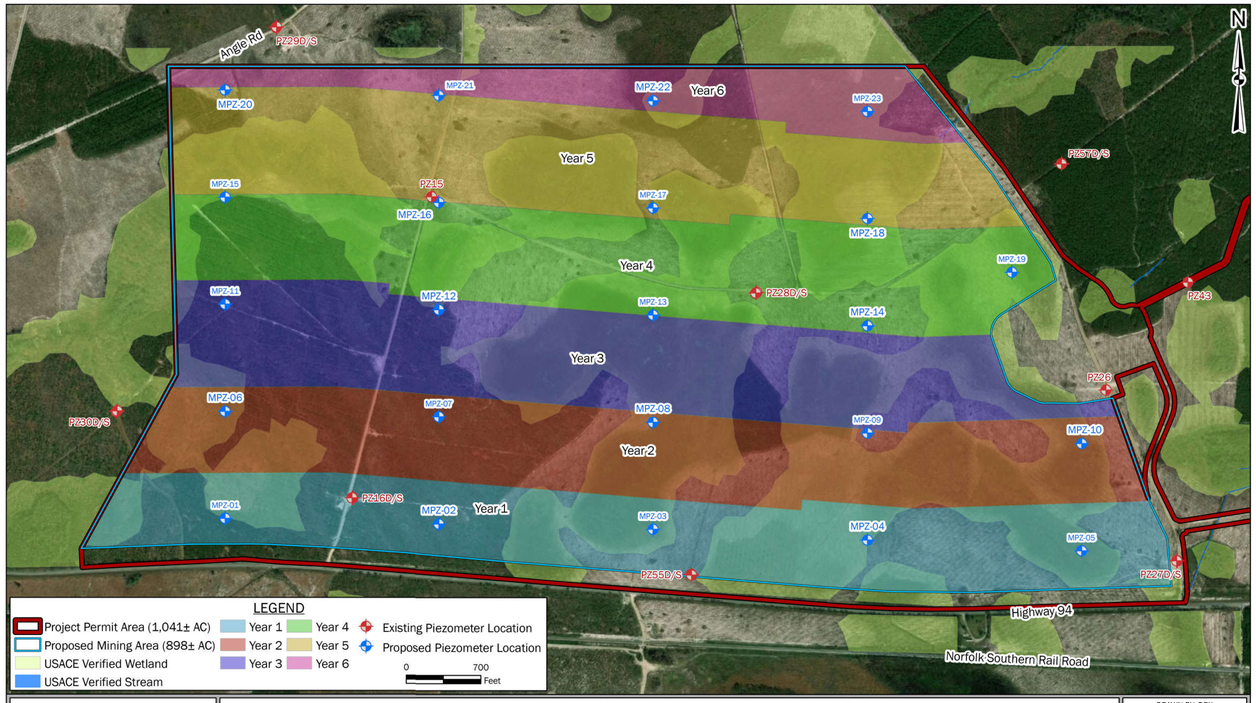
APPROX. SCALE:	1 in = 3,000 ft



TTL

FIGURE 15: PROPOSED PIEZOMETER LOCATION & ESTIMATED MINING TIMELINE MAP

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution)

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APPROX. SCALE:	1 in = 700 ft

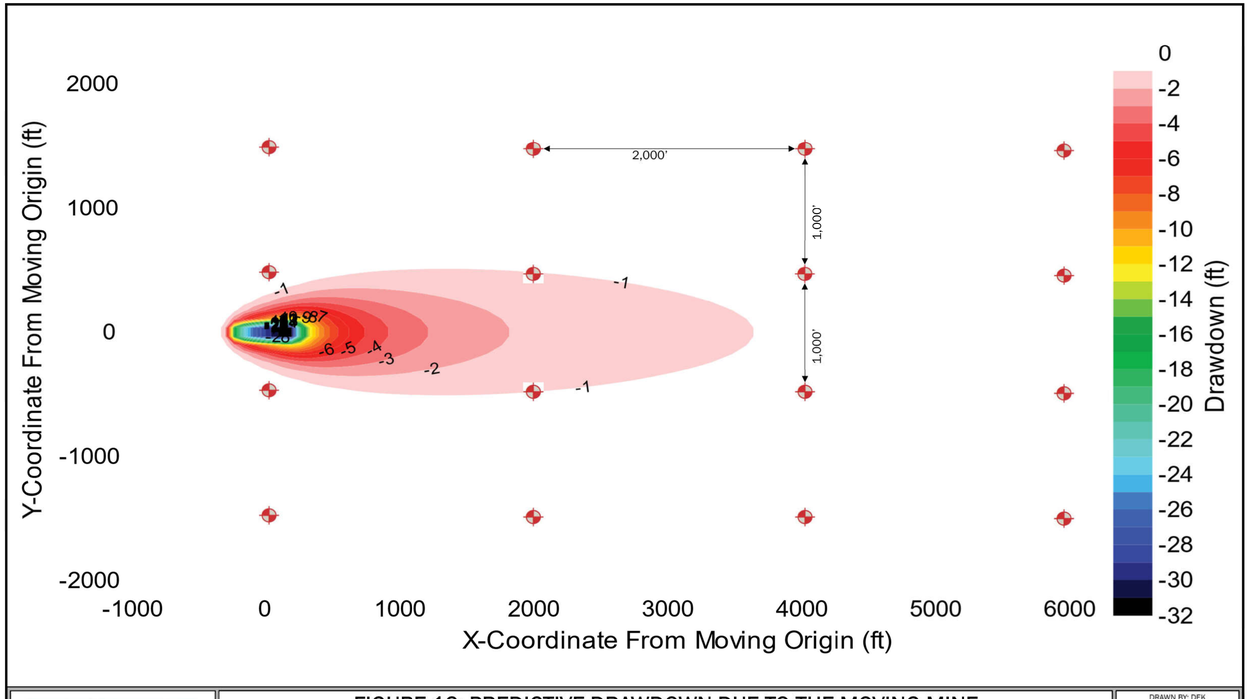

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FIGURE 16: PREDICTIVE DRAWDOWN DUE TO THE MOVING MINE

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

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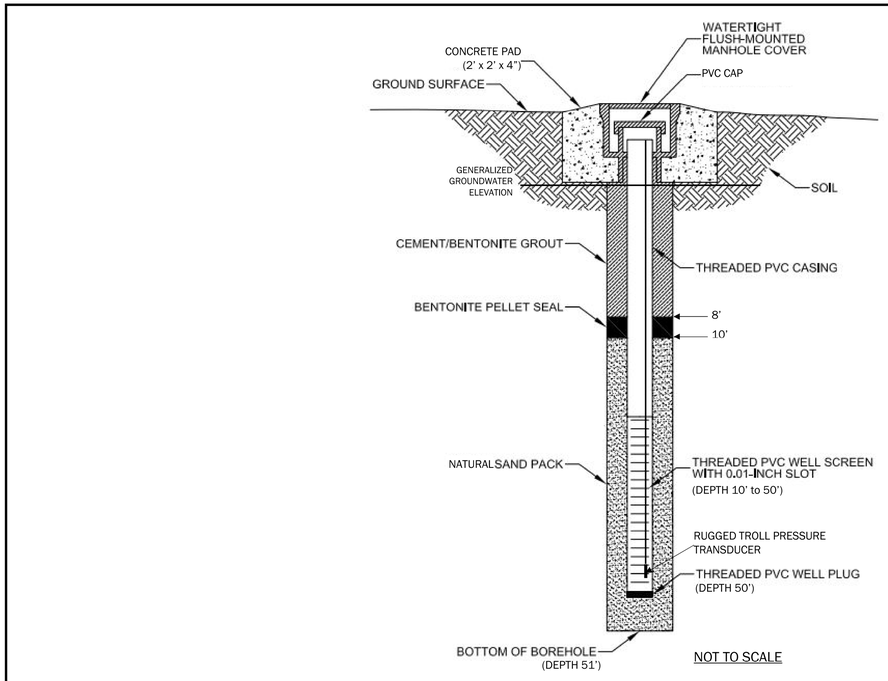

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FIGURE 17: TYPICAL PIEZOMETER CONSTRUCTION DETAIL

TWIN PINES MINERALS

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APPROX. SCALE:	

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FIGURE 18: SURFACE WATER & BACKGROUND WATER-QUALITY MONITORING LOCATIONS

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: DigitalGlobe, 3/24/2018 (0.46 m Resolution).

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APPROX. SCALE:	1 in = 3,000 ft