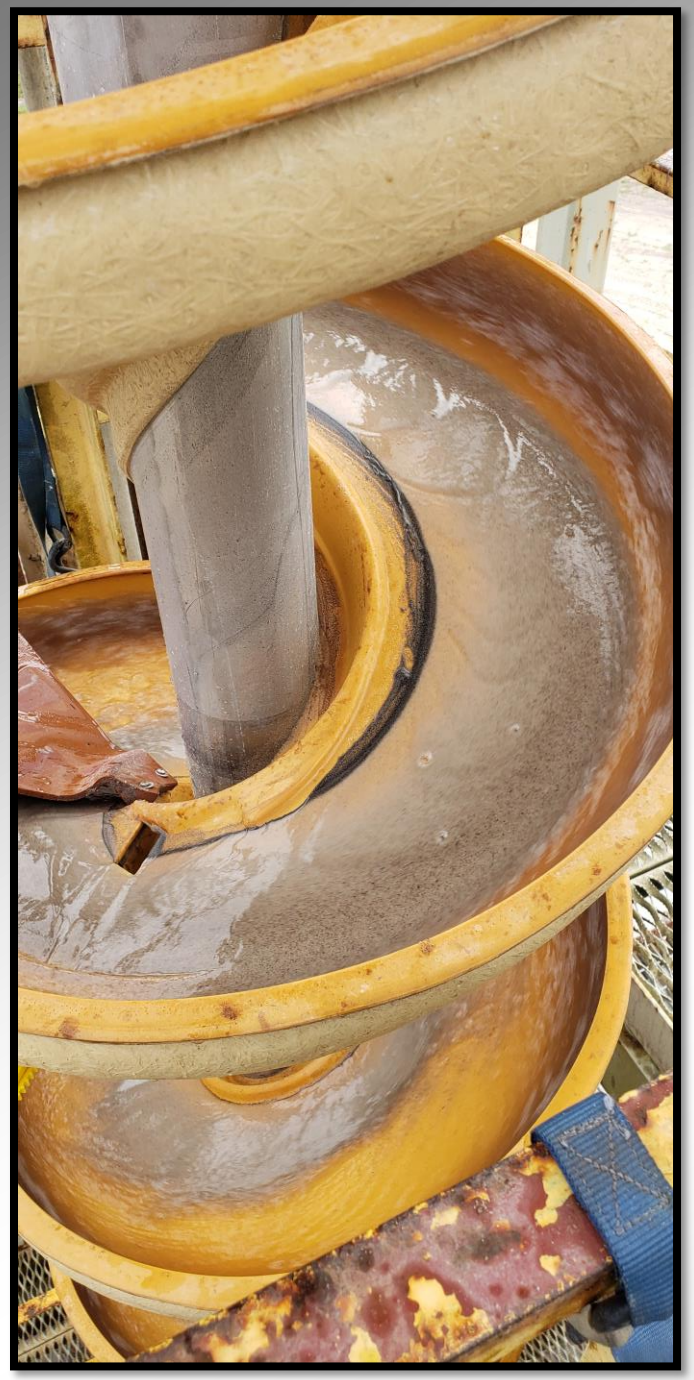
Twin Pines Minerals
Proposed Saunders
Demonstration Mine
SAS-2018-00554



Presentation Outline

- Project Team (C. Stanford – TTL)
- Project History (C. Stanford – TTL)
- Twin Pines Public Outreach (C. Stanford – TTL)
- Project Introduction (C. Stanford – TTL)
- Project Purpose & Need (C. Stanford – TTL)
- Alternative Analysis (C. Stanford – TTL)
- Mining Plan (C. Stanford – TTL)
- Site Activities (C. Terrell – TTL)
- Permitting Impacts (C. Terrell – TTL)
- Mitigation (C. Terrell – TTL)
- Hydrogeology (Dr. Holt – Holt Hydrogeology)
- Geochemistry (Dr. Schroth – Jacobs)

Project Team

Twin Pines Minerals, LLC

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Holt Hydrogeology

corblu ECOLOGY GROUP

Jacobs

Westervelt ECOLOGICAL SERVICES

TERRA-IGNEA ENTERPRISES

CONSERVATION SERVICES BY J.M. KLAUS

TERRAXPLORATIONS

Leading the Future in Recording America's Past

Altamaha Environmental Consulting

TTL Team Members

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Melissa Norris, PG (GA)

Chris Stanford

Subject Matter Experts

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Archaeology
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Botany
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Geochemistry
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Water Quality
Lynn Sisk, PE (AL)

Geochemistry
Brian Schroth, PhD,
PG (CA), C. Hg (CA)

Reclamation/Restoration
Greg Smith

Reclamation/Restoration
Brent Shaver

Reclamation/Restoration
John Wigginton, PhD

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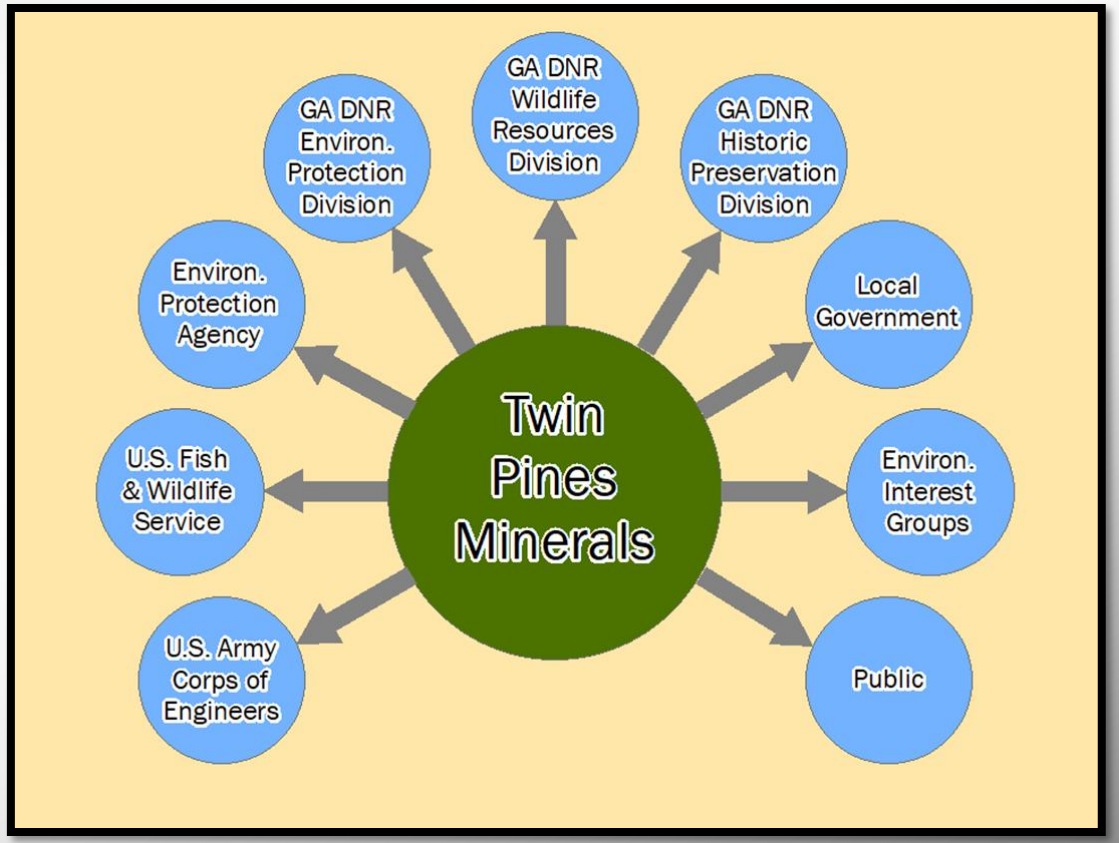
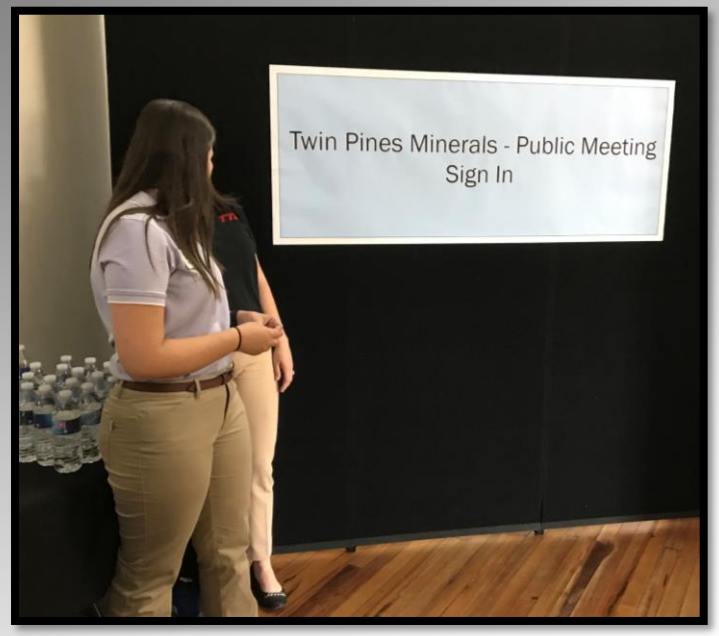
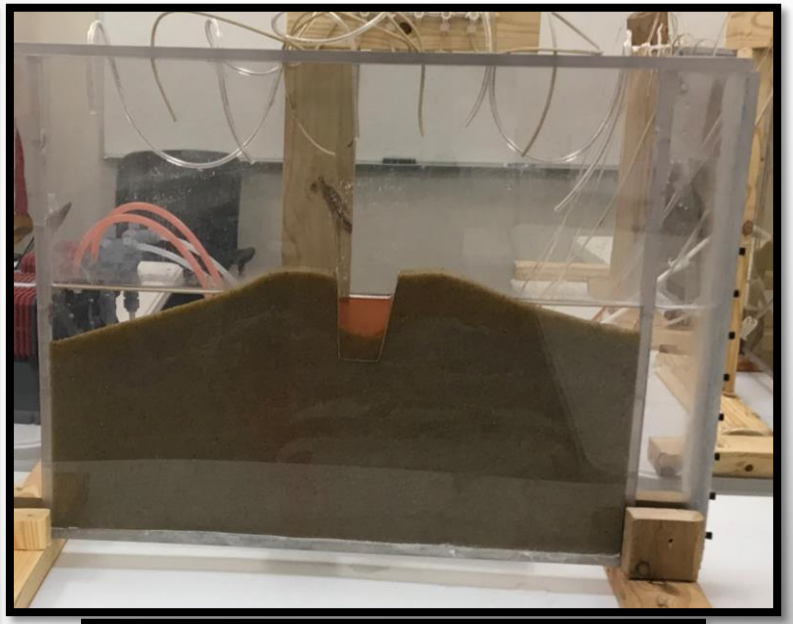
Project History

- Aug 7, 2018: Interagency Review Team
- Dec 13, 2018: Project update meeting with the USACE
- Feb 14, 2019: USACE Pre-Application Meeting
- May 16, 2019: USFWS Meeting
- July 3, 2019: Initial Permit Application Submitted
- July 25, 2019: Multiple Agencies complete site visit
- Aug 13/14, 2019: Twin Pines Public Outreach Events
- Jan 15, 2020: USACE Meeting
- Jan 27, 2020: USACE Meeting
- Jan 28, 2020: Ga EPD Meeting
- Feb 7, 2020: USACE Permit Withdrawal
- March 2, 2020: Ga EPD Meeting
- March 6, 2020: Revised Permit received by the USACE



Twin Pines Public Outreach





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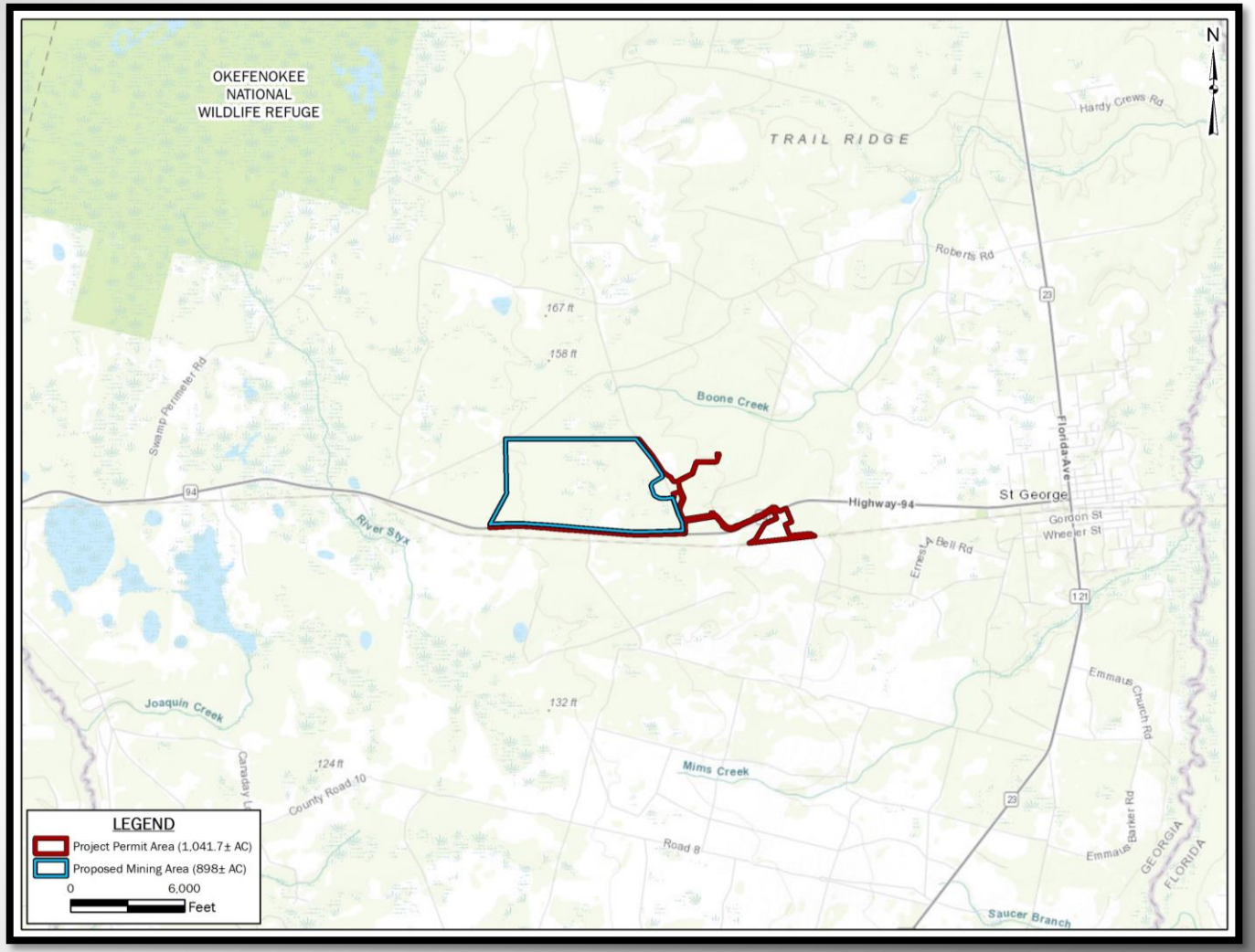
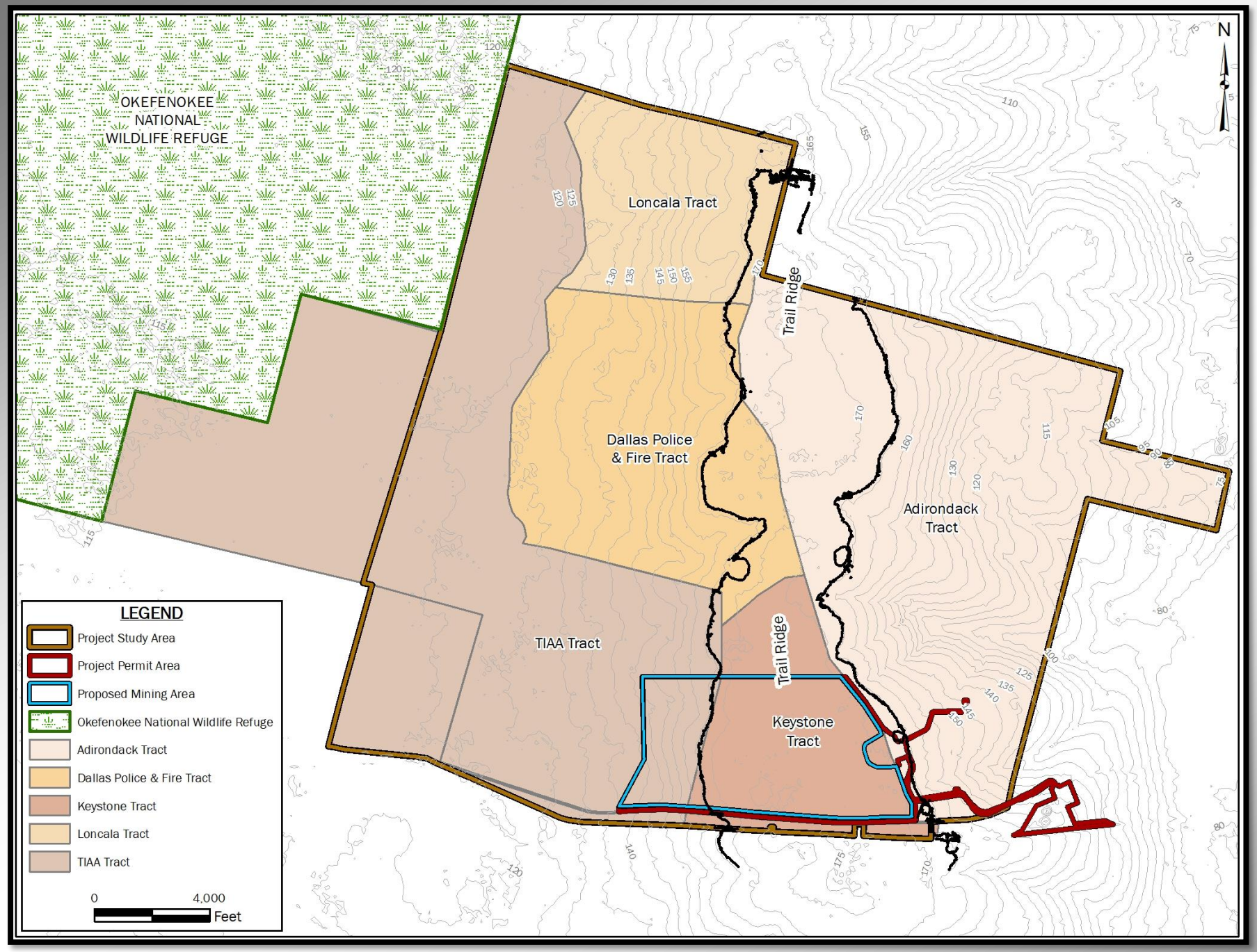
Introduction

Project Introduction

- Heavy Mineral Sand Demonstration Mine
- Located ~3 miles west of St. George, Georgia
- PURPOSE: To demonstrate that heavy mineral sand mining can be conducted in an environmentally responsible manner.
- Used to validate Groundwater Model





Property Map

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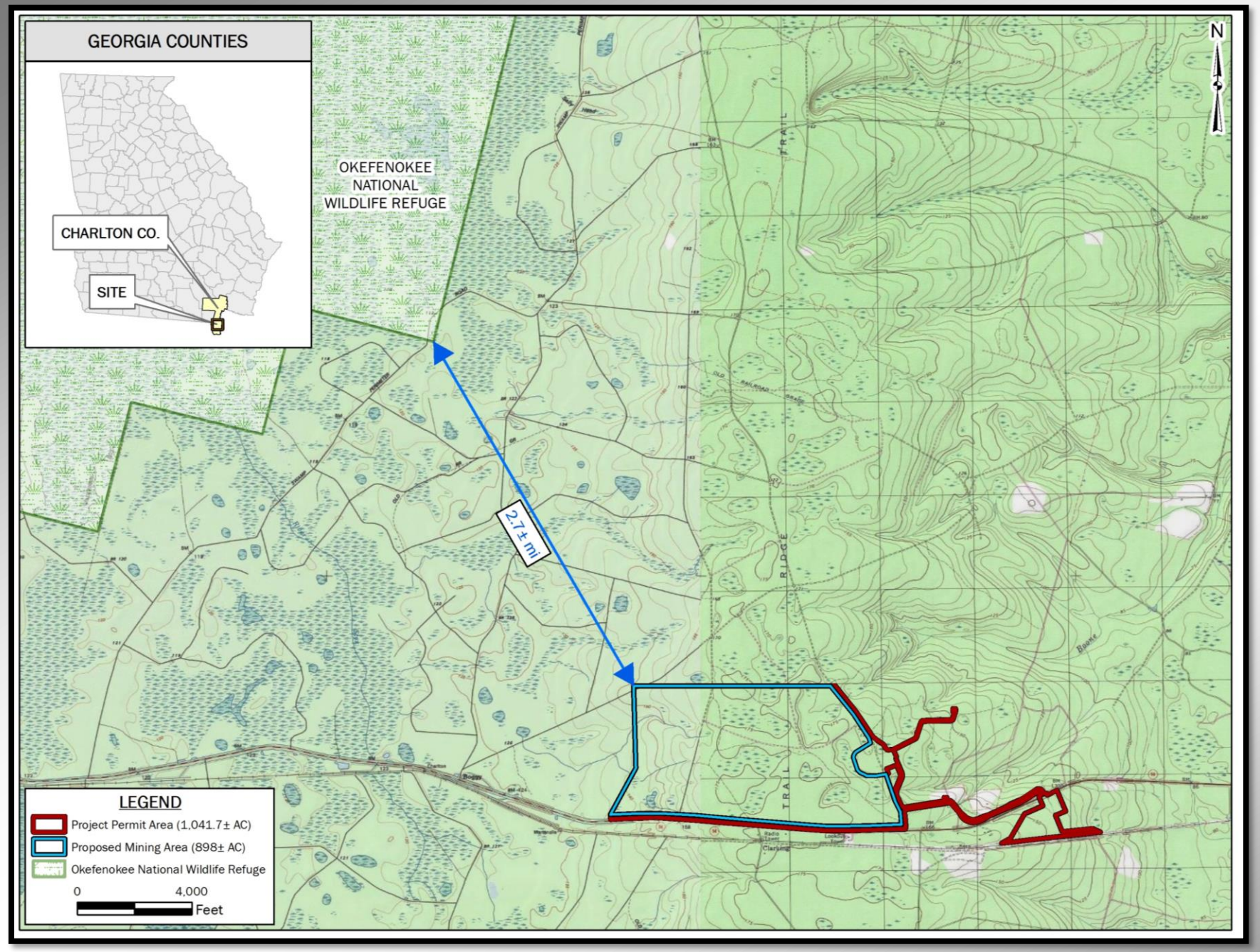

Project Location

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Purpose & Need

Purpose & Need

1 – Gather data required to evaluate the groundwater hydrology model completed on the selected site.

2 – Demonstrate that heavy mineral sand mining can be accomplished in an environmentally sensitive area with negligible impact

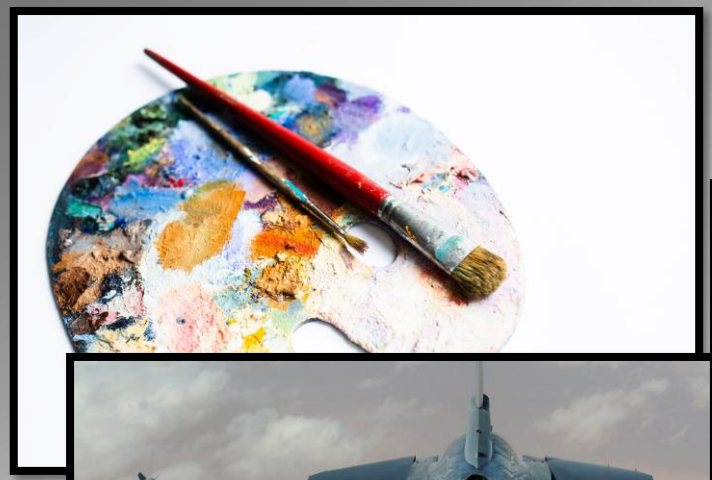
3 – Develop a high-quality heavy mineral sand reserve to produce heavy mineral sand (titanium and zircon) concentrate products

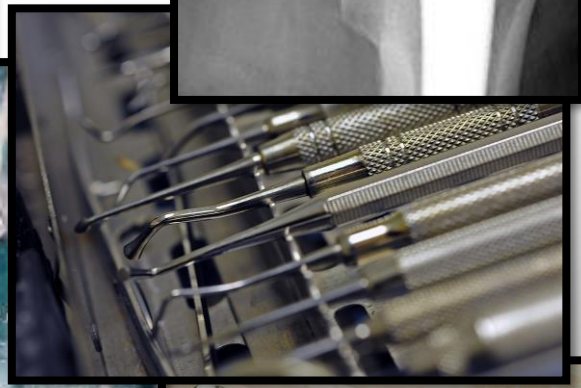
Executive Order 13817

A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals

- “Reduce the Nation’s vulnerability to disruptions in the supply of critical minerals, which constitutes a strategic vulnerability for the security and prosperity of the United States”
- “Final List of Critical Minerals” published by the Dept. of Interior May 18, 2018
  - Includes titanium and zirconium

Uses of Titanium





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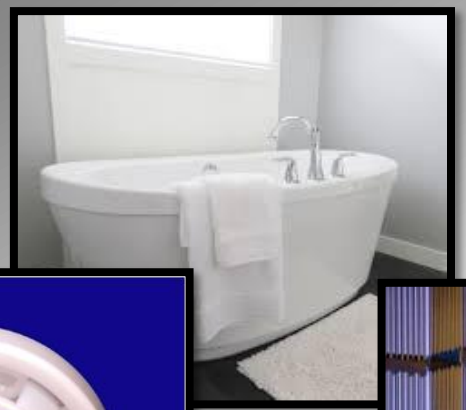
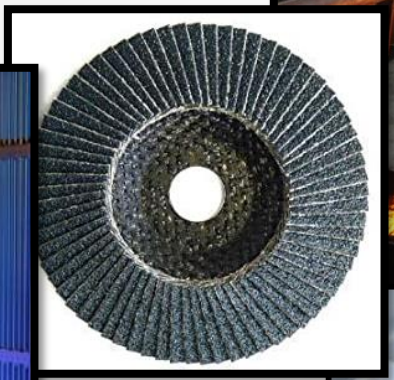
Uses of Zircon








Source: Zircon Industry Association. 2019

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Alternatives Analysis

Alternative Analysis

Alternative Criteria

- Must satisfy purpose & need
- Technologically and economically reasonable
- Must be within Atlantic Coastal Plain (southeast Georgia/northwest Florida)
- Rail Accessible
- Minimal Environmental Impacts

Alternative Screening Process

- Evaluate Alternate Locations
- Evaluate Alternate Mining Methods
  - Truck & Shovel
  - Floating Dredge
  - Dragline

Geology Of Heavy Mineral Sands

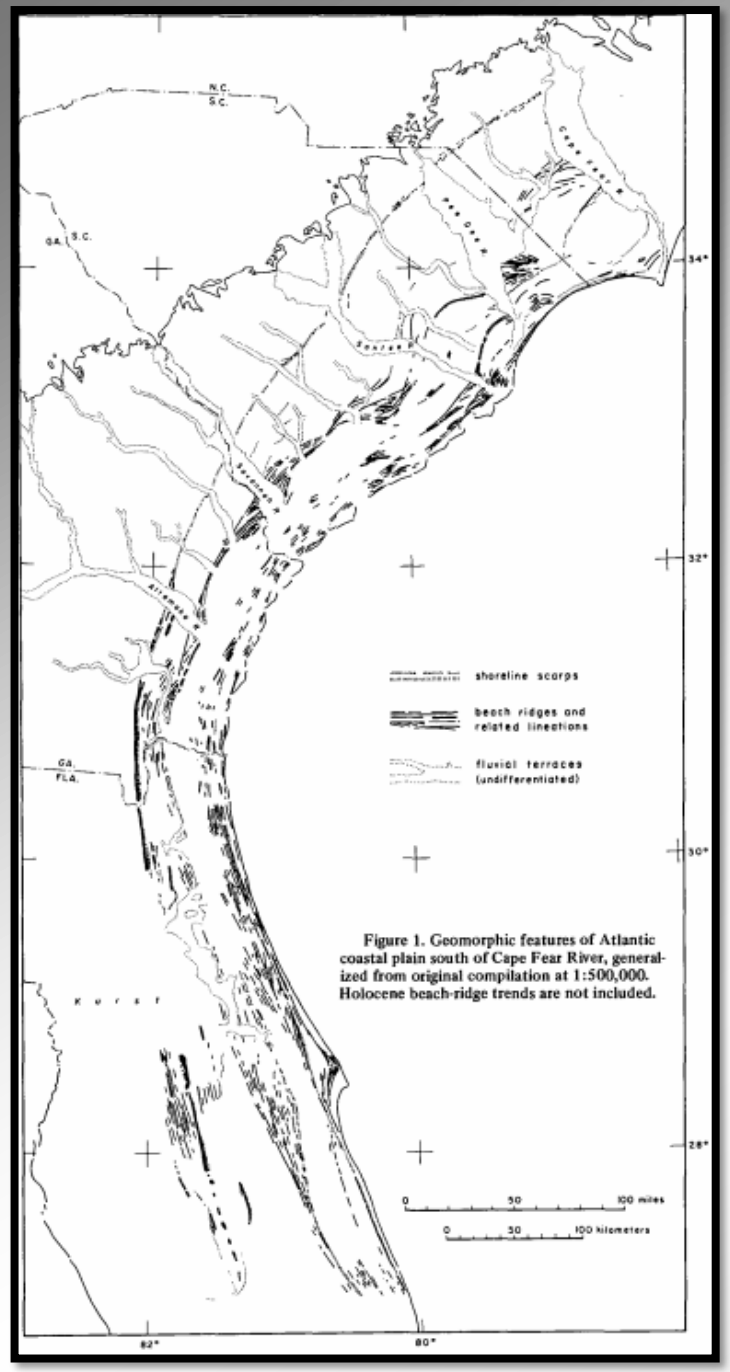
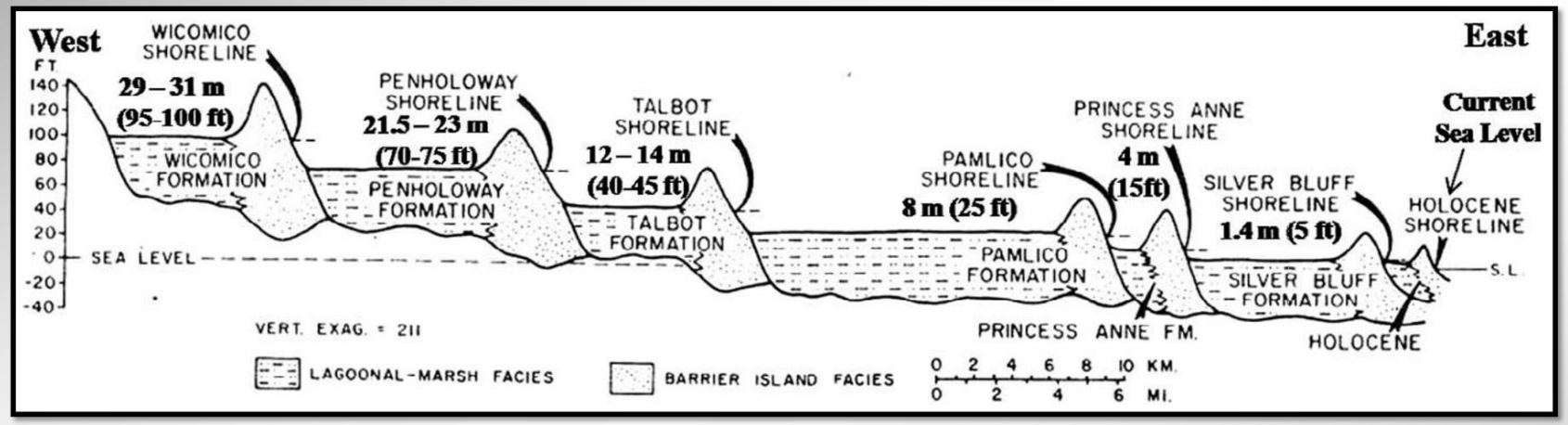


Figure 1. Geomorphic features of Atlantic coastal plain south of Cape Fear River, generalized from original compilation at 1:500,000. Holocene beach-ridge trends are not included.



Source: Winkler & Howard, 1976; Pirkle, Pirkle & Rich, 2013

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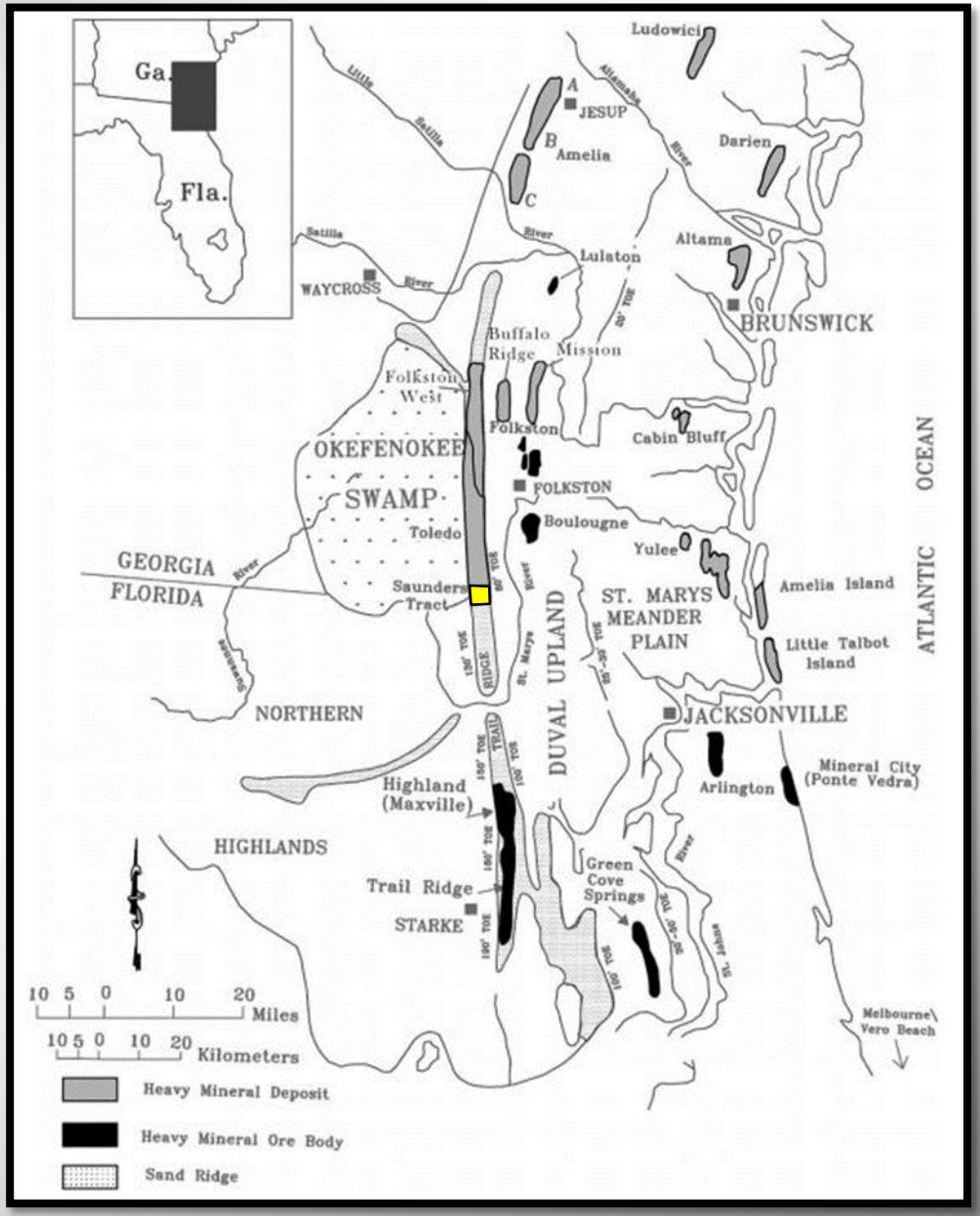
Heavy Mineral Deposits

Active Mining Deposits

- Trail Ridge/Highland/Maxville
- Amelia
- Mission Deposit

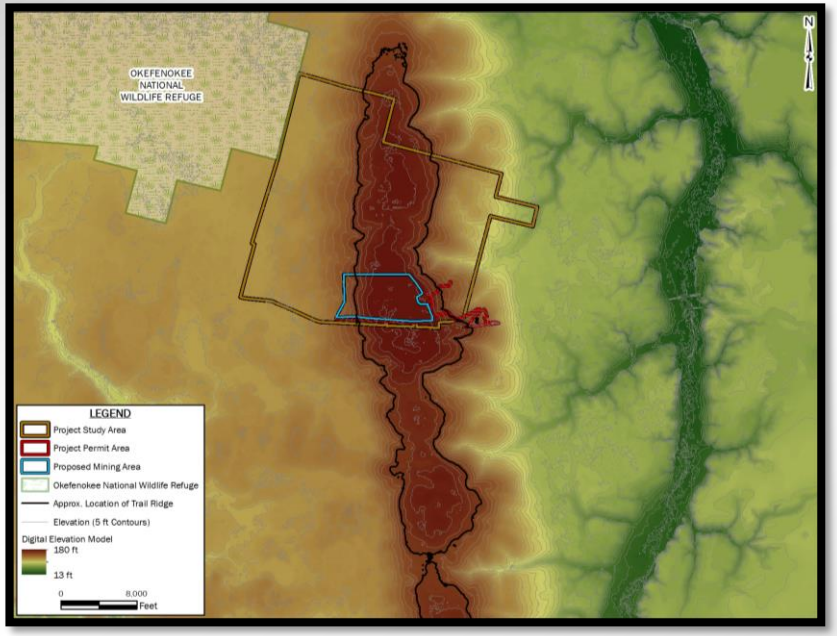
Proposed Mining Deposit

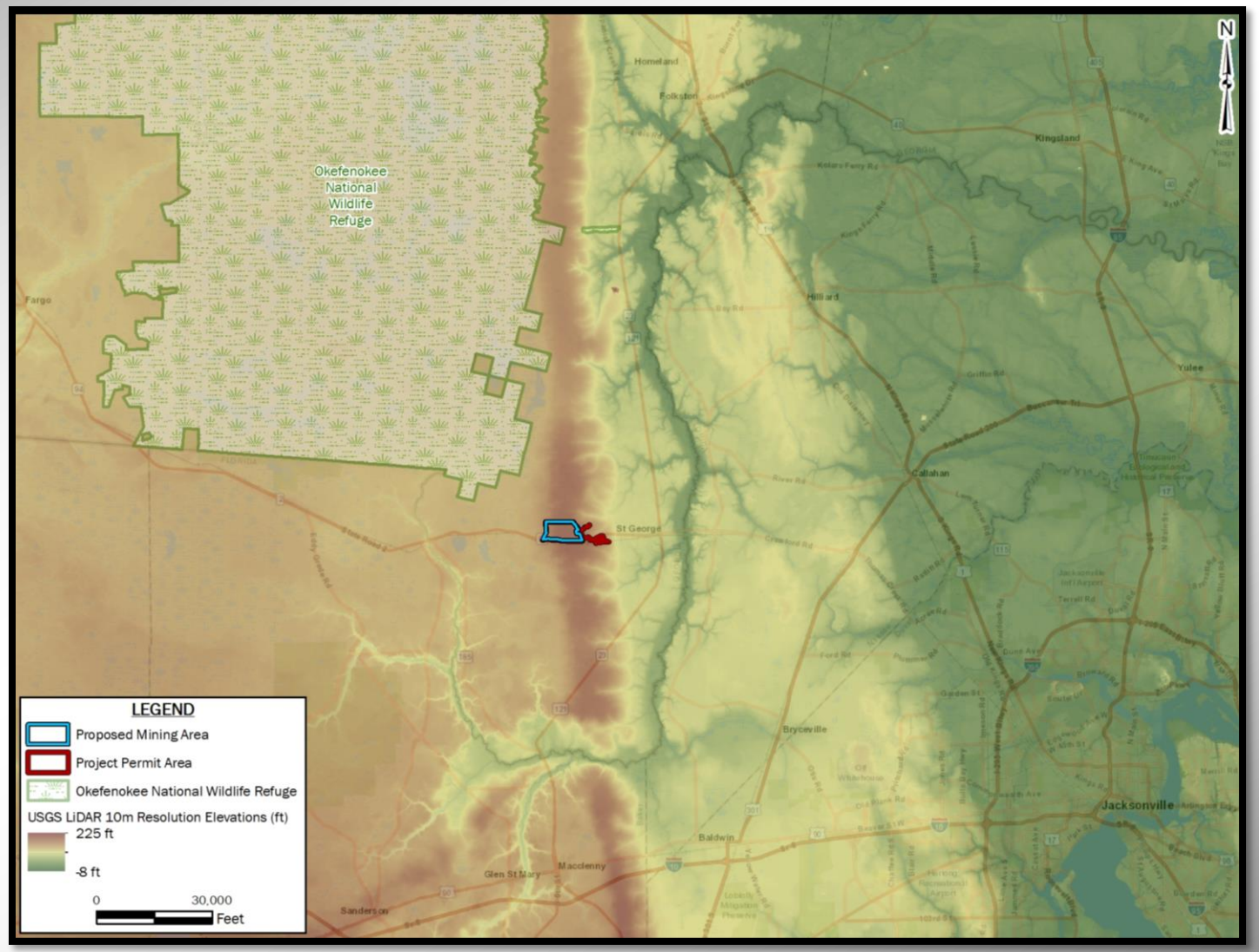
- Saunders Deposit



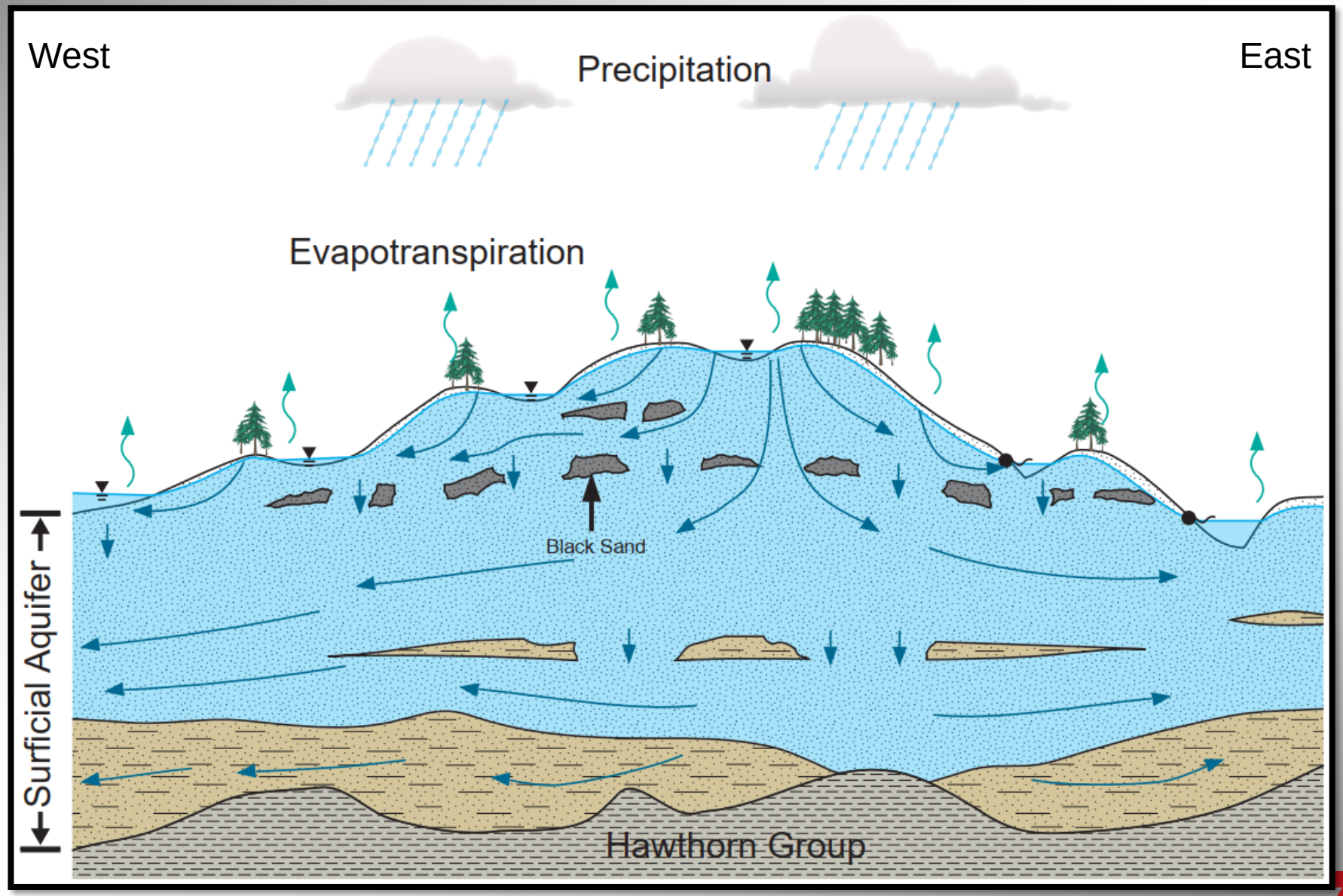
Trail Ridge

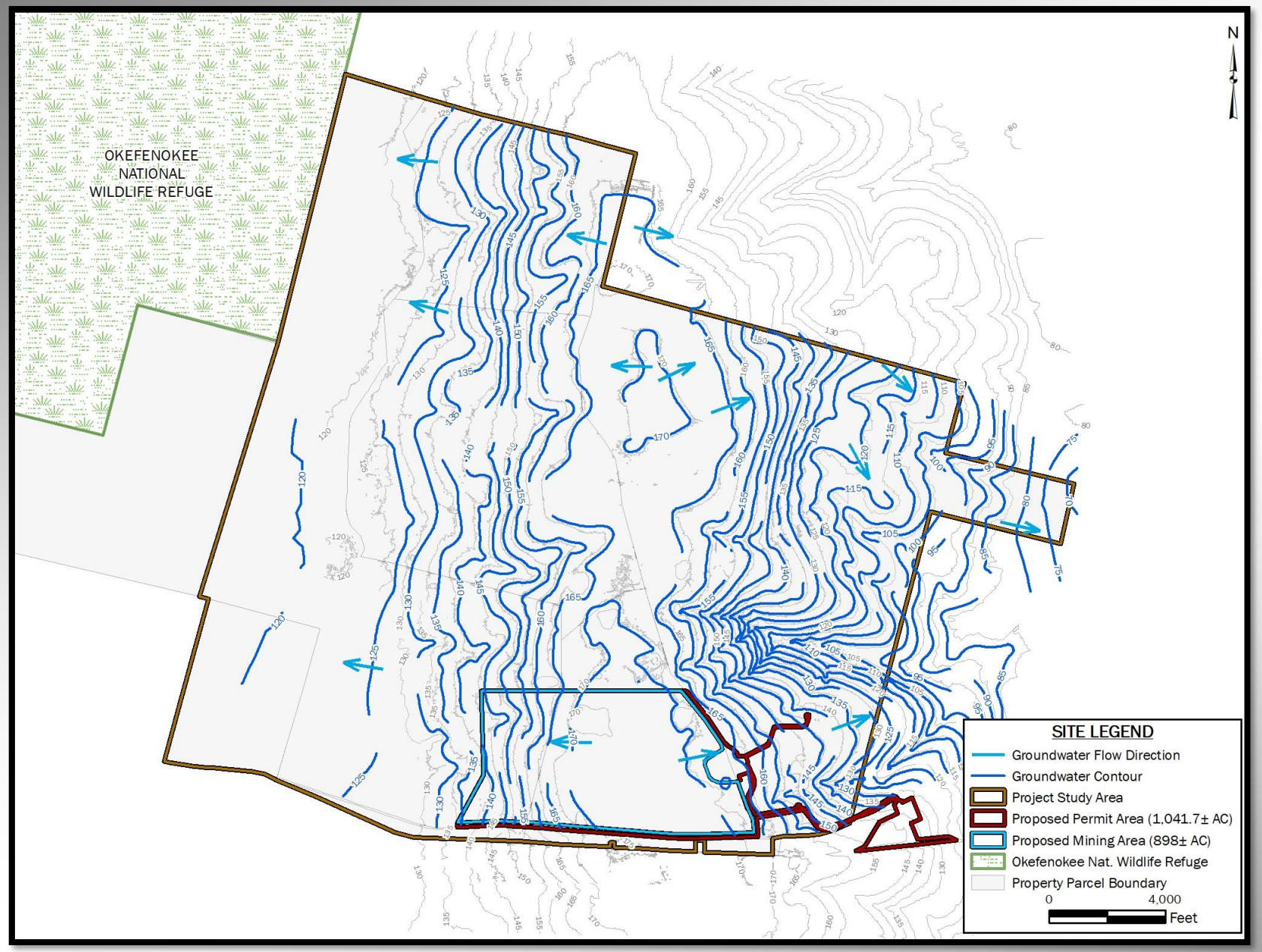
- 1 mile wide
- 100 miles long
- Former beach complex





Conceptual Hydrogeologic Model





Water Level Map

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Alternative Analysis Mining Methodology

MINING METHODOLOGY
Truck & Shovel

- Utilize mobile heavy equipment to mine
- Able to mine down ~20 feet below land surface
- Rim ditch around pit to dewater
- Slimes pumped to separate deposition pit
- Tailings used to backfill the mine pit
- Require large areas of active disturbance

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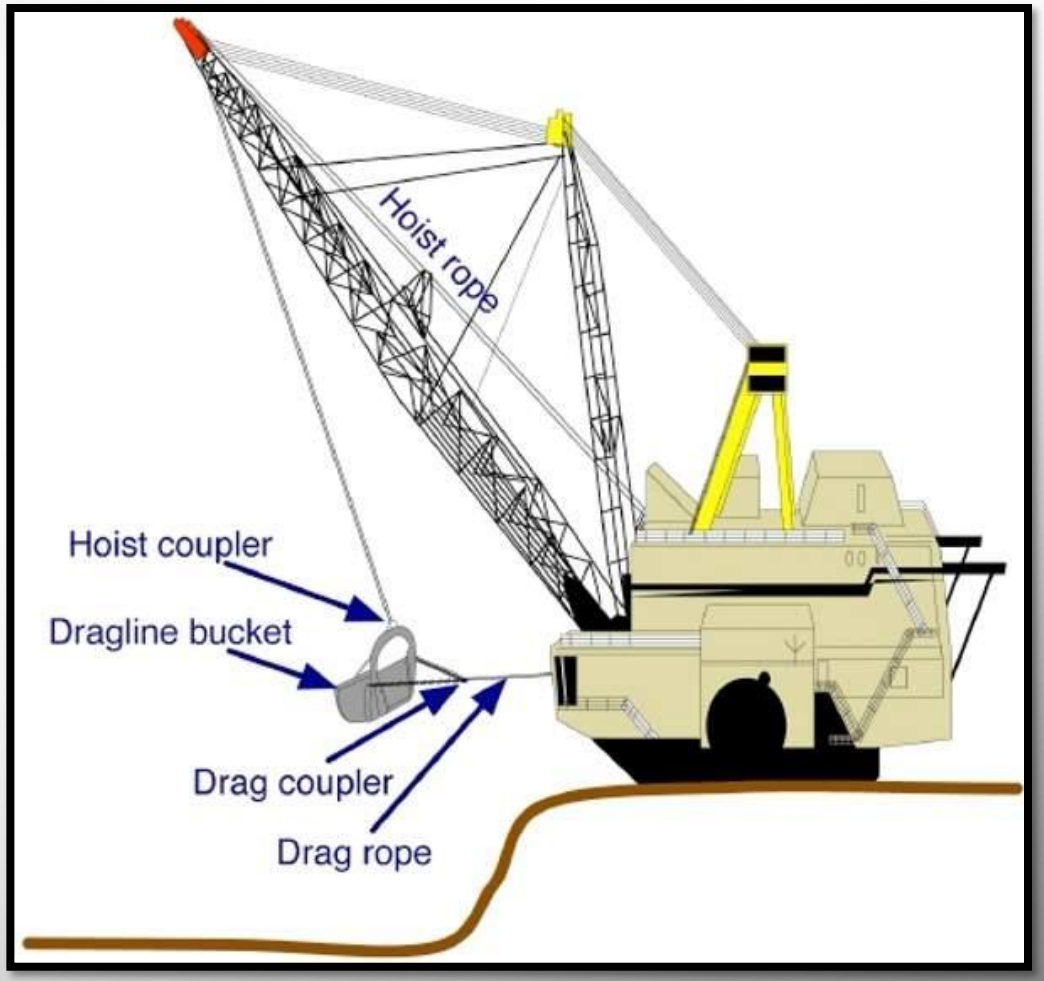
MINING METHODOLOGY
Floating Dredge

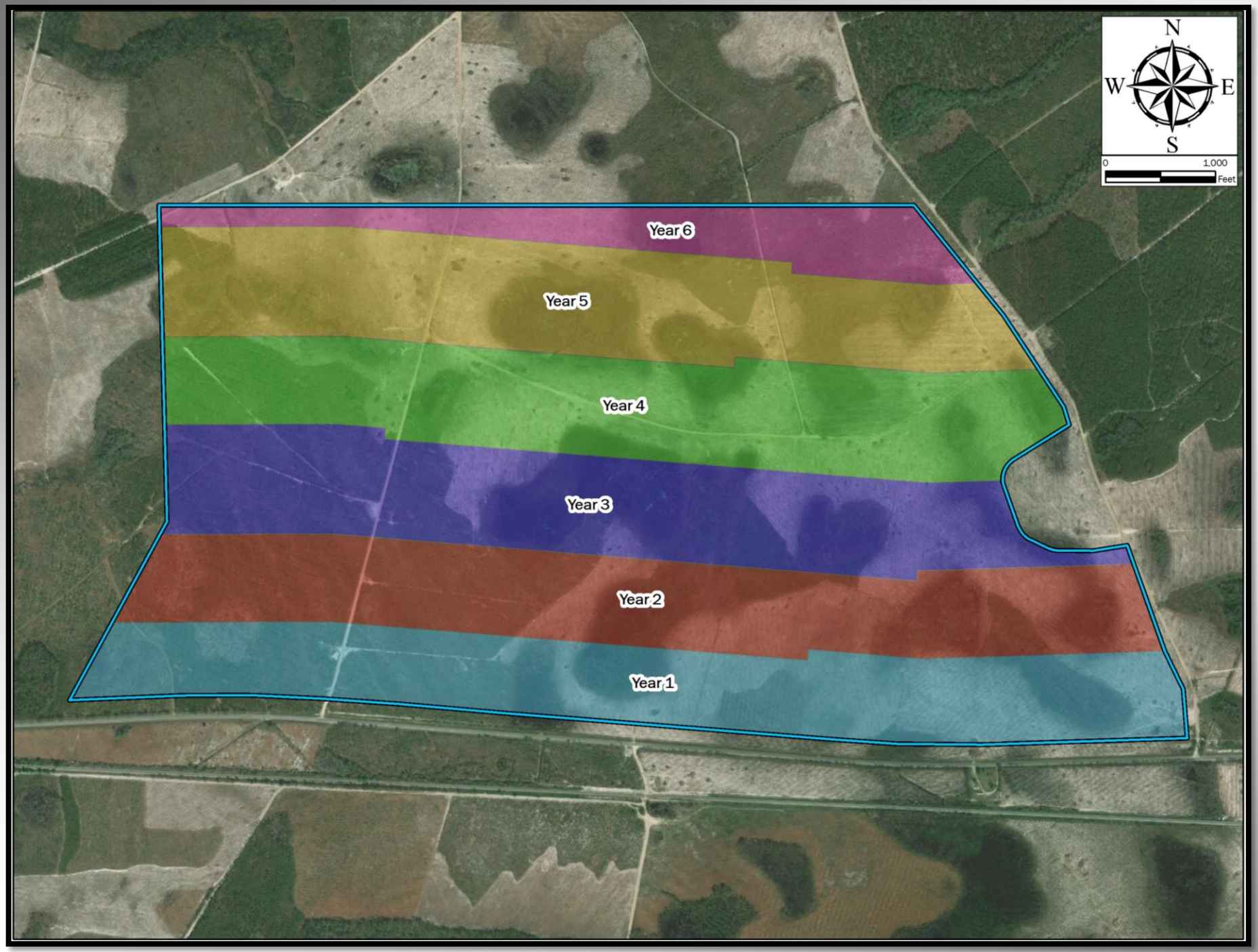
- Utilize floating platform with suction/cutter head
- Able to mine down ~40-50 feet
- Requires pits to be dewatered to reach maximum depths
- Require large open, water filled pits to float the barge
- Long term reclamation (18-30 months)
- Slow – advance 5 feet per day

MINING METHODOLOGY
Dragline Mining

- More efficient excavation
- Simultaneous mining and tailings placement in the same pit
- Reclamation begins within days of mining
- Minimizes water loss



Mining Plan



Mining Progression

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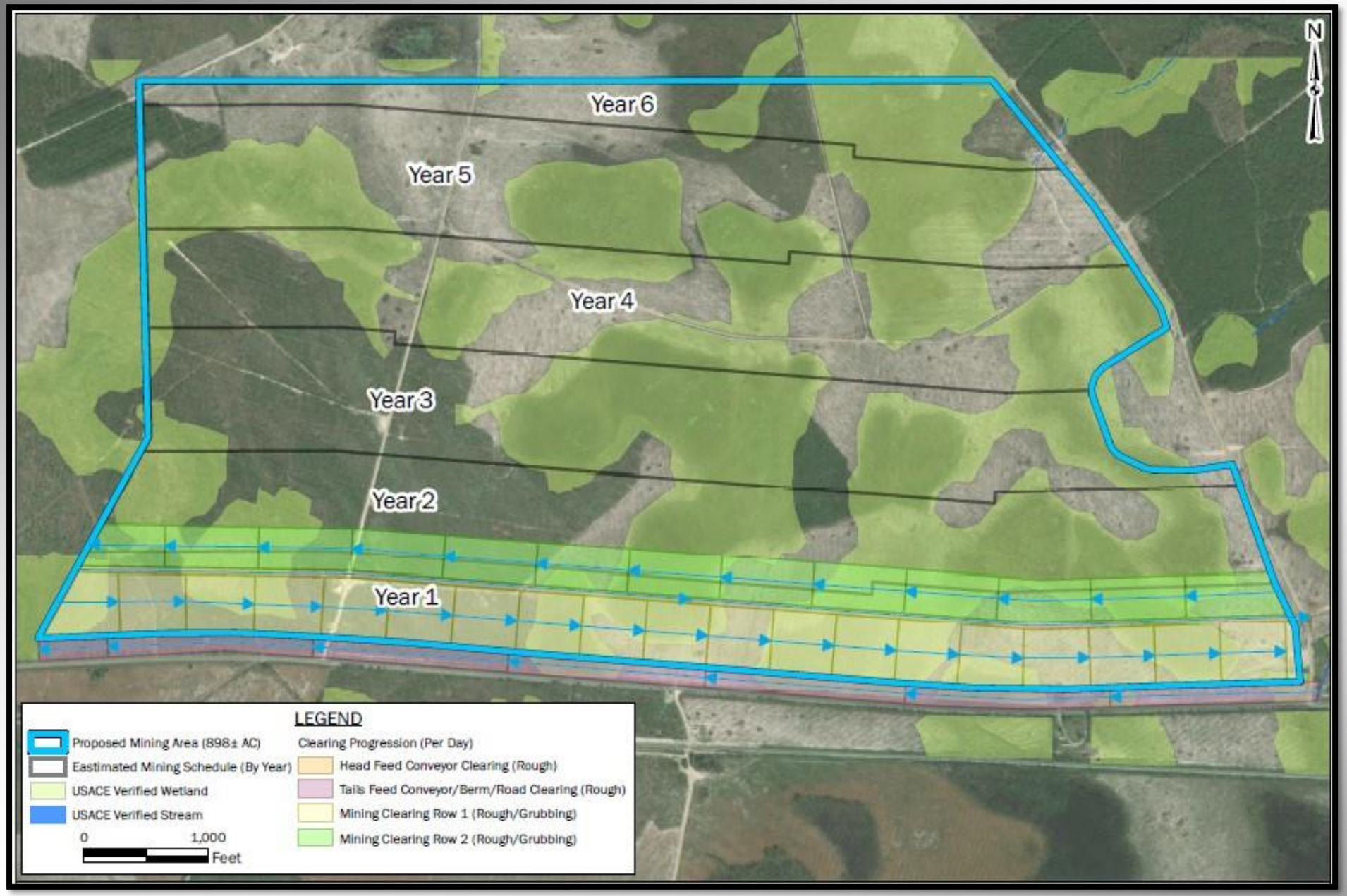

Timing Of Mining

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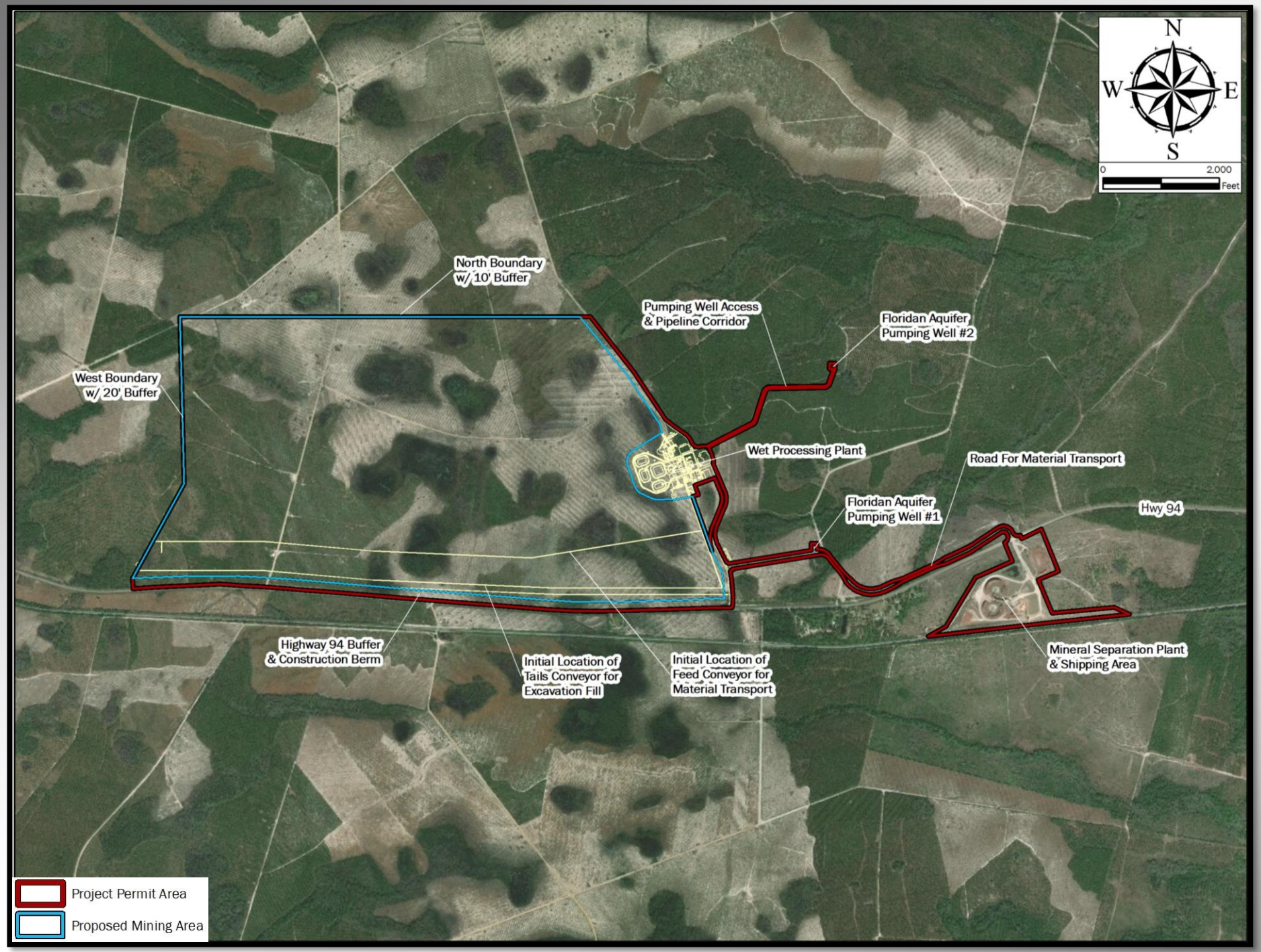

Site Layout Map

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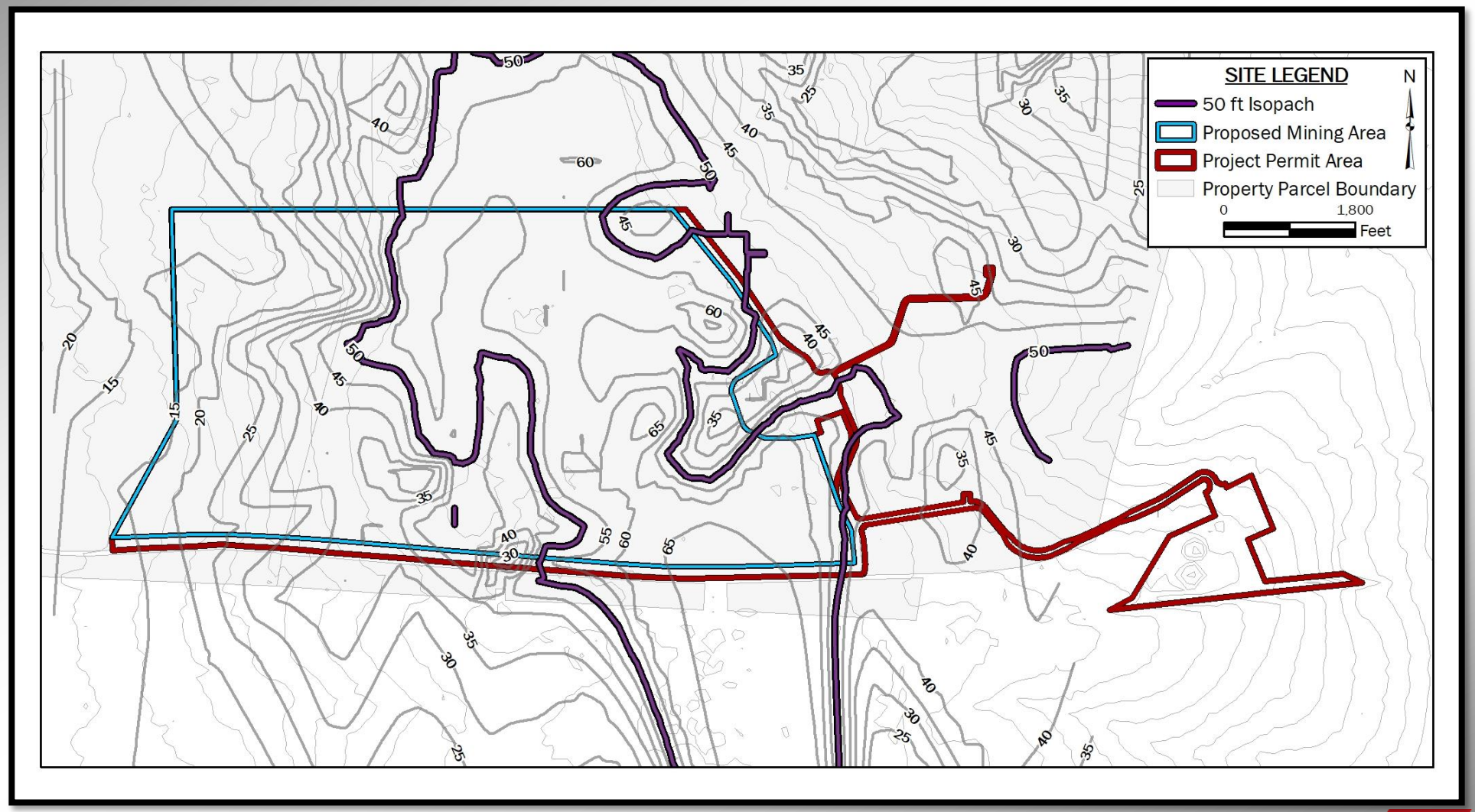
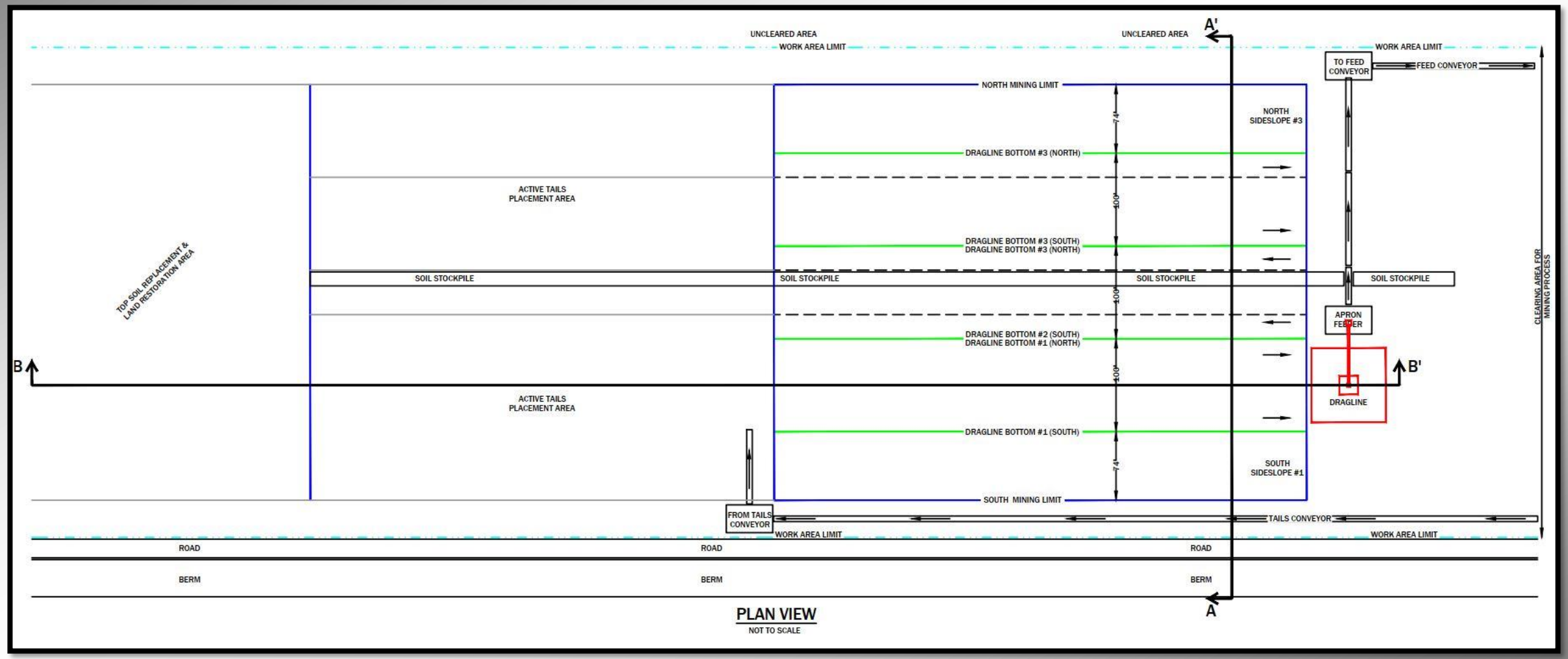
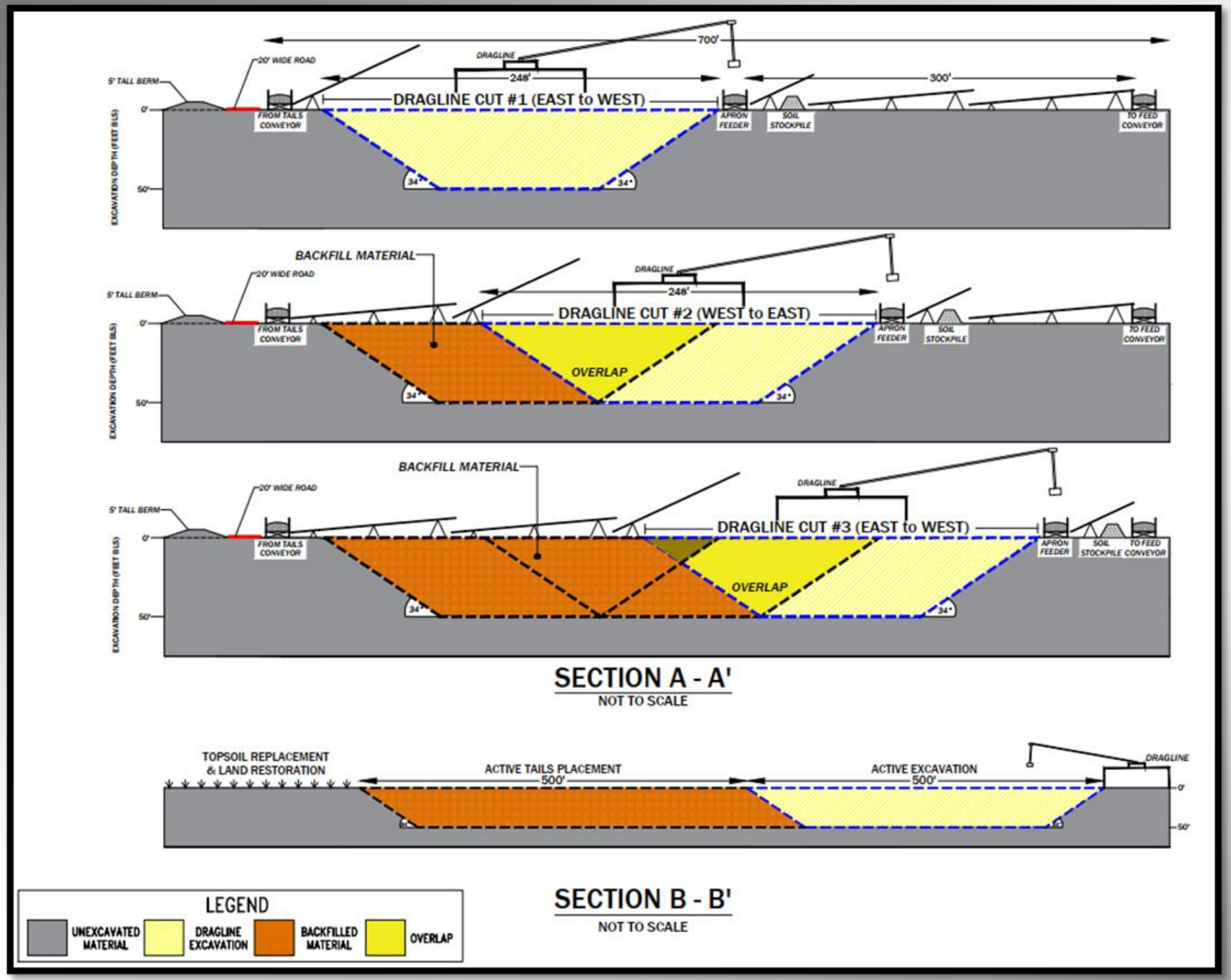
Heavy Minerals Isopach



Typical Dragline Plan View





Typical Dragline Cross-Section

Mining Operations

- Sands will be excavated via dragline
- Pit will be 100 feet wide, 500 ft long, and maximum of 50 feet deep
- The pit will advance at ~ 115 ft/day
- Sands will be placed into a wet processing plant near the point of operations
  - ~98% of mined material is immediately moved back into the pit
  - ~2% sent to dry processing plant to separate product from remaining sands

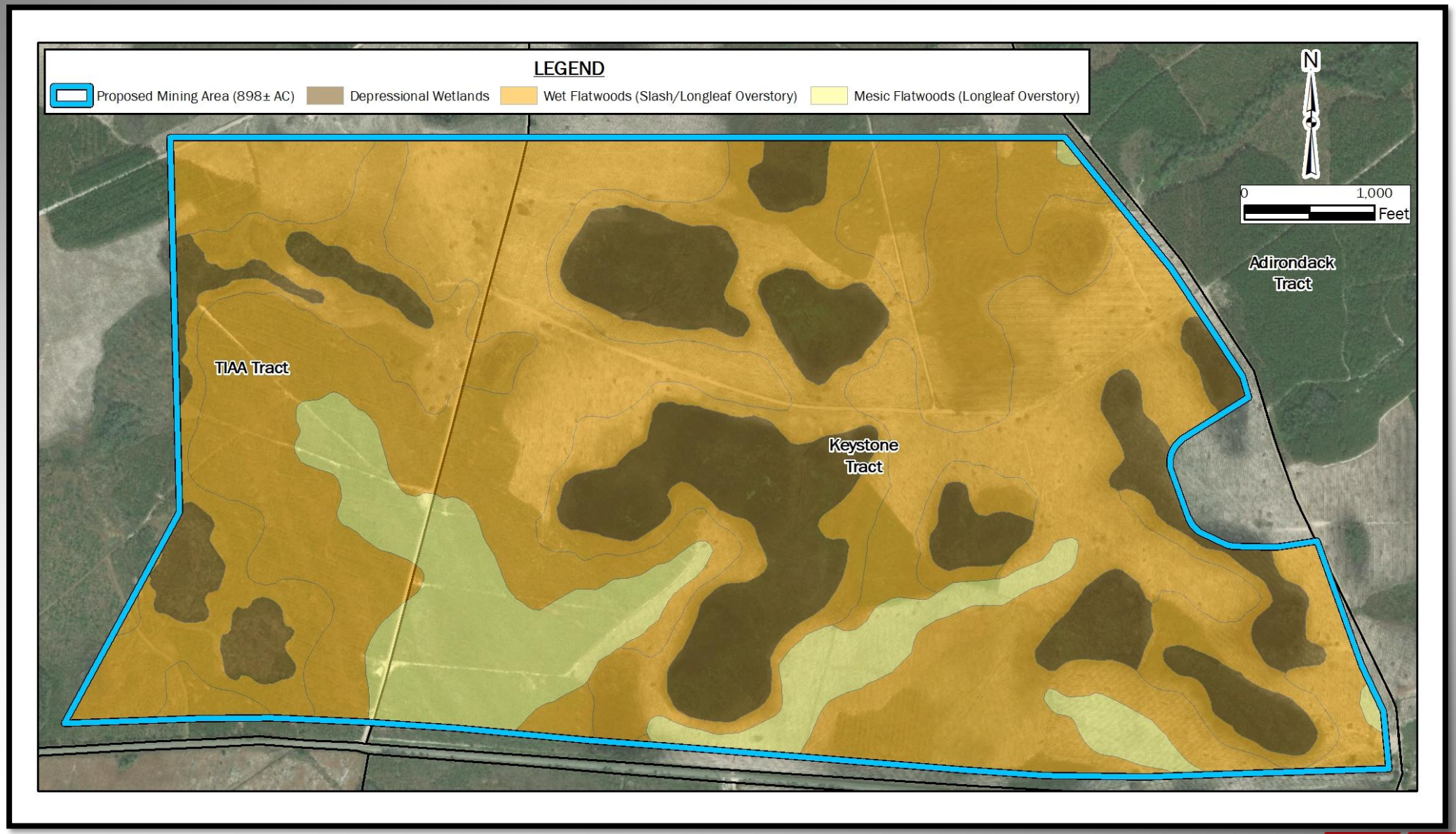
Site Activities

Field Work Completed

- Habitat Characterizations
- Protected Species Surveys
- Cultural Resource Surveys
- Aquatic Resource Delineations
- Hydrogeologic Characterization

Habitat Characterization & Site History

Site/Habitat Characterization




High Altitude View of Proposed Mine

1970 Aerial Photograph

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Protected Species Surveys

Site Specific Flora Surveys

Group	Name	Federal Status	Supporting Habitat in or near the Site
Flowering Plants	Florida hartwrightia (Hartwrightia floridana)	Under Review	Habitat is present. Was not identified on site.
	Flooplain tickseed (Coreopsis integrifolia)	Under Review	Habitat is present. Was not identified on site.
	Purple Honeycomb-head (Balduina atropurpurea	Under Review	Habitat is present. Was not identified on site.

Other Special Concern Species

Group	Name	State Status	Supporting Habitat in or near the Site
Flowering Plants	Dwarf pawpaw (*Asimina pygmea*)	None	Habitat is present. Individuals observed on site.
	Florida orange-grass (*Ctenium floridanum*)	None	Habitat is present. Was not identified on site.
	Green-fly orchid (*Epidendrum magnolia*)	Unusual	Habitat is present. Was not identified on site.
	Southern umbrella-sedge (*Fuirena scirpoidea*)	None	Habitat is present. Individuals observed on site.
	Florida milk-pea (*Galactia floridana*)	None	Habitat is present. Was not identified on site.
	Chapman's skeleton grass (*Gymnopogon chapmanianus*)	None	Habitat is present. Was not identified on site.
	Narrowleaf water-willow (*Justicia angusta*)	None	Habitat is present. Was not identified on site.
	Southern bog-button (*Lachnocaulon beyrichianum*)	None	Habitat is present. Was not identified on site.
	Pond spice (*Litsea aestivalis*)	Rare	Habitat is present. Was not identified on site.
	Odorless bayberry (*Morella inodora*)	Threatened	Habitat is present. Was not identified on site.
	Palafoxia (*Palafoxia integrifolia*)	None	Habitat is present. Was not identified on site.
	Arrow arum (*Peltandra sagittifolia*)	None	Habitat is present. Was not identified on site.
	Pennyroyal (*Piloblephis rigida*)	None	Habitat is present. Was not identified on site.
	Chapman's fringed orchid (*Platanthera chapmanii*)	None	Habitat is present. Was not identified on site.

Group	Name	State Status	Supporting Habitat in or near the Site
Flowering Plants	Yellow fringeless orchid (*Platanthera integra*)	None	Habitat is present. Was not identified on site.
	Wild coco (*Pteroglossaspis ecristata*)	Threatened	Habitat not present.
	Chapman oak (*Quercus chapmanii*)	None	Habitat is present. Was not identified on site.
	Nuttall meadowbeauty (*Rhexia nutallia*)	None	Habitat is present. Individuals observed on site.
	Fernald's beakrush (*Rhynchospora fernaldii*)	None	Habitat is present. Was not identified on site.
	Hooded pitcherplant (*Sarracenia minor* var. *minor*)	Unusual	Habitat is present. Was not identified on site.
	Parrot pitcherplant (*Sarracenia psittacine*)	Threatened	Habitat is present. Individual observed on site.
	White sunnybell (*Schoenolirion albiflorum*)	None	Habitat is present. Was not identified on site.
	S Sandhill skullcap (*Scutellaria arenicola*)	None	Habitat is present. Was not identified on site.
	Florida ladies-tresses (*Spiranthes floridana*)	None	Habitat is present. Was not identified on site.
	Wireleaf dropseed (*Sporobolus teretifolius*)	None	Habitat is present. Was not identified on site.
	Stokes aster (*Stokesia laevis*)	None	Habitat is present. Was not identified on site.
	Sprawling goats' rue (*Tephrosia chrysophylla*)	None	Habitat is present. Was not identified on site.
	Bartram's air-plant (*Tillandsia bartramii*)	None	Habitat is present. Was not identified on site.
	Diverse-leaf crownbeard (*Verbesina heterophylla*)	None	Habitat is present. Was not identified on site.

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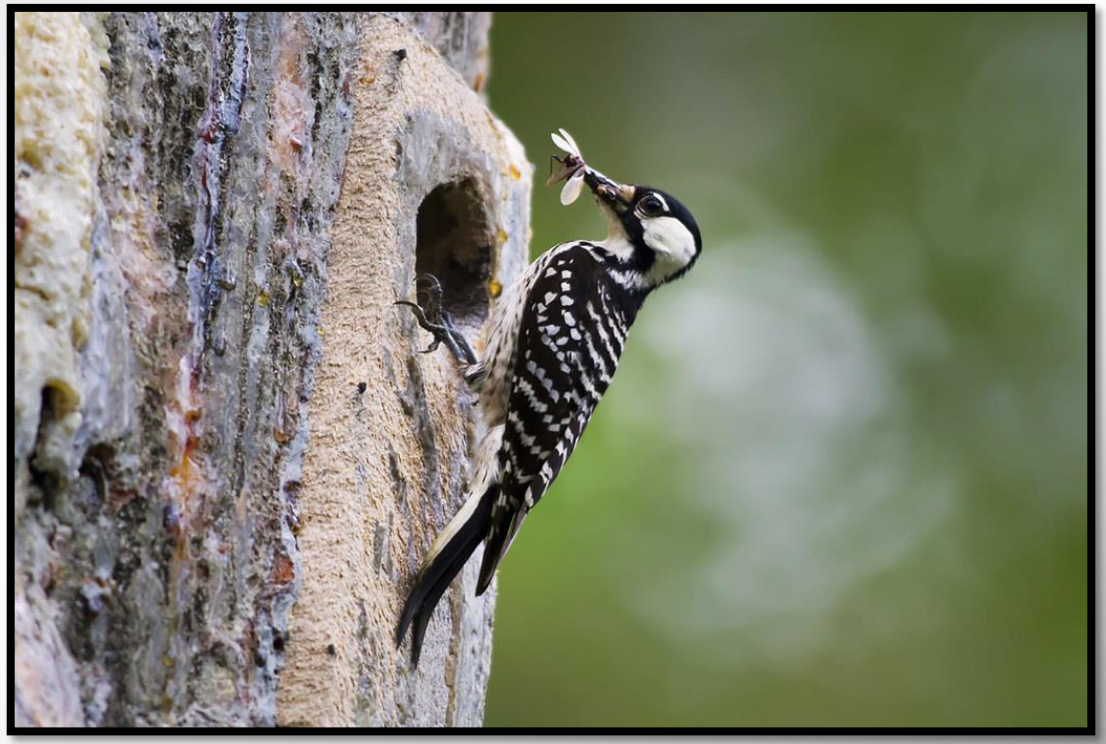
Site Specific Fauna Surveys

Group	Name	Federal Status	Supporting Habitat in or near the Site
Amphibians	Frosted flatwoods salamander (*Ambystoma cingulatum*)	Threatened	Habitat on site is too degraded to support. Species not observed.
	Striped Newt (*Notophthalmus perstriatus*)	None	Habitat not observed. Species not observed.
	Gopher frog (*Lithobates capito*)	Candidate	Habitat is present on site. Species not observed within the demonstration project area.
Birds	Red-cockaded woodpecker (*Picoides borealis*)	Threatened	Habitat not observed. Species not observed. May forage on site.
Reptiles	Eastern indigo snake *(Drymarchon corais couperi)*	Threatened	Habitat observed on site. No individuals observed. May forage on site.
	Gopher tortoise *(Gopherus polyphemus)*	Candidate	Habitat, burrows and individuals observed.

Red-cockaded Woodpecker

- **No suitable habitat observed onsite**
- **No species or cavity trees observed onsite**



Frosted Flatwoods Salamander

- **Sampled for in Feb-Mar 2019**
- **No individuals observed during sampling activities**

Striped Newt

- **Sampled for in Feb-Mar 2019**
- **No individuals observed during sampling activities**

Gopher Frog

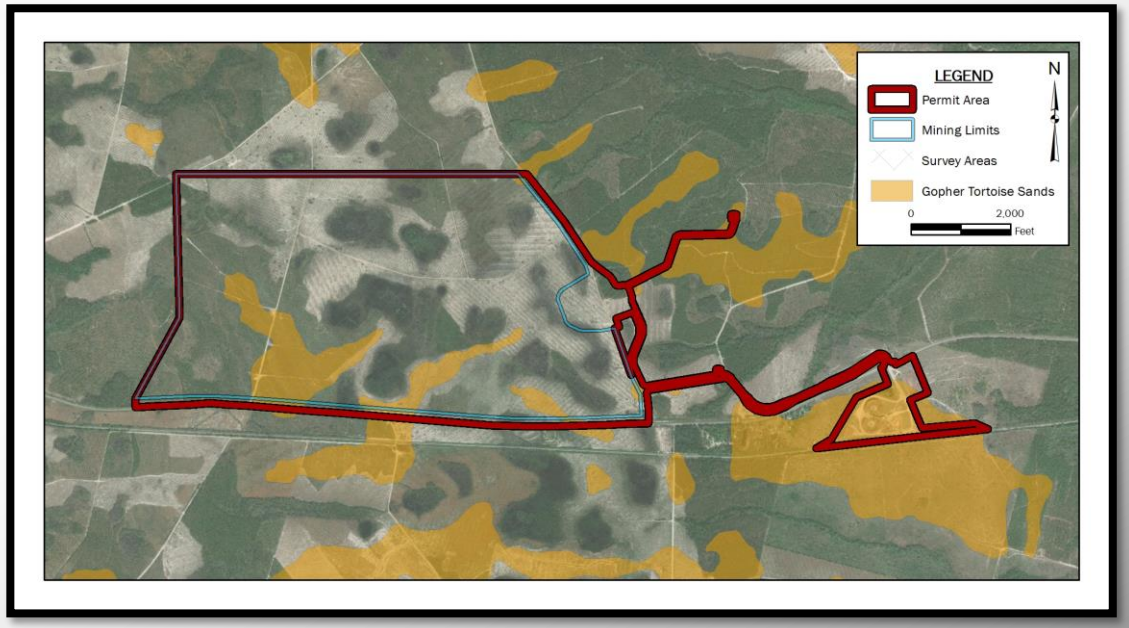
- **Discovered during Dec 2018 gopher tortoise surveys**
- **Six observed individuals**
- **None observed within proposed demonstration project footprint**

Eastern Indigo Snake

- Surveys conducted Dec 2018-Mar 2019
- Burrows scoped in spring 2019
- Surveys conducted Nov 19- Dec 18, 2019
- No eastern indigo snakes, shed skin, or snake tracks observed during surveys

Gopher Tortoise

- **Surveys conducted on Loncala, Keystone, Adirondack, and TIAA tracts from 2018-2019**
- **Scoped burrows in spring 2019**
- **Only three active burrows and one associated tortoise observed within the proposed project footprint**



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Other Special Concern Species

- **Bald Eagle**
- **Bachman's Sparrow**
- **Red-faced Topminnow**
- **Black Bear**

- None of these species were observed onsite, but Bachman's sparrow documented via call in April 2019.
- Project will not likely affect Bachman's sparrow due to short-term nature of impacts and degraded nature of current onsite habitat

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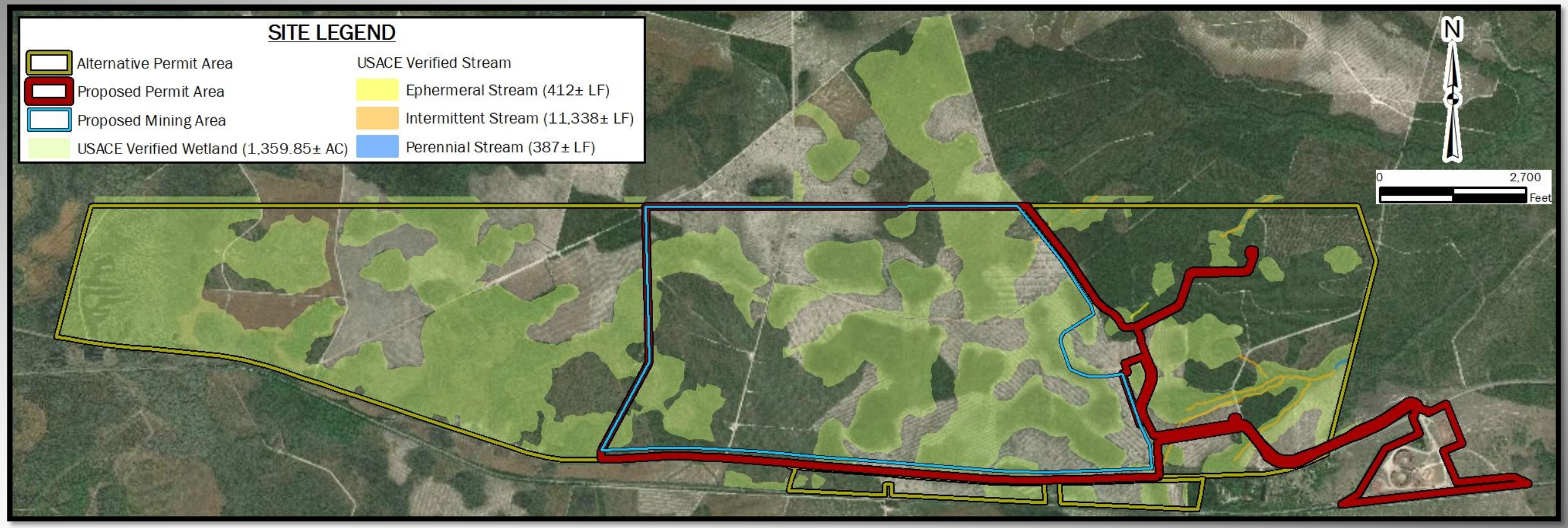
Cultural Resources

Cultural Resources

- **Railway eligible for NRHP, but not proposed to be impacted by project.**

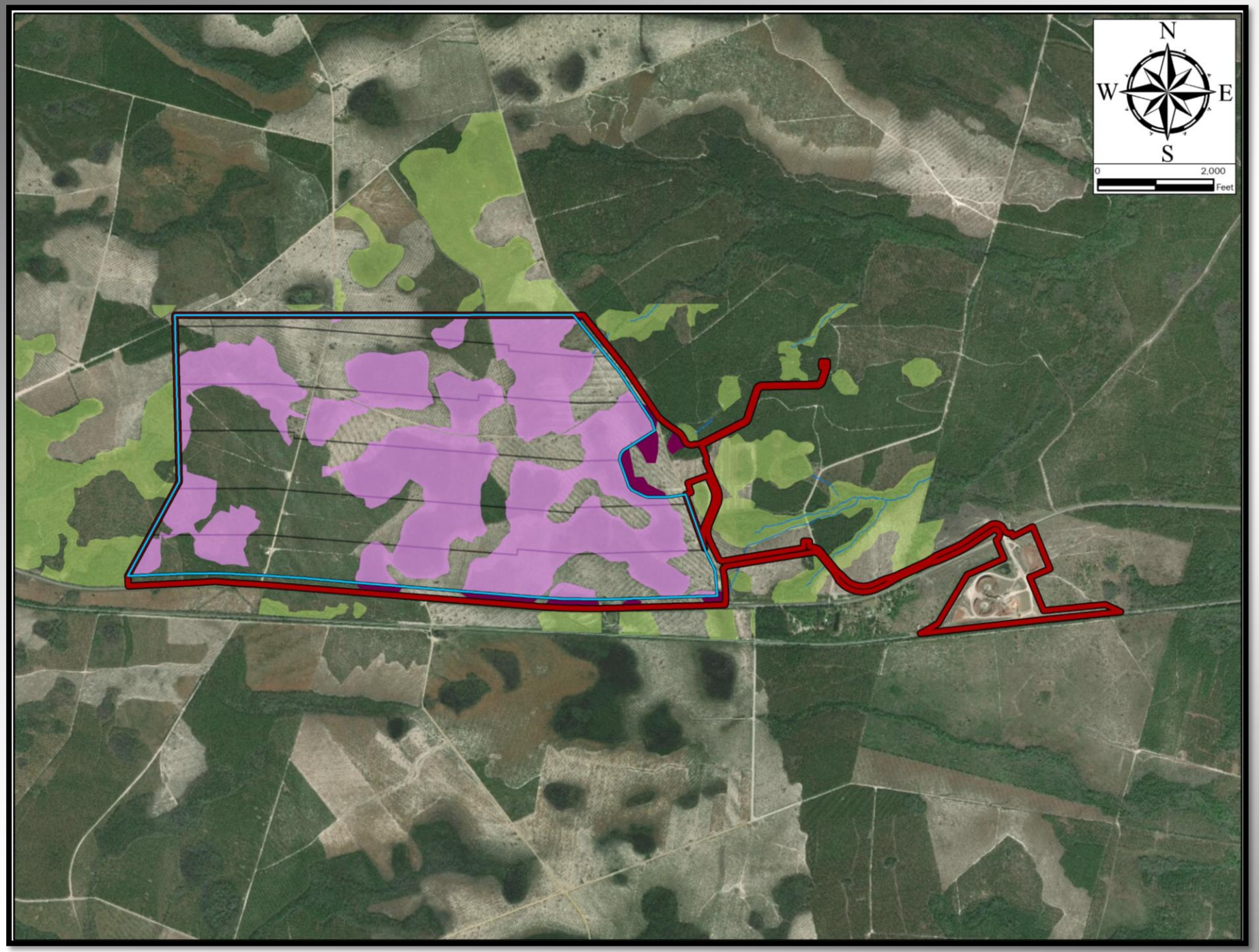
Aquatic Resources & Impacts

Aquatic Resource Delineations



Proposed Aquatic Resources Impacts

Proposed Aquatic Features Impacts by Year		
Impact Type	Depressional Wetland	Stream
	Acres of Impact	Linear Feet & Acres of Impact
Infrastructure	25.348	412 / 0.028
Mining Year 1	78.610	0.000
Mining Year 2	90.327	0.000
Mining Year 3	83.360	0.000
Mining Year 4	91.872	0.000
Mining Year 5	84.883	0.000
Mining Year 6	24.059	0.000
TOTAL	**478.459**	**412 / 0.028**



Aquatic Features Impacts

- Wetland Impacts: 478.459 ac
- Intermittent Stream Impacts: 412 linear feet

Proposed Aquatic Features Compensatory Mitigation

Impact Type/ Triggering Event	Anticipated Mitigation Credits Required			
	Wetland		Stream	
	Grandfathered Credits Required	2018 SOP Credits Required	Grandfathered Credits Required	2018 SOP Credits Required
Permanent Infrastructure	120.80	15.10	2,225.00	185.42
Mining Year 1	433.44	54.18	0.00	0.00
Mining Year 2	541.92	67.74	0.00	0.00
Mining Year 3	396.32	49.54	0.00	0.00
Mining Year 4	489.28	61.16	0.00	0.00
Mining Year 5	405.44	50.68	0.00	0.00
Mining Year 6	143.60	17.95	0.00	0.00
TOTALS	2,530.80	316.35	2,225.00	185.42

Thank You