404 (b)(1) REVIEW
ARKABUTLA DAM SAFETY MODIFICATION STUDY

I. Project Description

a. Location

Arkabutla Dam is located in Desoto County, Mississippi with portions of the Lake extending into Tate County, Mississippi. The dam is located on the Coldwater River, a tributary of the Tallahatchie River, that stores floodwater to provide flood damage reduction in the Yazoo Basin. The dam is located approximately 4.25 miles north of Arkabutla, Mississippi and approximately 35 miles south of Memphis, Tennessee. Arkabutla Dam is one of the four flood control dams in the Yazoo River Basin. The other three flood control dams are Enid on the Yocona River, Sardis on the Little Tallahatchie River, and Grenada on the Yalobusha River.

b. General Description

This project would involve construction of a new outlet works and stilling basin downstream at approximately river station 175+00. The new outlet works would consist of new state-of-the-practice reinforced concrete intake structure; reinforced concrete control house with vertical lift gates and an emergency gate; a bridge connecting the control house to the top of the dam; reinforced concrete conduit; and a reinforced concrete stilling basin. This plan also includes excavation of a new discharge channel with riprap scour protection to direct water towards the existing discharge channel.

A zoned soil embankment cofferdam would be constructed with 1V:3H side slopes to protect and dewater the outlet works excavation area. The upstream toe of the cofferdam would be built first from stone (riprap) material to provide a temporary dike to dewater the working area which will allow the construction of the remaining portion of the cofferdam in dry conditions. The cofferdam embankment would have a compacted clay core (CL) with random-fill outer shells (ML, CL-ML, CL). The base width of the compacted clay core is 100 feet. The crown of the cofferdam will be at EL. 264.3 feet, NAVD88. The downstream shell of the dam will have a 5 feet thick chimney filter to reduce porewater pressures and filter seepage. The upstream shell of the cofferdam will have a veneer of riprap up to elevation (EL 238 feet).

Following construction of the new outlet works, complete abandonment of the existing outlet works would occur. Along with the abandonment, the existing outlet channel would be backfilled. The channel would be prepared and backfilled with filter compatible native borrow material to the top of the existing ground from the stilling basin to the confluence of the new outlet channel. The borrow material will generally be cohesive, which will provide a cap and greatly increase the potential seepage pathway to limit BEP from downstream expressions.

During Pre-Construction Engineering and Design (PED) phase of the project, additional site and subsurface investigations would be required to refine the design of the cofferdam, stilling basin, outlet works, and confirm how much clay material is available in the potential borrow area.

c. Authority and Purpose

The Flood Control Act of 15 May 1928, as amended by the Acts of 15 June 1936 and 28 June 1938, authorized the construction of the Arkabutla Dam and Reservoir Project, which is included in the approved program for flood control under the appropriation "Flood Control Mississippi River and Tributaries", Act of 1939.

Development of recreation and public-use areas on USACE reservoir areas was authorized by Section 4 of the Flood Control Act of 22 December 1944, as amended by Section 209 of the Flood Control Act of 3 December 1954. Construction of the project began in August 1940 and was completed in June 1943. The authorized project purposes include flood control and recreation.

The purpose of the proposed project is to reduce the risk of Arkabutla dam breaching. USACE needs to lower this risk in order to prevent damages that would occur if an uncontrolled breach occurred and to continue properly operating Arkabutla Dam and Lake for their authorized flood prevention and recreational purposes.

d. General Description of Dredged or Fill Material

1) General Characteristics of Material –The cofferdam embankment would have a clay core with random fill outer shells grading from fine to coarse towards the outer edges.

   Material from the excavation of the new channel would likely be used to fill in the existing channel once the new outlet works is operational.

2) Quantity of Material – Approximately 1.3 million cubic yards of fill material would be required to construct the cofferdam and approximately 560,000 cubic yards of fill material would be required to backfill the current channel.

3) Source of Material – Any material required for the cofferdam would be furnished from an already existing commercial source and/or from the potential borrow area located in Figure 1.

   Material from the excavation of the new channel would likely be used to fill in the existing channel.

e. Description of the Proposed Discharge Site(s)

1) Location – The proposed project discharge sites are located within Arkabutla Lake and within the current outlet channel. The cofferdam would be placed within Arkabutla Lake around the location of the new outlet works.

   Backfilling the current channel would involve adding earthen material to the Coldwater River starting at the current outlet works and ending at the confluence of the new channel (Figure 1).

2) Size – The cofferdam would have a 100-foot compacted clay core base width. The crown of the cofferdam would be at EL. 264.3 feet, NAVD88.

Backfilling the current channel would involve filling approximately 2,415 linear feet of river channel. The newly constructed outlet channel would provide 3,414 linear feet of river channel.

3) Type(s) of Habitat – Habitats in the project area include the river channel, the lake, seasonally flooded bottomland hardwood forests, farmland, recreational areas, and the dam embankment.

4) Timing and Duration of Discharge – Construction is likely going to commence in the year 2029 and would take 3-5 years to complete. The cofferdam would be in place for most of the construction phase but would be removed after construction is complete.

   The current outlet channel would be permanently filled towards the end of the construction phase after the new outlet works and channel have been constructed and are operational.

f. Description of Disposal Method

The cofferdam would be constructed in Arkabutla Lake with 1V:3H side slopes to protect and dewater the outlet works excavation area. The upstream toe of the cofferdam will be built first from stone (riprap) material to provide a temporary dike to dewater the working area which will allow the construction of the remaining portion of the cofferdam in dry conditions. All material would be removed once construction of the new outlet works and outlet channel are complete.

When backfilling the current outlet channel, land-based equipment on both sides of the riverbank would place the fill material into the river channel up to the level of the existing ground. The current channel would be permanently filled.

II. Factual Determinations

a. Physical Substrate Determinations

1) Substrate Elevation and Slope –The Coldwater River Valley at the dam site is filled with alluvium that has an average thickness 76 FT. The alluvium is divided into a top stratum of fine-grained sediments (clays, silts, and some fine sands) and a substratum of predominately coarser grained sediments (sands and gravels). The top stratum ranges from 20 to 40 FT in thickness with the average being 32 FT. Clay (CL) varying from 3 to 24 FT in thickness caps the surface and is underlain by interbedded silts (ML) that sometimes contain clay strata; silty sands (SM) that sometimes contain clay strata; fine sands, or traces of gravel. The top stratum-substratum contact varies between elevation 174 and elevation 154. The substratum consists of fine to medium sands (SP) That may or may not contain gravel. Generally, these are underlain by sandy or clayey gravel (GP). However, when lenses or strata of silty sand or clay (CL) are present, some may be as thick as 15 FT.

The substratum ranges from 20 to 50 FT thick with the average being 36 FT. The alluvium is underlain by a minimum of 20 FT and possibly as much as 50 FT of medium-stiff to hard Tertiary clay of the Eocene, Claiborne Group, Cook Mountain Formation from Station 145+00 to Station 182+00. However, from Stations 135+00 to 145+00 and 182+00 to 190+00, the alluvium is underlain by a thick section of Tertiary sands and silty sands.

Relief, like that in other parts of the Lower Mississippi River flood plain, ranges from level to sloping, with a large part being level or nearly level. Soils in the project area are mostly comprised of made land soils that were placed when the levee and dam were constructed that have slopes of 0-8 percent. Part of the project area also contains Memphis silt loams have 17 to 40 percent slopes.

2) Sediment Type – Soils in the project area are mostly comprised of made land soils that were placed when the levee and dam were constructed. These soils are poorly drained and have very low permeability. Part of the project area also contains Memphis silt loams that are highly eroded and well drained with high permeability.

3) Dredged/Fill Material Movement – Material would be transported to the construction site using trucks provided by the contractor.

4) Physical Effects on Benthos – Any immobile benthic species within the proposed area of the cofferdam would likely experience increased levels of mortality caused by the dewatering and placement of the cofferdam material. These species are expected to recolonize the area after the cofferdam is removed. Mobile benthic species are expected to leave the area during construction and would return to the area after the cofferdam is removed. Overall benthic communities within Arkabutla Lake would remain unchanged.

   Backfilling the current channel would lead to increased mortality rates for immobile benthic species. Mobile benthic species are expected to leave the area during construction and the backfilling. While the backfilled channel would no longer be accessible for benthic species to recolonize, the newly constructed channel would provide in kind habitat for the benthic species to utilize. Overall benthic communities within the Coldwater River would remain unchanged.

5) Other Effects – N/A

6) Actions Taken to Minimize Impacts - The following actions would be implemented during construction to minimize impacts:

   - Effective erosion control would be in place prior to construction and maintained throughout the construction period.
   - Vegetation to be cleared would be the minimum necessary to allow for construction access.
   - Construction debris would be kept from entering the lake and river and shall be disposed of properly.
   - Appropriate steps would be taken to ensure that petroleum products or other

chemical pollutants are prevented from entering the water.

b. Water Circulation, Fluctuation, and Salinity Determinations

1) Water Quality. No significant long-term changes in water quality would be expected due to the construction of the cofferdam, outlet works, and new outlet channel. Turbidity and suspended solids would be temporarily increased as a result of the construction of the cofferdam and backfilling of the current channel. The impacts to water quality are expected to be minor and temporary since the cofferdam material would be removed from the lake and sediment would settle after construction of the cofferdam is completed, returning turbidity levels to normal. Similarly, turbidity levels downstream of the dam would likely minorly increase during the backfilling of the channel but would not increase enough to impair the downstream habitat or flow.

    a) Salinity – No expected change.

    b) Water Chemistry – No expected change.

    c) Clarity – Clarity of the water around Arkabutla Dam would likely decrease during construction of the cofferdam and the backfilling of the current channel due to increased suspended solids. These impacts would be minor and temporary with clarity around the dam returning to normal after construction is complete.

    d) Color – No expected change.

    e) Odor – No expected change.

    f) Taste – No expected change.

    g) Dissolved Gas Levels – No expected change.

    h) Nutrients – No expected change.

    i) Eutrophication – No expected change.

    j) Others as appropriate – N/A

2) Current Patterns and Circulation

    a) Current Patterns and Flow – No expected change.

    b) Velocity – No expected change.

    c) Stratification – No expected change.

    d) Hydrologic Regime – No expected change.

3) Normal Water Level Fluctuations – No expected change.

4) Salinity Gradients – N/A

5) Actions Taken to Minimize Impacts – The following actions would be implemented during construction to minimize impacts:

- Effective erosion control would be in place prior to construction and maintained throughout the construction period.
- Vegetation to be cleared would be the minimum necessary to allow for construction access.
- Construction debris would be kept from entering the lake and river and shall be disposed of properly.
- Appropriate steps would be taken to ensure that petroleum products or other chemical pollutants are prevented from entering the water.

c. Suspended Particulate/Turbidity Determinations

1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site – Minor temporary increases in suspended particulates and turbidity levels are expected during construction of the cofferdam and backfilling of the current channel. Best management practices would be used throughout the construction process to minimize this impact. Ambient conditions are expected to return shortly after completion of construction.

2) Effects on Chemical and Physical Properties of the Water Column

a) Light Penetration – No expected change.

b) Dissolved Oxygen – No expected change.

c) Toxic Metals and Organics – No expected change.

d) Pathogens – N/A

e) Aesthetics – Aesthetics would be minorly impacted due to the presence of construction equipment and some activities associated with construction, especially tree clearing along the riverbanks.

f) Others as Appropriate – None noted.

3) Effects on Biota

a. Primary Production – Species located within the proposed cofferdam location and the portion of the current outlet channel that would be backfilled would experience increased mortality due to the placement of the material. After the removal of the cofferdam, primary production species would recolonize the area. The overall stability of primary producers in Arkabutla Lake and the Coldwater River would be unaffected.

b. Suspension/Filter Feeders – Immobile species would experience increased mortality due to the placement of the cofferdam and backfill material. Mobile filter feeders are expected to avoid the area during construction activities. After

construction is complete and the cofferdam is removed, filter feeders would recolonize and return to normal utilization of the area. The overall community stability of filter feeders in Arkabutla Lake and the Coldwater River would be unaffected.

c. Sight Feeders – Sight feeders are expected to avoid the area during construction activities. After construction is complete and the cofferdam is removed, sightr feeders would recolonize and return to normal utilization of the area. The overall community stability of sight feeders in Arkabutla Lake and the Coldwater River would be unaffected.

3) Actions taken to Minimize Impacts – The following actions would be implemented during construction to minimize impacts:

- Effective erosion control would be in place prior to construction and maintained throughout the construction period.
- Vegetation to be cleared would be the minimum necessary to allow for construction access.
- Construction debris would be kept from entering the lake and river and shall be disposed of properly.
- Appropriate steps would be taken to ensure that petroleum products or other chemical pollutants are prevented from entering the water.

d. Contaminant Determinations – It is not expected that any contaminants would be introduced or translocated due to construction. A hazardous, toxic, and radioactive waste (HTRW) Phase I ESA investigation was conducted on the proposed project site and revealed no concerns related to the construction activities. If any HTRW concerns are encountered during construction of this project, USACE would be contacted to coordinate the proper handling and disposal of the material.

e. Aquatic Ecosystem and Organism Determinations

1) Effects on Plankton – No expected impact on plankton communities.

2) Effects on Benthos – Any immobile benthic species within the proposed area of the cofferdam would likely experience increased levels of mortality caused by the dewatering and placement of the cofferdam material. These species are expected to recolonize the area after the cofferdam is removed. Mobile benthic species are expected to leave the area during construction and would return to the area after the cofferdam is removed. Overall benthic communities within Arkabutla Lake would remain unchanged.

Backfilling the current channel would lead to increased mortality rates for immobile benthic species. Mobile benthic species are expected to leave the area during construction and the backfilling. While the backfilled channel would no longer be accessible for benthic species to recolonize, the newly constructed channel would

provide in kind habitat for the benthic species to utilize. Overall benthic communities within the Coldwater River would remain unchanged.

3) Effects on Nekton – Nekton species would likely experience minor temporary disturbances due to the construction of the cofferdam. These species are expected to avoid the area during construction but would return after the project is complete.

   Nekton species are expected to leave the current channel as it is backfilled. The channel would be permanently filled, and species would not be able to return. However, the Coldwater River nekton species would reestablish in the newly constructed channel after the project is complete.

4) Effects on Aquatic Food Web – No expected change.

5) Effects on Special Aquatic Sites

   a) Sanctuaries and Refuges – N/A

   b) Wetlands – A wetland delineation was performed on the project site. There are 5.2 acres of seasonally flooded bottomland hardwood forest that would be impacted by the construction of the new outlet channel. This area would need to be cleared and but would not require compensatory mitigation due to with project design that results in a net positive wetland functional capacity units.

   c) Mud Flats – N/A

   d) Vegetated Shallows – N/A

   e) Coral Reefs – N/A

   f) Riffle and Pool Complexes – N/A

6) Threatened and Endangered Species – In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, an official list of species and critical habitats potentially occurring in the vicinity of the proposed project area was acquired from the USFWS Information for Planning and Conservation (IPaC) website at (https://ecos.fws.gov/ipac/) on 8 July 2024. The federally listed species are as follows:

Northern Long-eared Bat (*Myotis septentrionalis*)	Endangered
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered
Alligator Snapping Turtle (*Macrochelys temminckii*)	Proposed Threatened
Monarch Butterfly (*Danaus plexippus*)	Proposed Threatened

   USACE made the determination that the proposed actions “May Affect but Are Not Likely to Adversely Affect” all four species. A concurrence letter for USACE’s determinations and a list of best management conservation measures for the project was received from USFWS on 16 August 2024. Any changes in project design and impacts would be coordinated with USFWS.

7) Other Wildlife – No expected change.

8) Actions Taken to Minimize Impacts – Actions that would be implemented during construction to minimize impacts are listed below:

- Tree clearing would not occur during bat maternity season which runs from May 15th - July 31st.
- Any construction involving abandoning the current outlet works would not take place during bat hibernation season which runs from November 16th-March 14th.
- On-bank construction efforts for the current channel would need to be concentrated to mid-September through mid-April to reduce impacts to alligator snapping turtles.
- Backfilling of the channel would occur during warmer months when the average water temperatures are above 50°F.
- Vegetation removal would be minimized where possible to avoid impacts to terrestrial and aquatic organisms.
- Reseeding would be done using native vegetation.
- The backfilled channel (approximately eight acres) would be left at a slightly lower elevation than the surrounding area to allow suitable hydrologic conditions for wetland establishment as well as allowing vegetative regrowth through natural succession. Therefore, an overall increase in wetland functional capacity units (FCU) with project is noted. Additionally, the regrowth would provide 15.7 average annual habitat units (AAHU) of wildlife habitat.

f. <u>Proposed Disposal Site Determinations</u>

1) Mixing Zone Determinations – N/A

2) Determination of Compliance with Applicable Water Quality Standards – This project would require a Water Quality Certification (WQC). USACE will work with the Mississippi Department of Environmental Quality to complete the WQC process during the PED phase of the project. No project construction would occur until water quality certification is received.

3) Potential Effects on Human Use

a) Municipal and Private Water Supply – N/A

b) Recreational and Commercial Fisheries – No significant impacts are expected. There are no commercial fisheries in the project area. In order to maintain safety recreational fishing would likely not be possible around the dam during construction. However, there are numerous similar locations on other parts of Arkabutla Lake that the public can use to fish.

c) Water Related Recreation – Most water-based recreation at Arkabutla Lake is currently inaccessible due to the lowered lake pool. The lake pool was lowered to

reduce pressure on the dam until permanent repairs can be completed. After construction of the proposed project is complete Arkabutla Lake would be returned to its normal pool level and water recreational areas would be reopened.

d) Aesthetics – Aesthetics would be temporarily impacted during construction due to the presence of construction equipment and the clearing of trees along the riverbank.

e) Determination of Cumulative Effects on the Aquatic Ecosystem – Impacts of the proposed project action were evaluated during the preparation of the environmental assessment (EA) on the natural and human environment. Future conditions are expected to be consistent with previous conditions. Besides USACE authorized projects, other activities in the vicinity, including agriculture and recreation, have not increased, and are not projected to increase in the future.

f) Determination of Secondary Effects on the Aquatic Ecosystem – No expected changes.

g) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves – No expected changes.

III. Findings of Compliance

a. Evaluation of Availability of Practical Alternatives to the Proposed Discharge Site which Would Have Less Adverse Impact on the Aquatic Ecosystem

An environmental assessment (EA) was written that addresses other alternatives to the proposed action. The table below contains the final array of alternatives considered for this project.

Table 1: Final Array of Alternatives

Alternative	Name	Description
1	No Action (required)	No actions would be taken, and the dam would not be repaired.
2	Outlet Works in New Location	Construct a new dam outlet works in a nearby location and decommission the current outlet works.
6	Conduit Liner + New Stilling Basin	Install a steel liner in the conduit and construct a new stilling basin downstream of the current stilling basin.
7	Conduit Liner + Stilling Basin Rehabilitation	Install a steel liner in the conduit and install foundation grouting.
9	Partial Cutoff Wall + Conduit Liner + New Stilling Basin	Install a steel liner in the conduit, construct a new stilling basin downstream of the current stilling basin, and add a partial cutoff wall to the dam.

After being examined and compared to each other, Alternative 2 was determined to be

the most practicable of the alternatives. Alternative 2 has greater wildlife habitat impacts than Alternatives 6, 7, and 9 due to the construction of the new outlet channel. However, with mitigation for the impacts, Alternative 2 would have overall similar environmental impacts as the other alternatives. Alternatives 6, 7, and 9 were determined to be less practical than Alternative 2 due to problems with constructability. For Alternatives 6, 7, and 9 there would be multiple challenges grouting and lining the conduit during construction. Additionally based on how often Arkabutla Dam has experienced inflow issues and had its current conduit regrouted, Alternatives 6, 7, and 9 would likely not properly address the current problems in the long-term. The No Action Alternative would fail to meet the projects' purpose and need. Under the No Action Alternative, no repairs would be made to the dam and the risk of breach would continue to increase over time. For these reasons Alternative 2 is the most practicable alternative.

During the evaluation process multiple borrow areas were evaluated. The proposed borrow area (Figure 1) was chosen because it would have the fewest environmental and cultural impacts.

b. Compliance with Applicable State Water Quality Standards

This project would require a Water Quality Certification (WQC). USACE will work with the Mississippi Department of Environmental Quality to complete the WQC process during the PED phase of the project. No project construction would occur until water quality certification is received.

c. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Air Act

DeSoto County, Mississippi is in attainment for all air quality standards. No significant impacts to air quality are expected. Greenhouse gas emissions that would be generated by the project have been recorded in the EA.

d. Compliance with Endangered Species Act of 1973

The U.S. Fish and Wildlife Service's (FWS) Information Planning and Consultation (IPaC) tool was used to obtain a report of the federally listed species in the project area and coordination with USFWS was completed.

e. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972

N/A

f. Compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

The proposed project site would be reviewed and surveyed for effects to cultural resources during the PED phase through a Programmatic Agreement. Coordination with Tribes and the State Historic Preservation Office has been initiated and will continue through the PED phase of the project.

g. Evaluation of Extent of Degradation of the Waters of the United States

1) Significant Adverse Effects on Human Health and Welfare

a) Municipal and Private Water Supplies – N/A

b) Recreation and Commercial Fisheries – No significant adverse impacts are expected. Only minor temporary impacts to recreation would occur.

c) Plankton – No significant adverse impacts are expected.

d) Fish – No significant adverse impacts are expected.

e) Shellfish – No significant adverse impacts are expected.

f) Wildlife – No significant adverse impacts are expected.

g) Special Aquatic Sites – N/A

2) Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems.

No significant adverse impacts are expected.

3) Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity, and Stability.

No significant adverse impacts are expected.

4) Sign Significant Adverse Effects on Recreational, Aesthetic, and Economic Values.

No significant adverse impacts are expected. Temporary minor impacts would likely affect recreation and aesthetics due to construction.

h. Appropriate and Practical Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

Actions that would be implemented during construction to minimize impacts have been previously described in each of the sections above. In summary best management practices would be implemented and impacted areas would be limited to the extent necessary for construction.

i. On the Basis of the Guidelines, the Proposed Disposal Site(s) for the Discharge of Dredged or Fill Material is:

1) _ Specified as complying with the requirements of these guidelines; or,

2) **_X_** Specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical mitigation and conditions to minimize pollution or adverse effects on the aquatic ecosystem; or,

   All conditions from the Mississippi Department of Environmental Quality would be adhered to.

3) _Specified as failing to comply with the requirements of these guidelines.

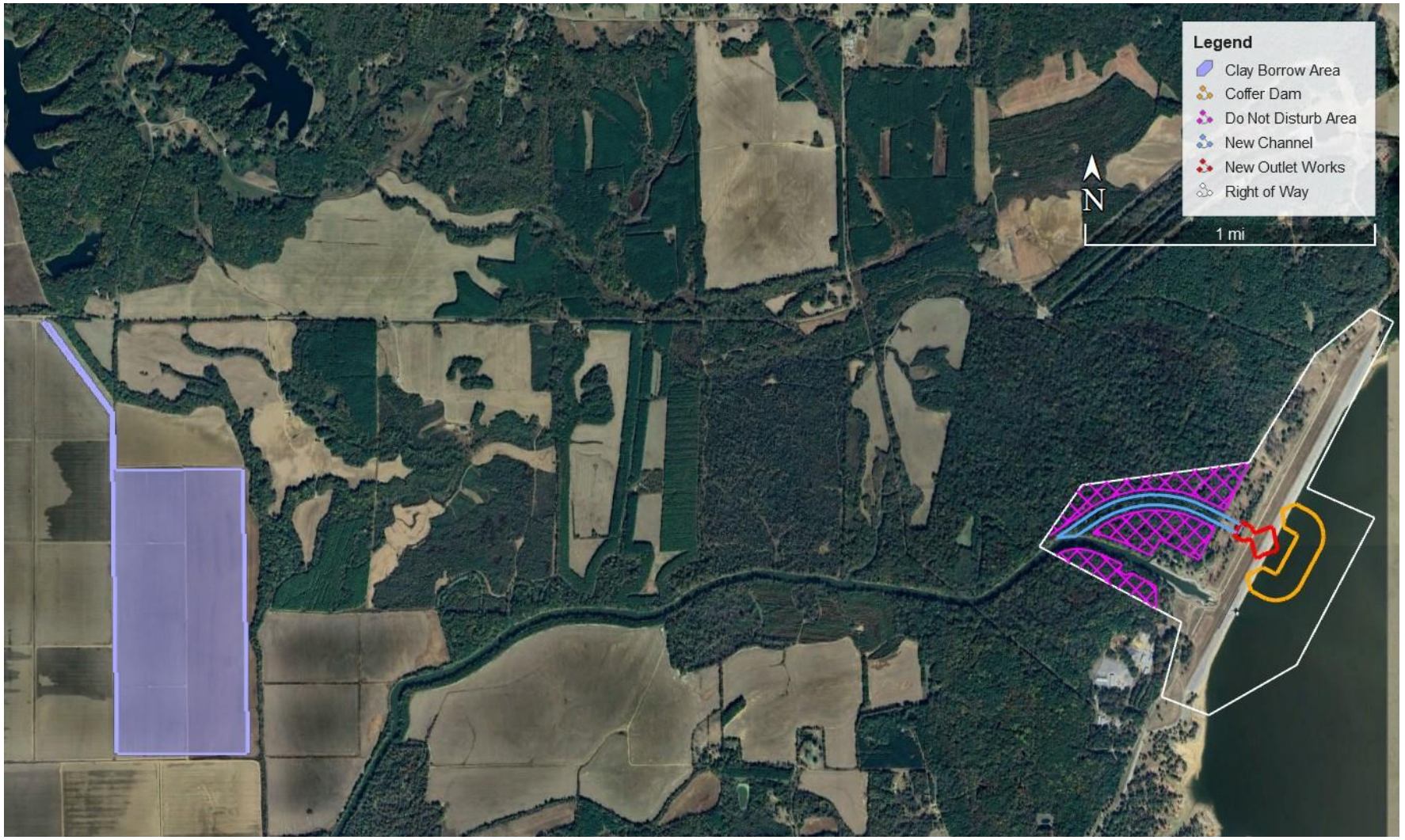

Figure 1: Project Site Plan, Arkabutla Dam, DeSoto County, Mississippi.